Financial Risk Management

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Chapter I

Introduction to Risk Management

After reading this chapter, you will be conversant with:

- The Meaning of Risk
- How Risk is Managed?
- Limitations of Risk Management

Elements of Uncertainty and Risk

Since time is immemorial, human beings have tried to manage risks faced in their day-to-day life. Keeping inflammable material away from fire, saving for possible future needs, creation of a legal will are all examples of attempts at managing risk. Risk is the possibility of the actual outcome being different from the expected outcome. It includes both the downside and the upside potential. Downside potential is the possibility of the actual results being adverse compared to the expected results. On the other hand, upside potential is the possibility of the actual results being better than the expected results.

Although the terms risk and uncertainty are often used interchangeably, they are in fact not synonymous. There is a clear distinction between certainty, uncertainty and risk. Certainty is the situation where it is known what will happen and the happening or non-happening of an event carries a 100% probability. Risk is the situation when there are a number of specific, probable outcomes, but it is not certain as to which one of them will actually happen. Uncertainty is where even the probable outcomes are unknown. It reflects a total lack of knowledge of what may happen.

Risk is not an abstract concept. It is a variable which can be calibrated, measured and compared. The degree of risk attached to an event is generally linked to the likelihood of the occurrence of that event. The higher the probability of the actual outcome being different from the expected outcome, the higher is the risk attached to the event. However, risk is a function of not only the probability of an outcome being different from that expected, but also its potential intensity, if it occurs. On 26th January, 2001 at 8.a.m. a massive earthquake measuring 7.9 on the richter scale took place in Gujarat, killing more than 50,000 people and rendering thousands homeless and injured. It is said that there has been no such intensity earthquakes in India in the past 100 years and even this one was not expected. This goes to prove the point that despite its high intensity, no one would have forecasted a proper riskiness of the same, as the probability of occurence was very low. The magnitude of the probable outcomes and the probability of their occurrence, together determine the riskiness of an event. Hence, risk is generally measured using the concept of standard deviation.

Risk is different from the terms 'peril' and 'hazard'. While risk is the possibility of a loss, peril is a cause of loss. Hazard, on the other hand, is a factor that may create or increase the possibility of a loss in face of an undesired event, or may increase the possibility of the happening of the undesired event. For example, fire is a peril that may cause loss. Inappropriate structure of a building is a hazard that increases the possibility of a loss in case of a fire. Inappropriate wiring is a hazard that increases the probability of a fire. Risk is the possibility of a loss due to these factors.

The degree of risk present in a particular situation is not an absolute, independent amount. It is dependent on the level of information available with the entity facing the risk. The degree of information available determines the entity's perception of the expected value and the probability distribution, which in turn determines the degree of risk. Even when complete information is available, risk is dependent on the interpretation of the information by the entity and its perception as to the future outlook. Two different entities may interpret the same information differently, or may have different expectations for the future, which would lead to two different sets of probability distributions. Hence, the same set of circumstances may translate into different levels of risk for different people.

A corporate's aim is to create wealth for its shareholders. This wealth is reflected in the market value of its shares. Hence, for a company the risk faced is reflected in the possibility of the actual market value of its shares being different from the expected market value. As the market value of a firm's shares is closely related to the profit earned by it, corporate risk can also be termed as the possibility of a company's actual Profits After Tax (PAT) being different from the expected PAT.

For a corporate, downside risk may stem from the possibility of either costs being higher than expected, or revenues being lower than expected. Similarly, the upside risk may result from either the possibility of costs being lower than expected, or the possibility of revenues being higher than expected.

DEFINITION OF RISK

The literal meaning of Risk is given variously. The Websters Dictionary says that 'Risk' is the possibility of something unpleasant happening or the chance of encountering loss or harm. Risk, in the present context, means the uncertainty of future cash flows. The objective of the companies is believed to be maximization of shareholders' wealth. Hence, the possibility of the growth rate of the shareholders' wealth falling short of the set targets can be considered as the risk a corporate faces. While this is the effect, and the job of a Risk Manager involves identification of

i. the nature of risk,

ii. the remedial measures available for managing the risk,

iii. the cost of managing the risk.

It will then be necessary for the Risk Manager to decide on the risks to be managed and the alternatives to be selected for managing the same. The basic Risk Return framework advocates selection of an investment depending on the capability/willingness of the investor to take risk apart from the return available on such investments. *Hence, the Risk Manager's job involves in ensuring that the RISK is maintained at the desired level. It must be clearly understood that Risk Management does not always mean Risk Reduction. In all such cases where risk is imperative, increasing the predictive ability also forms part of risk management.*

Types of Risk

The risks to which a corporate is exposed can be as under:

i. Interest Rate Risk.

ii. Exchange Risk.

iii. Liquidity Risk.

iv. Default Risk.

v. Internal Business Risk.

vi. External Business Risk.

vii. Financial Risk.

viii. Events of God.

ix. Market Risk.

x. Marketability Risk.

xi. Credit Risk.

xii. Personnel Risk.

xiii. Environmental Risk.

xiv. Production Risk.

These risks are discussed in more detail in the chapter 'Total Risk: Main Issues'. This list is not exhaustive, but covers the major types of risk.

MANAGING THE RISK

Once the different types of risks are identified, the next step involves identifying the alternate tools available for managing the risk. The tools may be described as under:

i. Avoidance

ii. Loss Control

iii. Separation

iv. Combination

v. Transfer.

Avoidance

As stated earlier the concept of risk is relevant if one is holding an asset/liability which is exposed to risk. Avoidance refers to not holding such an asset/liability as a means of avoiding the risk. Exchange Risk (Transaction/Translation) can be avoided by not holding liabilities/assets denominated in foreign currencies. Business risk is avoided by not doing the business itself. This method can be adopted more as an exception than as a rule since any business activity necessitates holding of assets and liabilities.

Loss Control

Loss control measures are used in respect of risks which cannot be avoided. These risks might have been assumed either voluntarily or because they could be avoided. The objective of these measures is either to prevent a loss or to reduce the probability of loss. Insurance, for example, is a loss control measure. Introduction to systems and procedures, internal or external audit help in controlling the losses. Raising funds through floating rate interest bearing instruments reduces the losses due to interest rate risk.

Separation

The scope for loss by concentrating an asset at a single location can be reduced by distributing it to different locations. Assets which are needed for routine consumption such as inventory, stationary can be placed at multiple locations so that the loss, in case of any accident, can be minimized. However, this does increase simultaneously the number of risk centers.

Combination

This reflects the old adage of not putting all the eggs in one basket. The risk of default is less when financial assets are distributed over a number of issuers instead of locking in the same with a single issuer. It pays to have multiple suppliers of raw material instead of relying on a sole supplier. A well diversified company has a lower risk of experiencing a recession.

Transfer

Risk reduction can be achieved by transfer. The transfer can be of three types. The risk can be transferred by transferring the asset/liability itself. The risk emanating by holding a property or a foreign currency security can be eliminated by transferring it to another. The second type of transfer involves transferring the risk without transferring the asset/liability. The exchange risk involved in holding a foreign currency asset/liability can be transferred to another by entering into a currency swap. Similarly, the interest rate risk can be transferred by entering into an interest rate swap. The third type of transfer involves making a third party pay for the losses without actually transferring the risk. An insurance policy for vehicles covering third party risk is an example of this. When a credit card issuing agency takes a policy to cover the losses incurred on account of misuse of lost cards it is in effect finding someone to finance the losses while it still has the obligation to pay to the Merchant Establishment.

LIMITATIONS OF RISK MANAGEMENT

Risk management although essential to control risks and avoid losses cannot guarantee full success. Risks can be minimized but never completely erased. While various theories discuss the benefits of diversification, careful investments in selected sectors, hedging and arbitraging, no money manager can guarantee a fool proof system against risks, mainly because many risks are unexpected and as a result from events of God. The remedial measures available to manage the risk are mostly based on general experience from the past. Managing risk tools may prove to be very costly and the investment in such tools may not justify the returns.

Out of the various ways in which risks are being managed, none of the methods is perfect and may not even work in a similar situation in future.

The selection of suitable methods for risk management depends on the firm's expectations regarding the future as well as the degree of risks acceptable to the management.

In short, given the uncertainty of returns and the occurrence of risks, the management should undertake to the extent of risk management which is appropriate to its level of operations.

SUMMARY

- The terms Risk and Uncertainty are used interchangeably but they have a distinct meaning. Risk is a situation when there are a number of specific probable outcomes and it is not certain which one will happen. Uncertainty is the situation where even the probable outcomes are not known.
- Risk management does not always mean risk reduction, but maintenance of risk at a desired level.
- There are various types of risks to which a business may be subjected.
- The tools available for managing the risk are: Avoidance, loss control, separation, combination and transfer.
- No foolproof system can ensure that risk is totally abolished and most of the techniques are based on past experiences.

Chapter II

Total Risk: Main Issues

After reading this chapter, you will be conversant with:

- Sources of Risk
- Types of Risk in Overall
- The Different Meanings of Risk
- The Cost of Risks

SOURCES OF RISK

If a company is exposed to a risk the impact should finally be felt on the values of its assets and liabilities. In some cases, the impact may be direct while in others it may be indirect. It is also true that the concept of risk becomes relevant only when there are assets and liabilities to be affected by risk either immediately or in future. For example, fire is a source of risk and it can effect directly the inventory. When a fire destroys the inventory there can be a consequential indirect impact on the profits of the company. If the value of the stock destroyed is, say, Rs.10 lakh and entire amount is recovered through an insurance claim, which usually is never the case in practice, there can still be a loss due to delay in production/loss of sales/increase in administrative costs, etc. Hence, analysis of risk involves three stages:

i. Source of Risk

ii. Nature of Assets/Liabilities to be affected

iii. Quantification of Loss.

As discussed, risks can be pure risks or speculative risks. The list of pure risks is vast and it suffices to say that doing anything in life involves risk.

The main pure risks can be described as under:

i. Property Exposure

ii. Liability Exposure

iii. Life and Health Exposure

iv. Financial Exposure.

Property Exposure

Any business or individual that uses any kind of property whether owned, leased, rented or otherwise is exposed to the risk of loss, theft and damage that may be caused by man-made reasons or natural reasons. Depending on the extent of exposure and damage, the business may be affected.

Liability Exposure

Around the world, liability to any business due to litigation, damages, claims, etc., has become a major issue of concern. Millions of dollars are lost by companies over legal suits and settlements. Such risks are there to an individual also.

Life and Health Exposure

Human beings have a certain death, although the extent of life and its quality cannot be determined. An individual may die while still young or may be bed-ridden for most of his life. Some people are healthy while others have to spend a major part of their earnings on health related matters. This exposure leads to loss of earnings for the individual, as well as loss of man-hours to the business to which he is associated.

Financial Exposure

The three exposures mentioned above involve pure risks. Financial exposure can be because of speculative nature also, and should not always be considered as a pure risk, but it still has same problems associated with pure risks. Although the techniques associated with these risks may be different from those used to manage the other risks mentioned above, it remains critical that these risks be identified and assessed in order for the firm to achieve its business goals.

The following Box depicts the major types of risk.

Box 1: Types of Risks – An Illustrative List

1. BUSINESS EVENT RISK
   - i. Collapse of Markets
   - ii. Currency Convertibility Risk
   - iii. Disaster Risk
   - iv. Legal Risk
   - v. Regulatory Risk
   - vi. Reputation Risk
   - vii. Shift in Credit Rating
   - viii. Taxation Risk
   - ix. War Risk
2. INFLATION RISK
3. INVESTMENT RISK
4. LIQUIDITY RISK
5. MARKET RISK
6. OPERATIONAL CONTROL RISK
   - i. Exceeding Limits
   - ii. Fraud
   - iii. Key Personnel Risk
   - iv. Money Laundering
   - v. Processing Risk
   - vi. Rogue Trading
   - vii. Security Risk
7. POLITICAL RISK
8. REINVESTMENT RISK
9. REPLACEMENT RISK
10. SOVEREIGN RISK
11. SYSTEMIC RISK
12. TRANSACTION RISK
    - i. Booking Error
    - ii. Commodity Delivery Risk
    - iii. Contract/Documentation Risk
    - iv. Execution Error
    - v. Product Complexity
    - vi. Settlement Error
13. SYSTEMS RISK
    - i. IT Systems Failure
    - ii. Mark-to-market Error
    - iii. Model Error
    - iv. Programming Error
    - v. Telecom Failure

Some of the main risks are discussed below:

INTEREST RATE RISK

Interest rate risk is the risk of an adverse effect of interest rate movements on a firm's profits or balance sheet. Interest rates affect a firm in two ways – by affecting the profits and by affecting the value of its assets or liabilities. For example, a firm that has borrowed money on a floating rate basis faces the risk of lower profits in an increasing interest rate scenario. Similarly, a firm having fixed rate assets faces the risk of lower value of investments in an increasing interest rate scenario. Interest rate risk becomes prominent when the assets and liabilities of a firm do not match in their exposure to interest rate movements. For example, a firm that has fixed rate borrowings and floating rate investments has a higher exposure than a firm having fixed rate borrowings and fixed rate investments for the same term. It can also be defined as the risk arising due to sensitivity of the interest income/expenditure or values of assets/liabilities to the interest rate fluctuations.

EXCHANGE RISK

The volatility in the exchange rates will have a direct bearing on the values of the assets and liabilities which are denominated in foreign currencies. While appreciation of home currency decreases the value of an asset and liability in terms of home currency, depreciation of home currency will increase the values of assets and liabilities. While increase in the value of asset and decrease in the value of liability has a positive impact on the corporate, increase in the value of liabilities and decrease in the value of assets has a negative impact.

LIQUIDITY RISK

Liquidity risk refers to the risk of a possible bankruptcy arising due to the inability of the firm to meet its financial obligations. There is a misconception that a profitable firm will have little or no liquidity risk. It is possible that a firm may be very profitable but may have a severe liquidity crunch because it has blocked its money in illiquid assets. Liquidity risk also refers to the possibility of having excess funds, i.e., the risk of having more funds that it can profitably deploy. Liquidity which is represented by the quality and marketability of the assets and liabilities, exposes the firm to liquidity risk. Though the management of liquidity risk and interest rate risk go hand in hand, there is, however, a phenomenal difference in the approach to tackle both these risks. A bank generally aims to eliminate the liquidity risk while it only tries to manage the interest rate risk. This differential approach is primarily based on the fact that elimination of interest rate risk is not profitable, while elimination of liquidity risk does result in long-term sustenance.

DEFAULT RISK

Default risk is the risk of non-recovery of sums due from outsiders, which may arise either due to their inability to pay or unwillingness to do so. This risk has to be considered when credit is extended to any party.

INTERNAL BUSINESS RISK

The internal business risk refers to the degree of operational efficiency the management has with the unanticipated future. The systems adopted, the decision-making abilities, the ability of the management to visualize the future will all contribute to the internal business risk. To a great extent it is a controllable factor. The risk of losses that may arise due to the Personnel can also be classified here. A loss may occur due to the resignation/death of a key individual. It may also arise due to the frauds perpetuated by the staff.

EXTERNAL BUSINESS RISK

The external business risk is the result of external environment in which the business is in existence. It emanates from factors which are not within the control of the company. Delayed monsoon or fiscal policy or stability of the Government or any similar factors may have a bearing on the income earning capacity of the company.

FINANCIAL RISK

This risk emanates from the composition of the financing of the operations. The level of debt as a proportion to the total liabilities determines the risk. A company with low proportion of debt has lower level of financial risk. A company which is unlevered has no financial risk. Financial risk refers to the risk of bankruptcy arising from the possibility of a firm not being able to repay its debts on time.

Higher the debt-equity ratio of a firm, higher the financial risk faced by it. Liquidity risk and wrong capital structure are the prime reasons for financial risk. Availability of credit at reasonable rates affects the cost of production. Similarly, defaults or delays by debtors in settling their dues causes financial loss.

EVENTS OF GOD

This is a term that one comes across while on the subject of insurance. It is a common knowledge that general insurance covers risks such as fire, riot, strike, cyclone, earthquake, etc. The happening of any of these events may result in the loss/damage of assets or even stoppage of business.

MARKET RISK

Market risk is the risk of the value of a firm's investments going down is a result of market movements. It is also referred to as price risk. Market risk cannot be distinctly separated from other risks defined above, as it results from interplay of these risks. Interest rate risk and exchange risk contribute the most to the presence of market risk.

MARKETABILITY RISK

This is the risk of the assets of a firm not being readily marketable. The situation of having non-marketable assets may or may not be linked to the need for funds. When such assets are required to be sold due to the need for funds, the non-marketability may lead to liquidity risk. Marketing risks can also take place because of selling at lower than expected prices due to existence of competition, change in fashion or taste of consumers leading to obsolescence of products, political instability resulting in loss of exports, etc.

CREDIT RISK

When there is a counterparty failure in performing the repayment obligation on due date, it gives rise to low quality assets which in turn leads to credit risk. Like the interest rate risk and the liquidity risk, credit risk is also an inherenet feature of any firm that is into the business of lending funds either to individuals or to corporates.

Effective management of credit risk involves the following key principles:

- Evaluation
- Pricing
- Monitoring.

By evaluating and sanctioning the proposal and appropriately pricing it, the credit risk management policy has indeed performed only half his job. While the measurement of the various ratios and other financial analyses is done with great accuracy, their interpretation is mostly not done. There has to be experience to scrutinize all the credit information and interpret the same. However, good the analyses may have been, the bank will be in no position to distinguish a good borrower from a bad borrower, who has no intention of repaying the loan. Despite all the caution, bad loans do creep into the banks. Thus, valuation and pricing decisions should be followed up with periodic review of the account and the credit rating of the borrower. Any fall in the rating will increase the credit risk. Credit risks persist from the time the loan is granted throughout its life period and continuous review during this period will help in the early detection of the problem loans.

PERSONNEL RISK

Many industries are service industries which depend mostly on the quality of their staff for success. By and large, every company needs personnel to operate. The loss of an important/key employee due to resignation/death/sickness could be a major risk to the performance of the company. A company could also incur heavy losses due to frauds committed by its staff.

ENVIRONMENTAL RISK

With the awareness created in public minds about the damages caused to the environment by industrial concerns, a company runs the risk of heavy fines, closure, government orders to shift the premises, orders to discontinue production of a certain product, etc.

PRODUCTION RISK

The production may be disrupted due to fires, floods, etc. The firm may not be able to produce the budgeted quantity at the budgeted price. The plant and machinery may not work efficiently or breakdown frequently affecting production. Raw materials may not be available or may be in short-supply. These are some of the risks due to production irregularities.

Other Risks

Firms also run the risks from the legal, social, political and economic environment in which they operate. Some risks may be beyond human control, while others may be controllable.

THE DIFFERENT MEANINGS OF RISK

Depending on the capacity and attitude towards risk, risks can also be divided into the following:

i. Pure Risks and Speculative Risks

ii. Acceptable Risks and Non-Acceptable Risks

iii. Static Risks and Dynamic Risks.

i. **Pure Risks and Speculative Risks:** Pure Risks are those in which the outcome tends to be a loss with no possibility of gain, while speculative risks are those in which there is a possibility of profit or loss. Example, the risk of fire in a godown results in a pure risk while dealing in the secondary market is a speculative risk, because one can either gain or lose.

   While it is possible to insure pure risks, speculative risks cannot be insured.

ii. **Acceptable Risks and Non-Acceptable Risks:** While risks are unavoidable in any business, the potential loss may be so minimal that some risks are acceptable without any prevention being taken. Certain risks are major and those are known as non-acceptable risks. For unacceptable risks, the management must find out ways to reduce, avoid or transfer the risk for example, a loss of 10 ball point pens in a month is an acceptable risk to the business, but a major financial loss of Rs.20 crore is a non-acceptable risk.

iii. **Static Risks and Dynamic Risks:** There are various risks that depend on changes in the economical, political, social and other scenarios. Such risks are known as dynamic risks. Speculative risks are types of dynamic risks.

   Risks that do not depend on various scenarios, are known as static risks. Pure risks are types of static risk.

THE COST OF RISKS

There are various costs involved in risk. These can be segregated as risk identifying costs, risk handling costs, actual losses, social costs, loss financing costs, loss control costs and cost of residual uncertainty. Let us discuss the same briefly.

Risk Identifying Costs

Risk identifying costs are those costs which an enterprise incurs to identify and analyze the risk like fees for consultants. Given the fact that most preventive measures are estimated on *ex ante* basis, risk identifying costs are estimates of the cost of the losses.

Risk Handling Costs

After the risks are identified, certain expenses of handling them are to be incurred like insurance premiums, alarm installation and loss prevention devices, etc., in addition to the man hours spent on risk handling.

Actual Losses

Actual losses imply direct as well as indirect losses. Damages caused by fire, death of personnel, injuries, loss of production and finished stocks are direct losses while indirect losses imply productivity reduction, stoppages, etc., which will happen if the fire takes place.

Social Costs

These are the costs that the company may have to undertake to compensate the society for whatever damages may be caused by its actions or by pure risks. For example, Union Carbide had to pay millions of dollars as compensation to the society because of the poisonous gas leak at Bhopal in 1984.

Loss Financing Costs

These costs also include insurance policies, hedging arragements and other contractual risk transfers. The same have been discussed in more detail in the next chapters.

Loss Control Costs

Loss control costs are the increased precautions and limits on the risk activities in order to reduce the chances of recurrence of risks. For example, proper timely maintenance of machinery can reduce the breakdowns and chances of accidents.

Residual Uncertainty Cost

After the magnitude of losses are eliminated through various measures like insurance policies, loss control, internal risk reduction, etc., there are certain risks that still remain uncovered. These are usually small in nature and are known as residual uncertainty risks. The costs involved with residual uncertainty risks are called residual uncertainty costs. For example, residual uncertainty about certain risk may make the staff uncomfortable about the future and they may demand higher wages to continue with the company. Generally shareholders, employees and other stakeholders are affected by residual uncertainty costs.

SUMMARY

- Risks can be divided into pure risks and speculative risks. Pure risks are those in which the management has no direct control while speculative risks are those in which the management can have full control.
- The main types of pure risks are property exposure, liability exposure, life and health exposure and financial exposure.
- Risks can also be divided into acceptable risks and unacceptable risks as well as static and dynamic risks.
- The main costs of risk are risk identifying costs, risk handling costs, actual losses, social costs, loss financing costs, loss control costs and residual uncertainty costs.

Chapter III

Corporate Risk Management

After reading this chapter, you will be conversant with:

- Approaches to Risk Management
- The Process of Risk Management
- Techniques of Risk Management
- Risk Management Guidelines

Introduction

No investor is obliged to take any risk on his or her investment. One may invest one's money in a government bond or a bank fixed deposit and receive fixed interest. This interest may be called risk-free return (actually only nearly risk-free) on investment. On the other hand, one may also invest in rather risky investments, in the expectation of earning very high returns. It appeals to common sense that one will invest in a risky venture only if one expects to earn a return in excess of the risk-free rate of return. But what do we mean by return from a venture? For that matter, what do we mean by riskiness of a venture? Let us have a closer look at the concept of return and risk.

Total Risk and Expected Returns

Investors want to maximize their expected returns subject to their tolerance for risk. Return is the motivation for investing. There could be two types of returns: realized return (the de-facto return) and expected return (or what the investors anticipate to earn). Return consists of the basic component in the form of interest or dividends and capital gains or losses due to the changes in the price of the asset. Total return can be defined as:

$$= \frac{\text{Cash payments received + Price changes over the period}}{\text{Purchase price of the asset}}$$

$$\text{or} \quad = \frac{(P_1 - P_0) + D_1}{P_0}$$

Return

In the field of finance, in general and security analysis in particular, the term return is almost invariably associated with a percentage (for example, return on investment of 15%) and not a mere amount (like profit of Rs.100). But then again, even in terms of a percentage, exactly what is return? Is it the return on investment or return on assets (profit as a percentage of assets)? Is it the return on total capital or return on equity? Is it the accounting rate of return or the internal rate of return? In corporate finance, from the corporate perspective, each of these definitions have a specific significance and the use of any one specific definition depends upon the purpose for which the return is being measured. For example, if the purpose is to measure the productivity of capital as a whole, one may measure the return on total capital; if one is concerned with the productivity of assets, one may compute return on assets and so forth.

Measuring Historical (ex post) Returns

To properly measure the return generated by an investment, one must account for both the price change and the cash flow derived from the asset during the period the asset was held. In other words, we can say that the return (the reward) from the investment includes both current income and capital gains (or losses) brought about by the appreciation (or depreciation) of the price of the security. The income and capital gains are then expressed as a percentage of the initial investment. Hence, return usually represents the total annual income and capital gain as a percentage of investment.

In bond investment, yield is the compounded rate of return on the purchase price of the bond over its life. Simply stated, it is referred to as yield-to-maturity. Since yield-to-maturity includes interest and capital gains or losses, it is also the return. The yield on a common stock, however, assumes no maturity date. Therefore, the stock yield is simply the price of the stock divided by the current dividend; there is no compounding of returns. It is known as the current yield. When bond yields are compared with stock yields, errors of judgment might be made, since the measures are different.

Total risk, which can be sub-divided into systematic risk (market risk) and unsystematic risk (firm specific risk), is the possibility that the realized return is less than the expected return.

What is Riskiness of Returns?

We can also interpret risk essentially in terms of the variability of security returns. The most common measures of riskiness of a security are the standard deviation and variance of returns.

STANDARD DEVIATION AND VARIANCE OF RETURNS

Standard deviation (commonly denoted as σ) of returns merely measures the extent of deviation of returns from the average value of return. Precisely put, standard deviation of returns is the square root of the average of squares of deviations of the observed returns from their expected value of return.

The square of standard deviation is called variance (commonly denoted by σ^2). Thus, variance of security returns is the average value of the squares of deviations of the observed returns from the expected value of return.

The variance is computed as follows:

Variance, $\sigma^2 = P_1 (r_1 - E)^2 + P_2 (r_2 - E)^2 + \ldots + P_n (r_n - E)^2$

Since variance is the square of standard deviation, we have standard deviation,

$$\sigma = \sqrt{(\text{Variance})}$$

The equations for quantifying the return, variance and standard deviation of individual security returns for both ex post and ex ante data are summarized in the following table.

Table 1

Historical (ex post)	**Expected (ex ante)**
Arithmetic mean return	Expected return
$\bar{r}_i = \frac{1}{n}\sum_{t=1}^{n} r_{it}$ Variance (Risk) $\sigma_i^2 = \frac{1}{n-1}\sum_{t=1}^{n} (r_{it} - \bar{r}_i)^2$ Standard deviation $\sigma_i = \sqrt{\frac{1}{n-1}\sum_{t=1}^{n}(r_{it} - \bar{r}_i)^2}$	$E(r_i) = \sum_{s=1}^{n} r_{is}\ P_s$ Variance (Risk) $\sigma_i^2 = \sum_{s=1}^{n} [r_{is} - E(r_i)]^2 . P_s$ Standard deviation $\sigma_i = \sqrt{\sum_{s=1}^{n}[r_{is} - E(r_i)]^2 . P_s}$

Where,

$\bar{r}_{it}$ = Historical (ex post) return generated by the ith stock in time period t.

r_{is} = Expected (ex ante) return for the ith stock assuming that S state of the world occurs.

P_s = Probability that the S state of the world will occur.

Total risks can also be defined as diversifiable and non-diversifiable risks. Diversifiable risks can be reduced by diversifying one's investment into a portfolio of various assets leaving one with the non-diversifiable risks, which arise from market wide movements of the security prices.

The non-diverisifiable risk can be measured by Beta (β). β shows how the price of a security responds to market forces. The more responsive the price of a security is to the changes in the market, the higher will be the β. The return on a stock can be measured by the following formula.

$$R_s = \alpha + \beta\ r_m$$

Where,

R_s = Estimated return on the stock

r_m = Return on market

β = Measure of stock's sensitivity to the market index

α = Estimated return when the market return is zero.

With the help of the CAPM, the required return on a security will be:

$$R_s = R_f + \beta (R_m - R_f)$$

Where,

R_f = Return that can be earned in a risk-free investment (Government bond).

So, in short, with the use of β, one can determine the appropriate required return (expected return) on the security or the securities to invest in.

Evolution of Risk Management

Corporate risk management refers to the process of a company managing its risks at an acceptable level. It is a scientific approach to deal with various kinds of risks faced by a corporate. According to Mark Dorfman, risk management is "the logical development and execution of a plan to deal with potential losses". It is a dynamic process which changes according to the evolving scenario. The aim of risk management is to maintain overall and specific risks at the desired levels, at the minimum possible cost.

Though it is a fact that risk includes both the upside and the downside potential, generally the upside is acceptable, and even desired. Hence, corporate risk management generally attempts to manage the possibility of profits being lower than expected. In fact, there are tools like options that help in managing the downside risk while retaining the upward potential. However, a part or whole of the upward potential may sometimes need to be foregone in order to manage the downward potential in a cost effective manner.

There is a misconception that the goal of risk management is the complete elimination of risk. In reality, risk management aims at ensuring that risk remains at a desired and acceptable level, or within an acceptable range. Complete elimination of risk can take place only when no business activity is undertaken. In fact, the return earned on government securities, which is generally referred to as the risk-free rate of return, is also not free from risks. The only risk such investments do not carry is default risk. In order to earn returns, it is essential to bear some risks. Risk management only aims at bringing the risk to a level that is in line with the returns expected to be generated by the investment. As the factors affecting risk change continuously, the risk faced by a firm also changes. Therefore, a company needs to continuously evaluate its risk level and make an attempt to bring it to the targeted level.

For the purpose of risk management, risks need to be classified as primary risks and secondary risks. Primary risks are those that are an essential part of the business undertaken. Secondary risks are those that arise out of the business activities, but are not integrally related to them. For example, the risks arising out of the industry structure are primary in nature, foreign currency exposure arising due to exports are secondary in nature. To a large extent, primary risks have to be borne in order to generate cash flows. They can be covered only partly. Unlike primary risks, secondary risks can be covered to a large extent, and only a part of them are unavoidable. This distinction becomes very important while deciding on the risks to be covered. Further, it is generally observed that when a firm faces a high degree of primary risk, it can bear less of secondary risk. A firm having a low degree of primary risk may be able to bear higher secondary risk, depending on the management's risk bearing capacity.

Traditional theories hold that the possibility of profit is the reward for taking risk. Still, the actual occurrence of the possible loss, that the presence of risk implies is not always welcomed by the party taking on the risk. In addition to the financial loss itself, there are a number of factors that make risk undesirable. The presence of risk induces the investor in the risky venture to demand a higher rate of return on his investment. This ultimately translates into a higher cost of goods and services produced by the investment. There may be situations where a high expected return may be accompanied by a very high expected variance, thus making an otherwise attractive opportunity unacceptable. The presence of risk may also warrant keeping aside some cash for the bad times. As this cash cannot be invested in any security other than a highly liquid one, it involves opportunity cost. This cost may turn out to be quite high in some cases. These factors give rise to the need to manage risks.

There are two schools of thought regarding the need to manage unsystematic risk. Traditional financial theory states that the market rewards only the systematic risk faced by firm. As the unsystematic risk can be diversified away, the market does not compensate the investors for bearing it. So, the presence of unsystematic risk does not increase the cost of capital for a firm. Thus, it is argued, a firm is not required to manage its unsystematic risks, as the costs involved reduce the return on investment, without reducing the cost of capital. This argument, however, does not take into consideration the indirect effect of unsystematic risk on the cash flows of a firm. A firm having a high degree of systematic risk, faces reduced confidence of the various stakeholders, i.e., the suppliers, the customers, the employees. As the suppliers feel that their payments are at risk, they either do not extend credit to the firm, or hike up the price of their supplies to make up for the increased risk. The customers do not show interest in buying the firm's products. This happens due to the perception that a risky firm is likely to cut down on its products' quality. Another reason for lack of consumer interest is that bankruptcy of the firm (which is highly probable for a firm facing a high degree of risk) would result in the lack of spare parts and after sales services for the firm's products. At the same time, the firm's employees also demand a higher compensation because of the higher possibility of them losing their source of earnings. All these factors result in the firm's operating cash flows falling down. Lower earnings would mean a lower market value for the firm, even if the firm's cost of capital remains unchanged. In practice, the providers of capital may be unwilling to fund highly risky ventures without extra returns. Hence, it can be said that managing unsystematic risks is essential for a firm to stabilize its earnings and to add value to its investors' wealth.

APPROACHES TO RISK MANAGEMENT

The following are some of the different approaches for managing risks:

- Risk avoidance
- Loss control
- Combination
- Separation
- Risk transfer
- Risk retention
- Risk sharing.

Risk Avoidance

An extreme way of managing risk is to avoid it altogether. This can be done by not undertaking the activity that entails risk. For example, a corporate may decide not to invest in a particular industry because the risk involved exceeds its risk bearing capacity. Though this approach is relevant under certain circumstances, it is more of an exception rather than a rule. It is neither prudent, nor possible to use it for managing all kinds of risks. The use of risk avoidance for managing all risks would result in no activity taking place, as all activities involve risk, while the level may vary.

Loss Control

Loss control refers to the attempt to reduce either the possibility of a loss or the quantum of loss. This is done by making adjustments in the day-to-day business activities. For example, a firm having floating rate liabilities may decide to invest in floating rate assets to limit its exposure to interest rate risk. Or a firm may decide to keep a certain percentage of its funds in readily marketable assets. Another example would be a firm invoicing its raw material purchases in the same currency in it which invoices the sales of its finished goods, in order to reduce its exchange risk.

Combination

Combination refers to the technique of combining more than one business activity in order to reduce the overall risk of the firm. It is also referred to as aggregation or diversification. It entails entering into more than one business, with the different businesses having the least possible correlation with each other. The absence of a positive correlation results in at least some of the businesses generating profits at any given time. Thus, it reduces the possibility of the firm facing losses.

Separation

Separation is the technique of reducing risk through separating parts of businesses or assets or liabilities. For example, a firm having two highly risky businesses with a positive correlation may spin-off one of them as a separate entity in order to reduce its exposure to risk. Or, a company may locate its inventory at a number of places instead of storing all of it at one place, in order to reduce the risk of destruction by fire. Another example may be a firm sourcing its raw materials from a number of suppliers instead of from a single supplier, so as to avoid the risk of loss arising from the single supplier going out of business.

Risk Transfer

Risk is transferred when the firm originally exposed to a risk, transfers it to another party which is willing to bear the risk. This may be done in three ways. The first is to transfer the asset itself. For example, a firm into a number of businesses may sell-off one of them to another party, and thereby transfer the risk involved in it. There is a subtle difference between risk avoidance and risk transfer through transfer of the title of the asset. The former is about not making the investment in the first place, while the latter is about disinvesting an existing investment.

The second way is to transfer the risk without transferring the title of the asset or liability. This may be done by hedging through various derivative instruments like forwards, futures, swaps and options.

The third way is through arranging for a third party to pay for losses if they occur, without transferring the risk itself. This is referred to as risk financing. This may be achieved by buying insurance. A firm may insure itself against certain risks like risk of loss due to fire or earthquake, risk of loss due to theft, etc. Alternatively, it may be done by entering into hold-harmless agreements. A hold-harmless agreement is one where one party agrees to bear another party's loss, should it occur. For example, a manufacturer may enter into a hold-harmless agreement with the vendor, under which it may agree to bear any loss to the vendor arising out of stocking the goods.

Risk Retention

Risk is retained when nothing is done to avoid, reduce, or transfer it. Risk may be retained consciously because the other techniques of managing risk are too costly or because it is not possible to employ other techniques. Risk may even be retained unconsciously when the presence of risk is not recognized. It is very important to distinguish between the risks that a firm is ready to retain and the ones it wants to offload using risk management techniques. This decision is essentially dependent upon the firm's capacity to bear the loss.

Risk Sharing

This technique is a combination of risk retention and risk transfer. Under this technique, a particular risk is managed by retaining a part of it and transferring the rest to a party willing to bear it. For example, a firm and its supplier may enter into an agreement, whereby if the market price of the commodity exceeds a certain price in the future, the seller foregoes a part of the benefit in favor of the firm, and if the future market price is lower than a predetermined price, the firm passes on a part of the benefit to the seller. Another example is a range forward, an instrument used for sharing currency risk. Under this contract, two parties agree to buy/sell a currency at a future date. While the buyer is assured a maximum price, the seller is assured a minimum price. The actual rate for executing the transaction is based on the spot rate on the date of maturity and these two prices. The buyer takes the loss if the spot rate falls below the minimum price. The seller takes the loss if the spot rate rises above the maximum price. If the spot rate lies between these two rates, the transaction is executed at the spot rate.

RISK MANAGEMENT PROCESS

Risk management needs to be looked at as an organizational approach, as management of risks independently cannot have the desired effect over the long-term. This is especially necessary as risks result from various activities in the firm, and the personnel responsible for the activities do not always understand the risk attached to them. The risk management function involves a logical sequence of steps. These steps are:

Determining Objectives

Determination of objectives is the first step in the risk management function. The objective may be to protect profits, or to develop competitive advantage. The objective of risk management needs to be decided upon by the management, so that the risk manager may fulfill his responsibilities in accordance with the set objectives.

Identifying Risks

Every organization faces different risks, based on its business, the economic, social and political factors, the features of the industry it operates in – like the degree of competition, the strengths and weaknesses of its competitors, availability of raw material, factors internal to the company like the competence and outlook of the management, state of industry relations, dependence on foreign markets for inputs, sales, or finances, capabilities of its staff and other innumerable factors. Each corporate needs to identify the possible sources of risks and the kinds of risks faced by it. For this, the risk manager needs to develop a fundamental understanding of all the firm's activities and the external factors that contribute to risk. The risk manager especially needs to identify the sources of risks that are not so obvious.

Risk Evaluation

Once the risks are identified, they need to be evaluated for ascertaining their significance. The significance of a particular risk depends upon the size of the loss that it may result in, and the probability of the occurrence of such loss. On the basis of these factors, the various risks faced by the corporate need to be classified as critical risks, important risks and not-so-important risks. Critical risks are those that may result in bankruptcy of the firm. Important risks are those that may not result in bankruptcy, but may cause severe financial distress. The not-so-important risks are those that may result in losses which the firm may easily bear in the normal course of business.

Development of Policy

Based on the risk tolerance level of the firm, the risk management policy needs to be developed. The time-frame of the policy should be comparatively long, so that the policy is relatively stable. A policy generally takes the form of a declaration as to how much risk should be covered, or in other words, how much risk the firm is ready to bear. Generally, the level of secondary risk acceptable to a firm depends on the degree of primary risk faced by it. A firm facing low primary risk may be more open to bear secondary risk than a company that faces a high degree of primary risk. The policy may specify that a specific percentage, say 50%, of all risks are to be covered or that not more than a specific sum can be at risk at any point of time. The development of Value at Risk (VaR) model provides a solution.

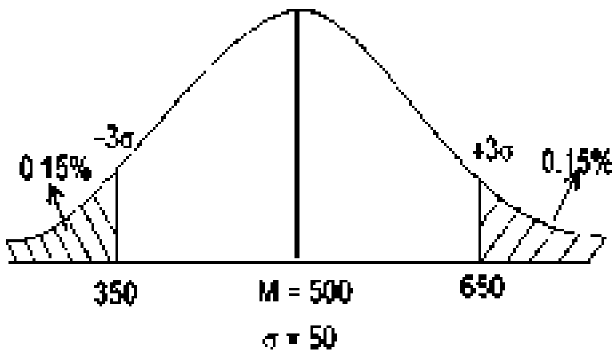
Barry Schachter describes Value at Risk as "an estimate of the level of loss on a portfolio which is expected to be equaled or exceeded with a given, small probability". VaR is a statistical measure calculated over a specific investment horizon. It measures the expected loss arising due to normal market movements in the variables responsible for the portfolio's risk. A particular portfolio having a VaR of X at 95% confidence level implies that there is a 5% probability of the portfolio's value falling by more than X. The concept of VaR is closely linked to the concepts of mean, standard deviation, and normal distribution. Let us see an illustration to understand VaR.

Mr. A holds 1000 shares of X Ltd. The current market price of the share is Rs.500 per share. The monthly standard deviation is Rs.50. Assuming that the price of the security follows a normal distribution, we can say that at the end of the month, the situation will be as follows:

– At 68.3% confidence level, the price of the security will lie between +/– 1 standard deviation of the current value, i.e. between Rs.450 and Rs.550.
– At 95.5% confidence level, the price of the security will lie between +/– 2 standard deviations of the current value, i.e. between Rs.400 and Rs.600.
– At 99.7% confidence level, the price of the security will lie between +/– 3 standard deviations of the current value, i.e. between Rs.350 and Rs.650.

The normal distribution for the security will look as below:

Figure 1: Standard Normal Distribution



Value at Risk is different from other methods of measuring risk in that it makes a distinction between the downside movements and the upside movements. As upside movements are generally welcome, VaR calculates the possible downside movement at the given confidence level. In the above illustration, there is a 99.7% probability that the price of the security will be between Rs.350 and Rs.650. In other words, there is a 0.3% probability that the price of the security will be below Rs.350 or above Rs.650. As we have assumed that the price of the security follows a normal distribution, there is an equal chance of the price being below Rs.350 and its being above Rs.650. Thus, there is a 0.15% probability of the price being above Rs.650. Hence, there is a 99.85% probability of the price being equal to or above Rs.350. Since the loss at this price will be Rs.150, we can say that for a one-month holding period, at 99.85% confidence level, the VaR is Rs.150.

The concept of VaR is also used to quantify the risk arising out of individual assets/liabilities. These can then be summed up to arrive at the Value at Risk for the organization as a whole. In addition to measuring the existing risk level, VaR can also be used to lay down the policy for the level of overall risk that is acceptable to the management. The value can then be disaggregated to arrive at certain prudential limits for different activities, as a part of the risk management framework of the organization. For example, an investment bank may decide that a VaR of $100 million at a confidence level of 98.5% is acceptable for the organization as a whole, while the corresponding value for the fixed income securities division will be $20 million. Thus, at no time the possible loss of the fixed income securities division can exceed $20 million.

However, VaR cannot be used in isolation to quantify risk. An important reason is that it does not measure ‘event risk’, i.e., the risk of drastic movements in the underlying variables. The probability of such movements is specified by the given confidence level, but the quantum of possible loss in the event of such drastic movements cannot be calculated using VaR.

Further discussion in detail on VaR is undertaken in the chapter “Value at Risk”.

Development of Strategy

Based on the policy, the firm then needs to develop the strategy to be followed for managing risk. The tenure of a strategy is shorter than a policy, as it needs to factor-in various variables that keep changing. A strategy is essentially an action plan, which specifies the nature of risk to be managed and the timing. It also specifies the tools, techniques and instruments that can be used to manage these risks. A strategy also deals with tax and legal problems. It may specify whether it would be more beneficial for a subsidiary to manage its own risk, or to shift it to the parent company. It may also specify as to how it will be most beneficial to shift the losses to a branch located at a particular location. Another important issue that needs to be specified by the strategy is, whether the company would try to make profits out of risk management (from active trading on the derivatives market) or would it stick to covering the existing risks.

While the strategy is to be designed within the guidelines laid down by the top management, and in a manner that best satisfies the objectives of risk management, the actual leeway available to the manager for making the decision changes from company to company. In some corporates, the guidelines may only specify the broad framework to be followed while making the risk management decision, giving him a lot of scope for deciding about the specific technique and instrument to be used for managing a specific risk. On the other hand, some corporates lay down rigid and detailed guidelines that need to be followed while making risk management decisions, leaving the manager very little scope for exercising his judgment. Finally, the devices used for risk management will depend on the management’s willingness to take risks, to shift production centers, to change the product mix, to use derivative products, etc.

Implementation

Once the policy and strategy are in place, they are to be implemented for actually managing the risks. This is the operational part of risk management. It includes finding the best deal in case of risk transfer, providing for contingencies in case of risk retention, designing and implementing risk control programs, etc. It also includes taking care of the details in the operational part, like the back office work, ensuring that the controls are complied with, etc.

Review

The function of risk management needs to be reviewed periodically, depending on the costs involved. The factors that affect the risk management decisions keep changing, thus necessitating the need to monitor the effectiveness of the decisions taken previously. Sometimes, the decisions taken earlier may not prove to be correct or the changing circumstances may make some other option more effective. A periodic review ensures that the risk management function remains flexible and the tools, techniques and instruments used to manage risk change according to the changing circumstances. In effect, review helps the risk manager analyze whether the risk management function is achieving the set objectives or not, and to find an alternative course of action if the results are not in accordance with the expectations.

The process of risk management has to be flexible because a company's risk profile keeps changing. Hence, it needs to be remembered that the emphasis of the risk management process is not an identification of any specific risk, but on developing a method of assessment of risk and of arriving at the best possible way of dealing with them, as and when they arise.

How are Exposures Created?

The activities of various departments have implications in terms of creating exposure to risks. Following are a few specific illustrations on how heads of different departments contribute to a firm's risk.

- **Purchase Managers** create exposure when they source from foreign suppliers. There is an explicit foreign currency risk when the invoice is in a foreign currency. Even when the invoice is in the domestic currency, the firm is indirectly exposed as the seller will factor-in the exchange risk while giving a quotation. Moreover, the cost or premium for the privilege of paying in one's home currency will be substantial – more often than not it will be cheaper to pay foreign currency and hedge the risk by other means.
- **Sales Managers** contribute to a firm's exposure in number of ways. Taking on foreign customers, maintaining price lists denominated in a foreign currency or signing long-term contracts are a few examples of creating apparent exposures. Many a time, the decisions lead to hidden risks. For example, operating in foreign markets exposes a firm to operating risks, like the risk of losing a customer due to the depreciation of a competitor's currency of invoice.
- **Engineers** expose their firm to risk when they specify a component that can be sourced from only one supplier from a given country. This awareness would encourage them to make an attempt to give global oriented specifications, while maintaining the desired level of quality.
- **HR Managers** may expose the firm to risk through their designing of compensation schemes. The inclusion of stock options as incentives can expose a company to substantial equity risk.
- **Logistics Managers** may expose the firm to price risk when they fix the input prices or agree to a specific input-price adjustment clause.
- **Divisional Presidents** may contribute to a firm's exposure through their decisions regarding development of a new product or location of a new facility. In general, any marketing analysis or site-selection process has inherently crucial exposure-management implications that need to be considered before the final decision is made. The same goes for M&A activity, as well as overall corporate financing (For example, fixed rate vs. floating rate debt or home currency vs. foreign debt).

RISK MANAGEMENT TECHNIQUES

There are two kinds of techniques that can be used for management of various categories of risk. These are internal techniques and external techniques. Internal techniques are those that are a part of the day-to-day operations of the firm, while external techniques are those that require the company to enter into some kind of financial contract with a market entity. Both internal and external techniques can be used to manage different risks. The following section describes these techniques.

Management of Business Risk

Most of the business risks are not manageable, i.e., they have to be borne. However, some of these operational risks can be managed by building flexibility into the operations. For example, if the designing of products is done in such a manner that standardized machines can be used for production purposes instead of specialized equipment, the risk of obsolescence of machinery is reduced to some extent. Some of the pure risks can be managed using external hedging techniques like insurance.

Box 1: How British Petroleum (BP) Changed Its Insurance Strategy

Major public companies typically buy insurance against large potential losses and self-insure against routine ones. The idea is that large losses can trigger financial distress. On the other hand, routine losses for a corporation are predictable, so there is little point paying premium to an insurance company and receiving back a fairly constant proportion as claims. BP has challenged this conventional wisdom. Like all oil companies, BP is exposed to a variety of potential losses. Some arise from routine events such as vehicle accidents and industrial injuries. At the other extreme, they may result from catastrophes such as a major oil spill or the loss of an offshore oil rig due to an accident. In the past, BP purchased considerable external insurance. During the 1980s, it paid out an average of $115 million a year in insurance premiums and recovered $25 million a year in claims.

Recently, BP took a hard look at its insurance strategy. It reasoned that it made sense to allow local managers to insure against relatively routine risks, for in those cases insurance companies have an advantage in assessing and pricing risk and compete vigorously against one another. However, it decided that for the most part it would no longer insure externally against losses above $10 million. For these larger, more specialized risks BP felt that insurance companies had less ability to assess the risk and were less well placed to advise on safety measures. As a result, BP concluded, insurance against large risks was not competitively priced.

How much extra risk does BP assume by its decision not to insure against major losses? BP estimated that large losses of above $500 million could be expected to occur once in 30 years. But BP is a huge company with equity worth about $35 billion. So even a $500 million loss, which could throw most companies into bankruptcy, would translate after tax into a fall of only 1% in the value of BP’s equity. BP concluded that this was a risk worth taking. In other words, it concluded that for large, low-probability risks the stock market was a more efficient risk-absorber than the insurance industry.

Source: Principles of Corporate Finance, Brealey & Myers.

Another important part of the business risk is the possibility of adverse movement in the cost of raw materials and the price of a firm’s final product. These risks can also be managed by buying and selling commodity futures. By buying commodity futures for those raw materials which are essential to the production process and whose value is expected to be volatile in future, a firm can lock-in its cost. Similarly, by selling commodity futures for its final product, the firm can lock-in its revenues, thus managing a part of its business risks.

Management of Currency and Interest Rate Risk

Currency and interest rate risk can be managed using both external and internal techniques. The external techniques are mostly dependent on the use of derivatives. A company may use products like forwards, futures, options and swaps for managing these risks. For example, an exporter who is expecting to receive $1 million at the end of 6 months is exposed to currency risk. He may hedge this risk by selling the foreign currency in the forward market. Alternatively, he may sell futures contracts for the relevant amount. Further still, the exporter may buy a put option for the foreign currency. Under the last alternative, while he limits his downside risk, he retains the upside potential. Similarly, a financial institution that is exposed to interest rate movements because it has fixed rate investments financed through floating rate borrowings, may enter into a swap transaction whereby it pays interest on a fixed rate basis and receives interest on a floating rate basis.

In addition to these external hedging techniques, there are a few internal hedging techniques that are available for managing currency risk. These are exposure netting, leading and lagging, and choosing the currency of invoice. Exposure netting refers to creation of exposures in the normal course of business which offset the existing exposures. Leading refers to advancing a payment and lagging refers to postponing a payment. This is done in anticipation of exchange rate movement. A company may lead a payment that is due in a currency which is expected to appreciate. Similarly, it may lag a payment that is due in a currency which is expected to depreciate. Thus, while the company does not have to pay a higher amount due to the subsequent appreciation of the foreign currency, it ends up paying a lesser amount due to the depreciation of the foreign currency. A firm can also manage exchange risk by invoicing all its exports and imports in the domestic currency. Alternatively, it may invoice its exports in a currency that is expected to appreciate, and its imports in a currency that is expected to depreciate. However, it needs to be remembered that the other party is likely to factor in these considerations while arriving at the acceptable price.

The internal techniques of managing interest rate risk form a part of asset-liability management.

Asset-Liability Management

Marshall and Bansal describe asset-liability management as "an effort to minimize exposure to price risk by holding the appropriate combination of assets and liabilities so as to meet the firm's objectives and simultaneously minimizing the firm's risk." Asset-liability management can be used to manage both interest rate risk and exchange risk. It can be used in addition to, or in the place of the risk management tools described above. However, generally asset-liability management is used to manage interest rate risk as a complementary tool to the other tools.

GUIDELINES FOR RISK MANAGEMENT

There are a number of instruments and tools available for management of risk. While going through the risk management process in general, and deciding the instrument to be used for hedging a particular risk, the following guidelines need to be kept in mind:

- **Common goal of risk management and financial management:** The overall goal of financial management is to create shareholder wealth. Shareholder's wealth is created by undertaking projects which generate a positive Net Present Value. Thus, the final goal of risk management should be to make sure that funds for such investments are available at the appropriate time.

- **Proper mix of risk management techniques:** No risk management can be complete or fool proof in itself. A firm has to ensure that it employs the most optimum mix of risk control, risk prevention, risk transfer and risk retention, as also that of various internal and external hedging techniques.
- **Proactive risk management:** There are a number of uncertainties involved in the financial and commodities markets. Continuous change in interest rates, exchange rates, commodity prices, economic variables and external environment is a reality. Though it is not possible to accurately predict the movement of these variables, the risk manager needs to make an attempt to forecast the same. These forecasts should be used for management of risks. Risk management cannot be done after the happening of an event, it has to be done in its anticipation.
- **Flexibility:** The risk management strategies should not be too rigid. They should be flexible enough to allow the risk manager to make the most appropriate decision according to the circumstances.
- **Bringing risk to the optimal level:** The process of risk management should aim at maintenance of risk at the level which is optimal according to the risk bearing capacity of the firm. While a firm should not be exposed to risks which may result in its liquidation, the aim of risk management is not to completely eliminate risks.
- **Risk substitution:** A firm needs to be aware of the fact that generally risk management techniques do not eliminate the risk completely, but substitute it by another kind of risk. For example, when a company deals in futures contracts, the risk is not completely eliminated, but is replaced by basis risk. So essentially, a firm trying to manage its risks is only exchanging certain unacceptable risks for other risks which are more acceptable to it. A firm needs to remember this fact while managing its risks.

Risk Management Tools

While diversification is a way to reduce the risk, corporate risk management has over a period of time developed various risk management tools, which can be described as under:

i. Hedging
ii. Forwards
iii. Futures
iv. Options
v. Swaps, and
vi. Hybrid debt securities.

These risk management tools are used in addition to insuring the assets by underwriting to insurance policies.

A brief description of each one of them is given here:

Hedging

While risk can be reduced by diversifying, hedging means identifying two exactly correlated assets as far as returns are concerned. One can hedge the risk by buying one of the assets while simultaneously selling the others. While complete hedging may not always be possible, sometimes residual risks remain. Nevertheless, hedging is a powerful tool in reducing risks.

Assume that you have sold stock of ABC Ltd. worth US $24 million. Now you fear that the market may move adversely and you may incur losses, as this was a short sale (sale without actual possession of the stock). You could hedge your risk by buying stock index futures. Based on your estimation of the β of ABC Ltd. (say $\beta = 1.6$) you could buy index futures worth US $25 million x 1.6 = US $40 million of index futures.

The balance funds could be obtained by borrowing from a bank US $15 million.

This will create a zero-value hedge.

Forwards

A forward is a contract to buy or sell an asset at a predetermined future date for a current price, i.e., paying today's price for the delivery of the asset at a future date. If the price goes up or down, the asset is to be delivered on the due date and no further payment is to be made for the difference.

Forwards are a good tool to ensure that future price volatility does not entail losses to the business. The gains of the buyer and seller are depicted in the following graphs:

Figure 2: Forward Buyer

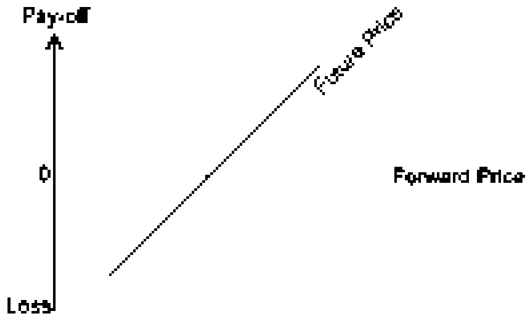
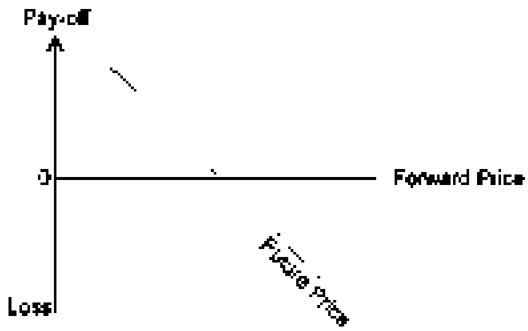


Figure 3: Forward Seller



The forward buyer will make profits if the future price is higher than the price at which the forward deal has been struck and the forward seller will make profits if the future price is lower than the price at which the forward deal has been struck.

Futures

A standardized forward contract, usually traded in the futures exchange with 'mark-to-market' on daily basis is called a futures contract. The futures contract has been discussed at length in the chapter 'Futures'.

Options

An option means a choice. It gives the holder the right (but no obligation) to enter into a deal at or before a specified future date. These are call options (options to purchase) and put options (options to sell). Depending on the type of underlying asset, the options could be stock options, index options, commodity options, currency options, futures options, etc. Options have been discussed at length in the chapter 'Options'.

Swaps

Swaps are risk management tools which involve the exchange of one set of financial obligations for another, aiming at reducing the financial obligation rate of the parties involved into the deal. Swaps can be interest rate swaps and currency swaps. Swaps have been discussed at length in the chapter 'swaps'.

Hybrid Debt Securities

Hybrid Debt Security is a debt security combined with any other type of derivative. Convertible Bonds are types of Hybrid Debt Securities. The name hybrid comes from the fact that these securities have the features of both equity as well as debt.

Some types of hybrid debt securities are:

a. 10-year fixed rate bond with interest in US$ and principal payable in DM.

b. 1-year FRN with principle tied to the value of S&P 500 index.

Hybrids are tied-up to either interest rate markets, foreign exchange markets, equity markets or commodity markets. A combination of two or more of these markets can create hybrids. Even combinations of two subsets in the main market can create hybrids. A few examples of combination hybrids will make the concept clear:

i. A dual currency bond is an interest rate/foreign exchange hybrid in which interest payments are denominated in one currency and principal repayment in another currency.

ii. A bond with fixed rate of interest and repayment value at maturity tied-up to an equity index is an interest rate/equity hybrid.

iii. In a currency/commodity hybrid, the total return on the hybrid is a function of the elemental return on a foreign exchange rate and the elemental return on a commodity (say gold).

One of the main benefits of hybrids is the possibility to combine the elemental markets to create securities with the desired features. The cost efficiency of the hybrid can be obtained if the right issuer is found, that is an issuer who has the need to create the opposite exposure on his balance sheet.

In short, hybrids are created for the following two main reasons:

i. Exploitation of arbitrage opportunities to reduce one’s cost of funds.

ii. Creation of liability exposure desired by the issuer based on assets owned by the company.

Risk Management in Practice

Corporate risk management, over time has come under strong discussion regarding its utility and importance. The surveys conducted suggested the following:

i. Risk management is of utmost importance to every kind of business.

ii. Some exposures can be reduced, but all cannot be hedged, resulting in residual risks.

iii. Simulation analysis is used by industrial companies while financial companies (including banks) use gap and duration analysis.

iv. Foreign exchange forward contracts are widely used, specially by multinational companies.

v. Futures contracts are used by treasury departments of companies.

vi. Ignorance of risk management is the main reason given by corporates for not using risk management.

SUMMARY

- Risk and return are two sides of the same coin. While an investor may be risk averse, every investor would like to get some positive return on his investments.
- Corporate risk management refers to the process of a company managing its risks at an acceptable level. It is a scientific approach to deal with various kinds of risks faced by a corporate entity.
- The main approaches to risk management are risk avoidance, loss control, combination, separation, risk transfer, risk retention and risk sharing.
- The risk management process consists of determining the objectives, identifying the risks, risk evaluation, development of policy, development of strategy, implementation and review.
- The main risk management tools are hedging, forwards, futures, options, swaps and hybrid debt securities.

Chapter IV

Introduction to Derivatives

After reading this chapter, you will be conversant with:

- History of Derivatives
- Major Exchanges for Derivatives
- Classification and Features of Derivatives
- Participants in Derivative Markets
- Derivative Markets in India

HISTORICAL PERSPECTIVE

In this era of globalization, we are witnessing innovations in financial engineering, which result in the evolution of a new set of products in the banking and financial sector named derivatives. The growth of these products in the last 20 years has been one of the most extraordinary and important features of the financial market place. Although commodity forwards and futures have been traded actively since the turn of the century and historians find antecedents for the options contracts in ancient Greek writings, it was not until 1972 that the market for modern derivatives was born.

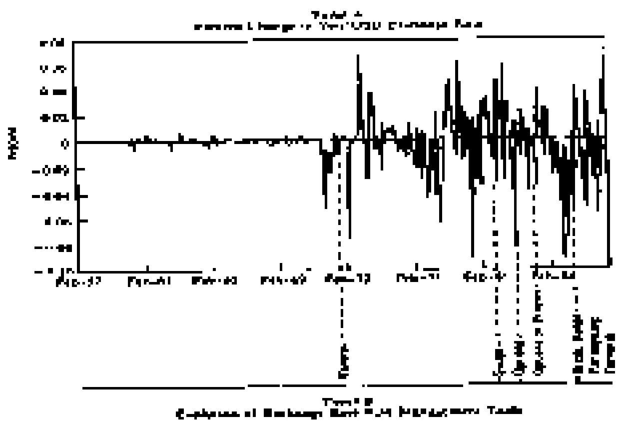
Towards the end of the second world war, representatives of 44 nations gathered in 1944 in Bretton Woods town in New Hampshire, USA and agreed on a fixed exchange rate system which lasted till the early 1970s. Under that system, the exchange rates of all currencies were fixed against the US dollar. As the US dollar was then convertible to gold at $35 per ounce, all currencies were indirectly fixed in terms of gold. In 1973, the Bretton Woods agreement, the pact that instituted a fixed exchange rate regime for the world's major nations, effectively collapsed when the US suspended the dollar's convertibility into gold. This resulted in increase of exchange rate and interest rate volatility.

Two months before the collapse of Bretton Woods system, the Chicago Mercantile Exchange (CME) launched the world's first exchange-traded currency futures. In 1975, interest rate futures contracts started on GNMA CDRs (Government Nation Mortgage Association Certificates of Deposit Rollover) on the Chicago Board of Trade (CBOT) and in the T-Bills on the CME.

THE RISE OF DERIVATIVES MARKET

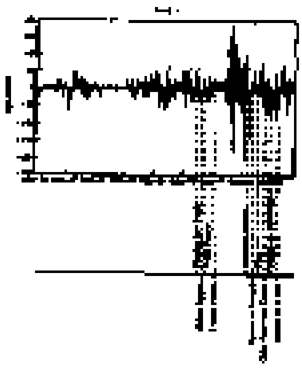
In the 1980s, the process of liberalization and deregulation of the financial markets gained momentum when the British and American leadership led what could perhaps be considered as the worldwide deregulatory movement. While the liberalization drive under the Reagan administration in the USA brought about major changes, London's pre-eminent position in the world's financial arena was further elevated by the "Big-Bang" of 1986, which allowed increased presence of foreign firms. This resulted in what is known as integration and the securitization of the world financial markets. The arrival of Information Technology (IT) facilitated the process of integration on an unprecedented scale. Cross-border activities in finance flourished and the access to different markets in the world increased manifold while transfer of resources from one market to another became rapid and almost cost free.

Figure 1: Percent Change in Yen/USD Exchange Rate



Source: Robert J. Schwartz and Clifford W. Smith. Jr; The Handbook of Currency and Interest Rate Risk Management.

Figure 2: First Difference in US Treasury Yield Five Year Constant Maturity



Source: Robert J. Schwartz and Clifford W. Smith. Jr; The Handbook of Currency and Interest Rate Risk Management.

It was also at this juncture that trends in disintermediation manifested manifold compelling banks to create new products and services. The prescription of Capital Adequacy norms by the Bank for International Settlement (BIS) resulted in increased costs of loans to banks and as an off-shoot of this development, banks found securitization, an off-balance sheet activity, an attractive route to expand assets. With the integration of the financial markets and free mobility of capital, risks also multiplied and risk diversification came to occupy the center stage. This logically led to the evolution of risk hedging mechanisms, first in the forex markets, later in the other segments of financial service industry and these have come to be known generally as Derivatives.

After emerging in the USA, the derivatives business expanded rapidly and flourished in the European markets. According to a recent estimate, total value of derivatives issued worldwide in 1995 was over $50 trillion[1].

The important developments in the derivatives markets also occurred in the early 1980s. In May 1972, the International Monetary Market on the Chicago Mercantile Exchange began trading futures contracts on the British pound, Canadian dollar, Deutschemark, Japanese yen and Swiss franc. Currency swaps were next to appear. Option contracts on foreign exchange followed closely on the heels of swaps. In December 1982, the Philadelphia Stock Exchange introduced an option contracts on the British pound. Although exchange-traded options on individual equities were available in the US, it was currency options and futures generally that spurred the development of a whole new generation of risk management techniques and strategies.

Table 1: ISDA Market Survey
Notional Amounts Outstanding at Year-end, all Surveyed Contracts, 1987-Present
Notional amounts in billions of US dollars

	Year-end out standings for interest rate swaps	Year-end out standings for currency swaps	Year-end out standings for interest rate options	Total IR and currency out standings	Total credit default swap out standings	Total equity derivative out standings
1987	682.80	182.80		865.60		
1988	1,010.20	316.80	327.30	1,654.30		
1989	1,502.60	434.90	537.30	2,474.70		
1990	2,311.54	577.53	561.30	3,450.30		
1991	3,065.10	807.67	577.20	4,449.50		
1992	3,850.81	860.39	634.50	5,345.70		
1993	6,177.35	899.62	1,397.60	8,474.50		
1994	8,815.56	914.85	1,572.80	11,303.20		
1995	12,810.74	1,197.39	3,704.50	17,712.60		

1 Source: BIS.

	Year-end out standings for interest rate swaps	Year-end out standings for currency swaps	Year-end out standings for interest rate options	Total IR and currency out standings	Total credit default swap out standings	Total equity derivative out standings
1996	19,170.91	1,059.64	4,722.60	25,453.10		
1997	22,291.33	1,823.63	4,920.10	29,035.00		
1998				50,997.00		
1999				58,265.00		
2000				63,009.00		
2001				69,207.30	918.87	
2002				101,318.49	2,191.57	2,455.29
2003				142,306.92	3,779.40	3,444.08
2004				183,583.27	8,422.26	4,151.29

Source: Bank for International Settlements.

Table 2: Turnover in Derivatives Contracts Traded on Exchanges (in US$ million)

Foreign exchange turnover net of local and cross-border inter-dealer double-counting by instrument, counterparty and currency in April 2004 Total reported transactions in all currencies

Daily averages, in millions of US dollars

		Specified Currency Against all Other Currencies					
	Total	US dollar	Euro	Yen	Pound sterling	Swiss franc	Canadian dollar
Spot	621,073	528,477	272,887	130,381	82,839	41,008	23,696
with reporting dealers	300,399	252,900	142,271	57,727	41,081	21,175	10,480
local	92,081	79,124	35,609	16,029	12,440	5,512	3,161
cross-border	208,318	173,776	106,662	41,698	28,641	15,663	7,319
with other financial institutions	212,529	184,859	93,203	42,316	29,231	13,253	8,555
local	72,466	62,457	28,411	17,562	9,949	4,653	3,299
cross-border	140,041	122,401	64,771	24,754	19,282	8,600	5,256
with non-financial customers	107,552	90,119	37,433	30,334	12,527	6,580	4,662
local	67,647	56,198	20,793	22,954	4,975	3,637	3,418
cross-border	39,905	33,921	16,641	7,380	7,552	2,943	1,244
Outright forwards	208,333	170,357	88,243	47,135	31,338	11,307	8,947
with reporting dealers	72,833	63,644	29,628	13,417	10,417	3,220	2,021
local	21 ,002	18,512	7,511	3,770	3,813	1,038	677
cross-border	51,831	45,132	22,117	9,647	6,604	2,181	1,344
with other financial institutions	79,897	63,692	32,520	20,789	13,568	4,030	4,111
local	42,267	33,047	16,384	12,978	8,743	1,743	2,462
cross-border	37,630	30,645	16,136	7,812	4,825	2,287	1,649
with non-financial customers	55,603	43,021	26,095	12,928	7,353	4,057	2,816
local	39,935	31 ,053	18,350	10,121	4,875	2,687	2,111
cross-border	15,668	11,969	7,744	2,807	2,478	1,371	705
Up to 7 days	92,196	75,888	41 ,556	21,830	16,087	5,002	2,964
Over 7 days and up to 1 year	110,859	89,865	45,417	24,770	14,228	6,184	5,801
Over 1 year	5,362	4,696	1,277	535	1,026	118	183
Foreign exchange swaps	943,869	874,083	298,231	181,715	185,241	55,390	41,930
with reporting dealers	562,293	543,412	154,323	111,976	106,187	31,572	24,258
local	188,055	181,378	42,379	38,858	47,464	7,349	7,804
cross-border	374,238	362,034	111,944	73,119	58,723	24,224	16,454
with other financial institutions	292,928	266,873	103,477	53,395	58,398	17,679	13,552
local	98,915	87,327	34,145	18,923	24,552	4,454	6,798
cross-border	194,013	179,546	69,332	34,472	33,846	13,225	6,754
with non-financial customers	88,648	63,798	40,430	16,344	20,655	6,138	4,119
local	51 ,703	35,198	22,271	10,744	12,122	3,618	2,971
cross-border	36,945	28,600	18,159	5,600	8,533	2,520	1,149
Up to 7 days	691 ,784	654,157	207,527	122,174	131,766	42,682	33,240
Over 7 days and up to 1 year	240,160	208,949	87,604	57,864	52,238	12,392	8,363
Over 1 year	9,789	8,857	3,094	1,677	1,231	313	326
Total	1,773,275	1,572,918	659,361	359,231	299,417	107,705	74,573

Source: Bank for International Settlements.

We already mentioned that interest rate volatility increased after the collapse of the Bretton Woods system. Figure 2 shows the volatility in the US interest rates. Exchange rate volatility was also seen during the same period which was at unprecedented levels by the then standards. Figure 1 shows the exchange rate volatility. Due to this, the presence of derivatives products in interest rates and exchange rates also increased.

Table 3: Futures Contracts Appear on the CBOT and CME

First Day Trading	Underlying Asset	Exchange
October, 1975	GNMA	CBOT
January, 1976	US T-Bills	CME
August, 1977	US T-Bonds	CBOT
December, 1981	Eurodollar	CME
May, 1982	T-Notes	CBOT

Table 4: Options Contracts Appear on the CBOT and CME

First Day Trading	Underlying Asset	Exchange
October, 1982	T-Bond Futures	CBOT
October, 1982	T-Bond	CBOE
March, 1985	Eurodollar Futures	CME
May, 1985	T-Note Futures	CBOT
July, 1985	T-Note	CBOE
April, 1986	T-Bill Futures	CME

Source: BIS Annual Report June, 99 and Quarterly Review August, 1999.

By mid-1980s, futures, options, swaps and Forward Rate Agreements (FRAs) had revolutionized financial and commodity risk management. The trading in the derivatives increased many fold on all the derivatives products. CBOT ran into ten million contracts a year and derivatives exchanges came into existence in many regions: The New York Futures Exchange in 1980, London International Financial Futures Exchange (LIFFE) in 1982, The Singapore International Monetary Exchange (SIMEX) in 1984, The Tokyo Financial Exchange (TFE) in 1985, and French Matif in 1985. Now financial futures account for more than 60 percent of futures traded around the world.[2]

Table: 5[3]: Annual Volume of Chicago Board of Trade (World's Largest Derivatives Exchange)

	1997	1998	1999	2000	2001	2002	2003
Futures and Options Combined Totals							
Agricultural	62,023,609	58,749,036	59,407,848	60,303,460	60,800,763	66,668,748	72,983,159
Financial	179,703,338	218,570,232	190,996,164	169,432,716	194,301,500	268,021,106	365,838,537
Stock Index	911,608	3,812,910	4,125,646	3,772,840	5,211,045	9,159,923	15,545,636
Other Index					4,292	15,551	43,321
Metals	44,658	49,233	30,974	19,536	15,470	17,201	179,977
Energy	–	272	22	–	–	–	–
Insurance	–	–	–		–	–	–
PCS Insurance	15,706	7,753	561	6	–	–	–
Grand Total	242,698,919	281,189,436	254,561,215	233,528,558	260,333,070	343,882,529	454,590,630

2 Doreen Soh; "How to invest in commodities, Gold & Currencies" Times Books International.
3 Source: WWW.CBOT. Com

The following is the list of major derivatives exchanges in the world:

Table 6: Major Exchanges

Major Exchanges Throughout the World Trading Futures and Options, with their Official Abbreviations

Agrarische Termijnmarkt Amsterdam	ATA
American Stock Exchange	AMEX
Australian Options Market	AQM
Belgian Futures & Options Exchange	BELFOX
Bolsa de Mercadorias e Futuros, Brazil	BM&F
Chicago Board of Trade	CBOT
Chicago Board Options Exchange	CBOE
Chicago Mercantile Exchange	CME
Coffee, Sugar & Cocoa Exchange, New York	CSCE
Commodity Exchange, New York	COMEX
Copenhagen Stock Exchange	FUTOP
Deutsche Termin Borse, Germany (formerly DTB)	EUREX
European Options Exchange	EOE
Financiele Termijnmarkt Amsterdam	FTA
Finnish Options Market	FOM
Hong Kong Futures Exchange	HKFE
International Petroleum Exchange, London	IPE
Irish Futures & Options Exchange	IFOX
Kansas City Board of Trade	KCBT
Kobe Rubber Exchange	KRE
Kuala Lumpur Commodity Exchange	KLCE
London Commodity Exchange	LCE
London International Financial Futures & Options Exchange	LIFFE
London Metal Exchange	LME
London Securities and Derivatives Exchange	OMLX
Manila International Futures Exchange	MIFE
Marche a Terme International de France	MATIF
Marche de Options Negociables de Paris	MONEP
MEFF Renta Fija y Variable, Spain	MEFF
Mercado de Futuros y Opciones S.A., Argentina	MERFOX
Mid America Commodity Exchange	MidAm
Minneapolis Grain Exchange	MGE
Montreal Exchange	ME
New York Cotton Exchange	NYCE
New York Futures Exchange	NYFE
New York Mercantile Exchange	NYMEX
New York Stock Exchange	NYSE
New Zealand Futures & Options Exchange	NZFOE
Osaka Grain Exchange	OGE
Osaka Securities Exchange	OSA

OTOB Aktiengesellschaft	OTOB
Pacific Stock Exchange	PSE
Philadelphia Stock Exchange	PHLX
Singapore International Financial Futures Exchange	SIMEX
Stockholm Options Market	OM
Swiss Options and Financial Futures Exchange	SOFFEX
Sydney Futures Exchange	SFE
Tokyo Grain Exchange	TGL
Tokyo International Financial Futures Exchange	TIFFE
Toronto Stock Exchange	TSE
Vancouver Stock Exchange	VSE
Winnipeg Commodity Exchange	WCE

Source: John C. Hill, Options, Futures & Other Derivatives, 3rd Edition.

Ongoing Developments

The process of development in the derivatives market still continues. New contracts come into existence on an ongoing basis in the market every month. New exchanges are opened for business. Over 50 exchanges throughout the world now trade in some form of derivatives or the other. At the same time, the OTC market has developed a vast array of products that can be customized to suit any risk/reward profile in almost every market. All the derivatives products like Swaps, FRAs, Options can now be purchased from a large number of professional market makers and brokers on different underlying assets. There are also derivatives whose underlying assets themselves are derivatives. One-off transaction has been offered the chance to hedge against the possibility of a Tokyo earthquake.

The development of these markets has enabled institutional investors, bank treasurers and corporate CFOs to manage risks more efficiently and to speculate on them if they wish. Treasurers now have no excuse for unexpected surges in interest expense, translational loss or real exchange losses. Instruments now exist that allow them to fix a budgeted rate, insure against catastrophic rate changes and participate in beneficial movements. Portfolio managers can now execute investment decisions without going to the asset market, which may be illiquid or expensive for an individual market participant. With derivative instruments, corporates can alter or synthesize assets and liabilities, quickly and efficiently without much cost. Now they can express their views on interest rate or exchange rates by entering directly into the market.

Derivative markets are able to bring the dividend and disparate markets together. These markets and instruments have created an efficient system for transfer of risk throughout the global financial system. Market makers became very sophisticated and they are ready to take any type of risk which a customer wants to hedge. Far from being a destabilizing force, derivative instruments can claim to be having moderating influence on world financial markets, enabling all users of those markets to position themselves according to their views. The derivatives market is now mature. There are now liquid exchange-traded contracts on all the major commodities, currencies and most of the key stock indices. The OTC market offers two-way prices for swap and option products on wider range of underlying assets. A large number of banks, financial institutions and brokers can now offer these services while their structures and uses are well-understood by many corporate treasurers and institutional investors. With this level of maturity, the transaction costs in derivatives markets has come down drastically and arbitrage profit for the traders became negligible. Exchange-traded futures and options for some traders became a ‘true’ commodity product. The markets are so efficient and transparent that there is little scope for large spreads.

All these derivatives products have been used effectively by treasury managers for hedging risk. Considering the potential profits in these products the corporates and treasurers, began looking at these products for enhancing their profits. Thus, speculation on derivatives slowly became an integral part of the treasury function. The most significant feature (most dangerous too) of the derivatives is that the cash outlay required for taking position is insignificant when compared to the cash outlay required for taking a similar position on the underlying assets.

In the last decade, several major cases of corporate losses were reported in international media due to trading in the derivative markets. Major losers are Barrings Bank, Procter & Gamble and Orange County. These incidents brought in their wake a school of thought which concluded that derivatives are adding to the risk rather than helping in hedging the risk. While there may be temptation to agree, an attempt to have a deeper insight will only highlight the need for strong risk management framework including treasury control and the need for scrupulous adherence to the guidelines. The important thing is to understand the products well and have appropriate controls in place. All the mishaps have taken place only because basic controls were not observed. These mishaps have only emphasized the need for adequate infrastructure, controls and reporting system.

THE CLASSIFICATION OF DERIVATIVES

It is easier to understand a derivative than to describe it and it is easier to describe a derivative than to define it. However, attempts were made to define a derivative. The following are few definitions.

"A contract or an agreement for exchange of payments, whose value derives from the value of an underlying asset or underlying reference rates or indices."

A derivative is a security whose price ultimately depends on that of another asset (called underlying).

— Nasim Taleb

"Derivative means forward, futures or option contract of predetermined fixed duration, linked for the purpose of contract fulfillment to the value of specified real or financial asset or to an index security."

— L C Gupta Committee

Literally a derivative instrument is an asset which derives, i.e., takes its origin from another asset. As a matter of fact, the price of a derivative instrument is contingent on the value of its underlying asset. Accordingly, derivatives are also sometimes called contingent claims. The simplest form of a derivative is a forward contract, "It is an agreement to buy or sell an asset at a certain future time for a certain price[4]", – something very familiar to the Indian environment in the forex market. The value of an existing forward contract depends on the ruling spot rate and forward margin for the currency; in other words, the value is the cash flow that needs to be exchanged if the contract is to be canceled now. Other forms of derivatives include futures, options and swaps, etc. For example, an interest rate futures contract is a derivative that commits the parties to exchange a debt security, say a Treasury Bond, at a future date for a predetermined price. The value of the futures contract depends on the underlying treasury bond. If the treasury bond price rises, the value of the futures contract also rises because the buyer of the futures contract is now entitled to receive a more valuable asset. The enormous and rapid growth in the variety of derivatives can be wildering even to experienced financial market participants. Notwithstanding the growth, all derivatives can be classified based on the following features:

a. Nature of contract,
b. Underlying asset, and
c. Market mechanism.

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4 John C. Hull; Options, and other Derivatives. Third edition.

a. **Nature of Contract:** Based on the nature of the contract, derivatives can be classified into three categories:

   i. Forward Rate Contracts and Futures,

   ii. Options, and

   iii. Swaps.

   The nature of contract sets upon the right and obligations of both the position to the contract.

b. **Underlying Asset:** Most derivatives are based on one of the following four types of assets:

   i. Foreign exchange,

   ii. Interest bearing financial assets,

   iii. Commodities, and

   iv. Equities.

   There can be a contract which is similar in all aspects except for the underlying asset. Thus an option contract can exist in currency or a stock. Similarly, a futures contract can exist on commodity or on a currency.

c. **Market Mechanism**

   i. OTC products, and

   ii. Exchange-traded products.

Mechanics of Derivative Markets

Some derivatives are traded on organized exchanges while others are traded only in OTC markets. Exchange-traded derivatives have standardized features and are not tailored to the needs of individual buyers and sellers. For example, in S&P 500 stock index futures which are traded on the Chicago Mercantile Exchange, the value of the futures contracts is tied to the Standard & Poor’s Composite Stock Price Index. The futures have standard maturity and the Exchange prescribes rules for settlement of any outstanding contracts in cash on the expiration dates. In contrast, OTC derivatives are customized to meet the specific needs of the counterparty. Financial Swap is a good example of OTC derivative. OTC market, remains predominantly a telephone market. Notwithstanding the advantages and disadvantages of such market, it remains a significant market, contributing to the volumes and innovation as well.

An important difference between exchange-traded and OTC derivatives is the credit risk. In the OTC markets, one party is exposed to the risk that his counterparty may default on the contract. In case of default, there will be a need to replace the counterparty which is also known as replacement risk. This risk becomes insignificant in case of exchange-traded derivatives since every contract between the two parties, say A and B, is substituted with two contracts one between A and the exchange and the other between the exchange and B. Thus, in the market for exchange-traded derivatives credit risk is taken by the exchange which acts as clearing house for all the trades. When a future contract is traded on the exchange, the exchange will become seller to the buyer and buyer to the seller. Hence, a party who is entering into the contract need not worry about the creditworthiness of the counterparty. The exchange protects itself by asking parties to deposit certain amount as margin on a day-to-day basis with the exchange which is usually enough to cover the price movement of the underlying assets on any given day. On any particular day, if the exchange feels that the volatility is likely to be high on the underlying asset, the exchange may request the parties to deposit additional margins during the trading day. Due to the above mechanics, losses to the exchange and to the counterparties who enter into the contract are minimized.

Role of Clearing Houses

A clearing house is a key institution in the derivatives market. It performs two critical functions: Offsetting customers dealings and assuring the financial integrity of the transactions that take place in the exchange.

The clearing house could be part of the exchange or a separate body co-ordinating with the exchange. The following is a list of the main exchanges and their clearing houses:

Table 7: Main Exchanges and Clearing Houses

Futures Exchanges	Clearing Houses
Chicago Board of Trade (CBOT)	Board of Trade Clearing Corp. (BOTCC)
Chicago Mercantile Exchange (CME)	CME Clearinghouse Division*
New York Mercantile Exchange (NYMEX)	NYMEX Clearinghouse Division*
Commodity Exchange, Inc. (COMEX)	COMEX Clearing Association
Coffee, Sugar & Cocoa Exchange (CSCE)	CSC Clearing Corporation Commodity clearing Corp.
New York Cotton Exchange (NYCE)	Intermarket Clearing Corp. (ICC)
New York Futures Exchange (NYFE)	BOTCC
Kansas City Board of Trade (KCBOT)	KCBOT Clearing Corp.
Minneapolis Grain Exchange (MGE)	MGE Clearinghouse Division*
Chicago Rice & Cotton Exchange (CRCE)	BOTCC
AMEX Commodities Corp. (AMEXCC)	ICC
Philadelphia Board of Trade (PHBOT)	ICC
Pacific Futures Exchange (PFE)	ICC
Options exchanges	
Chicago Board Options Exchange (CBOE)	Options Clearing Corp. (OCC)
American Stock Exchange (AMEX)	OCC Philadelphia Stock Exchange (PHLX)
New York Stock Exchange (NYSE)	OCC
Pacific Stock Exchange (PSE)	OCC
National Association of Securities Dealers (NASD)	OCC

* Clearing house is a department within the exchange. All other clearing houses are separately incorporated at independent from the exchange.

Source: Options and Futures, by Edward & Ma, McGraw Hill, Publications.

A detailed discussion on clearing houses and the mechanism of clearing is made in the following chapters.

THE IMPORTANT FEATURES OF DERIVATIVES

A detailed discussion on clearing houses and the mechanisms of clearing is made in the following chapter.

Derivatives became very popular and because of their unique nature, they offer a combination of characteristics which are not found in other assets. There are four important features that distinguish derivatives from underlying assets and make them useful for a variety of purposes:

a. Relation between the values of derivatives and their underlying assets.

b. It is easier to take short position in derivatives than in other assets.

c. Exchange traded derivatives are liquid and have low transaction cost.

d. It is possible to construct the portfolio which is exactly needed, without having the underlying assets.

a. **Relation between the values of derivatives and their underlying assets:** When the values of underlying assets change, so do the values of derivatives based on them. For some derivative instruments such as swaps and futures, the relation between the underlying assets and the instrument is straight forward, i.e., if the product price changes the instrument price also changes. In a currency future contract, the price to be paid when the currency is delivered will be fixed by the future contract, the value of the currency delivered will fluctuate depending on the movements of the underling currency. Thus, the value of the future contract depends on the value of the underlying currency. The relation between values of the underlying asset and option are more complicated, but the values of the option and underlying assets are still to be related. Due to this unique quality, the derivatives appear similar to real commodities for many traders.

b. **It is easier to take short position in derivatives than in other assets:** As all transactions in derivatives take place in future specific date[5] it is easy for the investor to sell the underlying assets, i.e., in an asset he is obligated to deliver it in future. The short position means taking stand for selling the underlying asset, with or without possessing the asset. He can take view of the market or product which is not possible in any other asset.

c. **Exchange traded derivatives are liquid and have low transaction cost:** Exchange traded derivatives are more liquid and have lower transaction costs than other assets. They are more liquid because they have standardized terms and low credit risk. Furthermore, their transaction costs are low due to high volume in trade and due to high competition. In addition, margin requirement in the exchange traded derivatives is relatively low, which reflects that the risk associated with this instrument is low.

d. **It is possible to construct portfolio which is exactly needed, without having the underlying assets:** Derivatives can be constructed or combined to closely match specific portfolio requirement. For example, suppose a firm with a floating rate loan needs to limit its exposure to sharp increases in the interest rate. The firm can purchase a derivative called an interest rate cap. This derivative pays the firm the difference between the floating rate of interest and a predetermined maximum called the cap rate whenever the floating rate exceeds the cap. Similarly, the lender can protect the decrease in the interest rate by buying the floor. The derivative product seller pays the lender the difference between a predetermined rate maximum called the cap rate whenever the floating rate falls below the floor rate.

PARTICIPANTS IN DERIVATIVE MARKETS

In order to understand the significance of these markets it will be necessary to know the participants of the market. While participants can be Banks, FIs, Corporates, Brokers, Individuals, etc., all of these can be classified into three categories:

- Hedgers,
- Speculators, and
- Arbitrageurs.

Hedgers

A transaction in which an investor seeks to protect a position or anticipated position in the spot market by using an opposite position in derivatives is known as a hedge. A person who hedges is called hedger. These are the people who are exposed to risk due to their normal business operations and would like to eliminate or minimize or reduce the risk. For example, an exporter whose receivable is denominated in US dollars is exposed to the risk of adverse movements of US dollars. Similarly, a corporate who borrowed a floating rate loan runs the risk of an increase in interest rates. If these risks are to be covered, they can take a corresponding position in the derivatives to hedge the risk. The exporter in the above example can sell futures in US dollars to hedge currency risk.

Speculators

A person who buys and sells a contract in the hope of profiting from subsequent price movements is known as a speculator. These people voluntarily accept what hedgers want to avoid. A speculator does not have any risk to hedge. He/she has a

5 There are some derivatives whose delivery date cannot be found out before like American Option and Hybrid Derivatives.

view on the market and based on the forecast the speculator would like to make gains by taking long and short positions on the derivatives. They perform a valuable economic function by feeding information and analysis into the derivative markets. In general, speculators can be the counterparties for hedgers.

Arbitrageurs

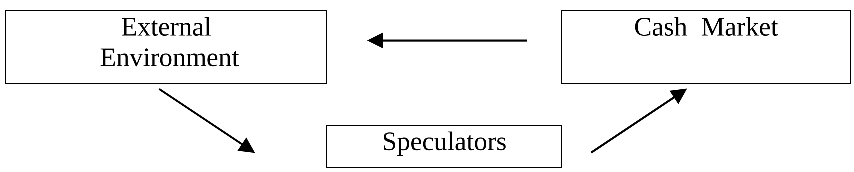
These are the third important participants in the derivative market. Arbitrage means obtaining risk-free profits by simultaneously buying and selling identical or similar instruments in different markets. For example, one could buy in the cash market and simultaneously sell in the futures market. The person who does this activity is called arbitrageur. They consistently keep track of the different markets. Whenever there is any chance of getting profit without any risk they will take position and make riskless profit. They perform a very valuable economic function by keeping the derivatives prices and current underlying assets price closely consistent. Arbitrageurs are in the same class as that of speculators to the extent that they have no risk to hedge. However, they buy to make gains by identifying mispriced derivatives, or inefficiencies between the markets for derivative and the corresponding underlying assets. While speculators help in enhancing liquidity, arbitrageurs help in price discovery heading to market efficiency.

Trading Techniques

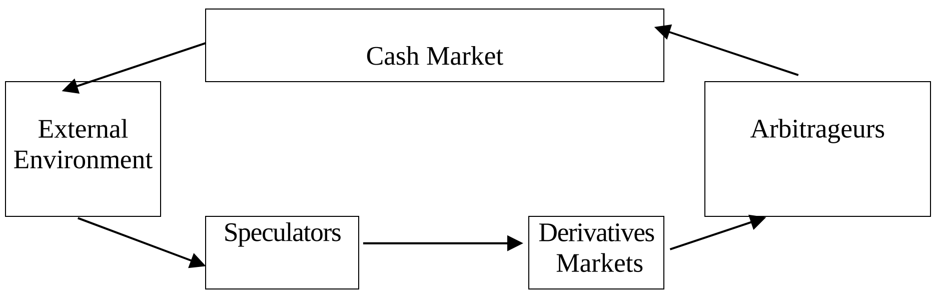
The efficiency of a market depends upon the pace with which information is assimilated into market prices. In the absence of a derivative market, the information flow gets reflected in the market for assets. The existence of a derivative market changes the information flow with derivatives market being affected first before the corresponding assets markets is affected. Kawaller, Koch and Koch[6] in their study determined that futures contract times leads the cash index for as long as 20 to 45 minutes, even though equivalent prices often occur simultaneously. Stoll and Whaley[7] in their study determined that futures provide a price discovery function with lead time of five minutes on average and up to 10 minutes. This is because of the flexibility with which position can be altered when compared to the asset market and the less margins required to take position in derivatives market.

Figure 3: Information Flows with and without Derivatives Markets

Information Flows without Derivatives Markets



Information Flows with Derivatives Markets



6 Ira Kawaller, Paul Koch and Timothy Koch, "The Temporal Relationship Between S&P Futures and the S&P 500 Index," The Journal of Finance, Vol. 42, No. 5, December 1987, pp. 1309 - 1329.

7 Hans Stoll and Robert Whaley, "The dynamics of Stock Index and Futures Returns," Journal of Financial and Quantitative Analysis, Vol. 25, No. 4, December 1990, pp. 441 - 468.

In a pure cash market, speculators feed information directly into the spot price. In the presence of the derivative market, the information received by the speculator will be used in taking position in the derivatives market, as it will give a better opportunity to make profit. From the derivative market the information will be processed by the arbitrageurs looking for better profits either in the derivatives market or in the cash market and take an appropriate position. They act as a critical link between the derivatives market and the cash market so that both the markets synchronize to the extent that there cannot be much scope for disequilibrium in the markets.

In short, derivative trading could be seen as a means of transfer of unwanted risk by those investors (hedgers) who seek less risks to those wanting to profit by having more risk possibilities (speculators). Options and futures can be used for hedging as well as speculation.

DERIVATIVE MARKETS IN INDIA

In India, the concept of derivatives is not a new one. On December 1999, the Securities Contract Regulation Act (SCRA) was amended to include derivatives within the sphere of 'securities' and the regulatory framework was developed for governing derivatives trading. The act also specified that derivatives shall be legal and valid only if such contracts are traded on a recognized stock exchange, thus precluding OTC derivatives. The government also withdrew in March 2000, the three-decade old notification, which prohibited forward trading in securities.

Derivatives trading commenced in India, in June 2000 after the grant of final approval by SEBI to this effect in May 2000. SEBI permitted the derivative segments of two stock exchanges, NSE and BSE, and their clearing house/corporation to commence trading and settlement in approved derivatives contracts. Initially, SEBI approved trading in index futures contracts based on S&P CNX Nifty and BSE-30(Sensex) index. This was followed by approval for trading in options based on these two indexes and options on individual securities.

The trading in BSE Sensex options and the trading in options on individual securities commenced in June 2001. Derivatives trading on NSE started with S&P CNX Nifty Index futures in June 2000.

Futures contracts on individual stocks were launched in November 2001, while the trading in index options commenced in June 2001 and trading in options on individual securities began in July 2001.

Trading and settlement in derivative contracts is done in accordance with the rules, byelaws, and regulations of the respective exchanges and their clearing house/corporation duly approved by SEBI and notified in the official gazette. National Securities Clearing Corporation Limited (NSCCL) is the clearing and settlement agency for all deals executed on the National Stock Exchange (NSE) futures and options segment. It acts as legal counterparty to all deals on the F&O segment and guarantees settlement. Foreign Institutional Investors (FIIs) are allowed to trade in all exchange-traded derivatives products.

Types of Derivative Instruments Available in India

FORWARDS

A forward contract is a contract between two parties to buy or sell an underlying asset at today's pre-agreed price on a specified date in the future.

Forward contracts in India can be booked by companies, firms and any person having authentic foreign exchange exposures only to the extent and in the manner allowed by the RBI. Foreign exchange brokers are not allowed to book the contact.

The volume of rupee forward has grown tremendously after 1992, when the government permitted unrestricted booking and cancellation of forward contracts for all genuine exposures, whether trade related or not. Further, in 2000, under the new regulation Foreign Exchange Management Act, 2000 (FEMA), the government issued guidelines for hedging in forward contract.

Box 1: Forward Contract – Foreign Exchange Management Act, 2000
A resident of India may enter into a forward contract with an authorized dealer in India to hedge an exposure to exchange risk in respect of a transaction for which sale and/or purchase of foreign exchange is permitted under the Act, or rules or regulations or directions or orders made or issued thereunder, subject to the following terms and conditions: • The authorized dealer, through verification of documentary evidence, is satisfied of the genuineness of the underlying exposure. • The maturity of the hedge does not exceed the maturity of the underlying transaction. • The currency of hedge and tenor are left to the choice of the customer. • Where the exact amount of the underlying transaction is not ascertainable, the contract is booked on the basis of a reasonable estimate. • Foreign currency loans – bonds will be eligible for hedge only after final approval is accorded by the Reserve Bank where such approval is necessary. • In case of Global Depository Receipts (GDRs), the issue price has been finalized. • Balances in the Exchange Earner's Foreign Currency (EEFC) accounts sold forward by the account holders shall remain earmarked for delivery and such contracts shall not be cancelled. They may, however, be rolled over. • Contracts involving the rupee as one of the currencies, once cancelled shall not be re-booked, although they can be rolled over at ongoing rates on or before maturity. This restriction shall not apply to contracts covering export transactions, which may be cancelled, re-booked or rolled over at ongoing rates. • Substitution of contracts for hedging trade transactions may be permitted by an authorized dealer on being satisfied with the circumstances under which such substitution has become necessary.

Source: www.rbi.org.in

After introducing FEMA in 2000, the government has taken various steps for the development of the derivatives market. Recently, in July 2004, the government made further amendments in the conditions under which a Foreign Institutional Investor (FII) can enter into a forward contract to hedge its exposure in India. Under the new guidelines, registered FIIs alone can enter into a forward contract, and that too only if "the value of the hedge does not exceed the market value of the underlying debt or equity instruments". Further, in the amendment, it has been also mentioned that, "Forward contracts once booked shall be allowed to continue to the original maturity even if the value of the underlying portfolio shrinks."

The liquidity in the Indian forwards market has increased in the past five years. The volume in the forward market was low between 1998 and 2001 due to a global slowdown, but the forward market has shown tremendous growth in past few years. Stringent regulations, along with the economic boom are reason for this development.

Further, with the gradual steps taken by the government for the opening up of the capital account, the forward premia is getting aligned with the interest rate differential. However, the basic factor that is necessary for the development of the forward market is the removal of barriers in the movement of capital from one country to another.

Cross Currency Forwards

Sometimes, due to the lack of liquidity in the forward market, big corporate institutions use cross currency forward. The concept of cross currency forward is almost similar to currency forward, except in some aspects. In cross currency forward contract, both legs of the contract are foreign currencies. For example, a forward contract in which the parties agree to exchange a fixed dollar amount for a fixed Euro amount. The regulation is also similar to the forward contract. The growth in this market also depends on the status of capital account convertibility. Due to the partial convertibility of the rupee, the volume of cross currency forward contract is very less in India, but is expected to increase the near future.

FUTURES

A futures contract is a contract between two parties to buy or sell an asset at a certain price at a certain time in the future. There is an important distinction between futures and forward contracts. Futures contracts are standardized exchange-traded contracts while forward contracts are customized OTC instruments. Hence, the futures are more liquid in nature and provide better commercial convenience compared to forwards. As futures are exchange-traded contracts, daily margins are fixed by the concerned stock exchange, which are to be paid to the stock exchange by the parties to the contract. Trading in the Futures commenced on June 12, 2000. Futures contracts on individual stocks were launched in November 2001.

Table 8: Most Active Futures Contracts

Sr.No.	Contract Descriptor	No.of Contracts	Traded Value (Rs. Crore)	Percentage of Contracts to Total Contracts
1	NIFTY OCTOBER 2005	5600378	139810	41.87
2	NIFTY NOVEMBER 2005	1197873	28401	8.95
3	RELIANCE OCTOBER 2005	442840	20662	3.31
4	SBIN OCTOBER 2005	344038	15605	2.57
5	INFOSYS OCTOBER 2005	308721	8009	2.31
	OTHERS	5482803	172011	40.99
	TOTAL	13376651	384498	100.00

OPTIONS

An options contract gives a buyer the right but not the obligation to purchase or sell an asset. Options contracts are of two types: Call options and put options. Under a call option, the buyer has the right but not the obligation to purchase a given volume of the underlying asset at a given price on or before a given future date. Under the put option, the buyer has the right but not the obligation to sell a given volume of the underlying asset at a given price on or before a given future date. The options life period is usually up to one year, but most options, which are traded on exchanges, have a maximum maturity of nine months. The options which are dated longer than a year are called warrants and are usually traded over-the-counter. The other types of options have a maturity of up to three years and are called Long-term Equity Anticipation Securities (LEAPS). The options of portfolios of underlying assets are called baskets. Generally, the underlying asset is a moving average or a basket of assets. Equity index options come under basket options.

Trading in Options has been introduced in the Indian stock exchanges since July, 2001. But the investors and the traders are still skeptical as these instruments are new to the Indian market and the scams in the derivatives dealing in the late nineties have made derivatives market in the world very dull. Index options already traded in market since June 2001 and from July 2002 stock options were also introduced in India. A proposal was made in December 2002, to introduce rupee options.

Table 9: Most Active Options Contracts

Sr.No.	Contract Descriptor	No.of Contracts	Traded Value (Rs. in Crore)	Percentage of Contracts to Total Contracts
1	NIFTY OCTOBER 2005 PE 2400	138451	3351	7.69
2	NIFTY OCTOBER 2005 CE 2400	122140	2974	6.79
3	NIFTY OCTOBER 2005 CE 2450	97439	2412	5.41
4	NIFTY OCTOBER 2005 CE 2600	93803	2475	5.21
5	NIFTY OCTOBER 2005 PE 2500	90171	2294	5.01
	OTHERS	1257769	35657	69.89
	TOTAL	1799773	49162	100.00

FINANCIAL SWAPS

Swap is another type of derivatives product. Swaps are private agreements between two parties, which are not traded on exchanges but are normally traded among dealers. The two swaps which are used commonly are currency swaps and interest rate swaps. Through currency swaps the differences between international capital markets are eliminated. Through interest rate swaps the barriers caused by regulatory structure are eliminated.

In July 1999, the rupee swap came into the picture when the RBI allowed for hedging the loan exposure and unwinding from such hedges. As per the Foreign Exchange Management Act (Borrowing and Lending in Foreign Exchange) Regulations 2000, a person residing in India, who has borrowed foreign exchange may enter into an Interest Rate Swap or Currency Swap or Coupon Swap or Foreign Currency Option or Interest Rate Cap or Collar (purchases) or Forward Rate Agreement (FRA) contract with an authorized dealer in India or with a branch of an authorized dealer outside India for hedging his loan exposure and unwinding from such hedges, provided that

a. The contract does not involve the rupee.

b. The Reserve Bank has accorded final approval for borrowing in foreign currency.

c. The notional principal amount of the hedge does not exceed the outstanding amount of the foreign currency loan, and

d. The maturity of the hedge does not exceed the un-expired maturity of the underlying loan.

Currency swap is used by corporate institutions for hedging currency exposure and minimizing their borrowing costs by the complete advantages of borrowing in their home country. Initially, the volume in the swap market was high, but later the government put some barriers to avoid adverse affects on the forex market. The RBI has fixed the maximum limit for swap transaction to $10 bn and any cancelled contract will not be allowed to re-book or be reentered for the same underlying. In spite of this restriction in the market, the volume in the rupee swap has shown a tremendous growth in both the interest and principal segment. As per the available sources, the volume of the rupee swap increased to approximately Rs.150,000 crore in December, 2002.

The increase in forex reserves due to the boost in the economy has created pressure on the RBI to increase the limit. Later, the RBI will increase the limit to $50 bn in two phases and also allow the authorized dealer to use currency swaps to hedge his asset-liability portfolio.

SUMMARY

- The derivatives market grew very fast in the last decade and is still growing.
- These markets have created an efficient system for transfer of risk throughout a global financial system.
- Unplanned trading in derivatives can prove very risky as was the case of Barings Plc and Sumitomo Corporation.
- Derivatives could either be traded in the organized exchanges or over-the-counter.
- Clearing houses offset customers dealings and assure the financial integrity of the transactions that take place in the exchange.
- The important features of derivatives are the relationship of the derivatives to the underlying assets, the facility to take short positions, the liquidity and low trading costs, the possibility of constructing a portfolio as required without owning the underlying assets.
- The participants in the derivatives market are hedgers, speculators and arbitrageurs.
- The derivatives market is growing in India at a reasonable pace.

Chapter V

Mechanics of Futures Markets

After reading this chapter, you will be conversant with:

- History of Futures Markets
- Meaning and Definition
- Types of Futures
- Mechanism of Futures Markets
- Motives behind using Futures
- Futures Prices

HISTORY OF FUTURES MARKETS

The futures market was the development following the forwards market. While the forwards markets took centuries to evolve, they provided good assurance against price uncertainties and later on, started becoming more standardized and regulated. Futures market, as they now exist in the US, are a fairly recent development, but understanding their origins help us to appreciate the role the markets play today and likely future changes in that role.

The futures markets were originally developed to meet the needs of the farmers and merchants. In the 19th century, commodity options were widespread in the US and till the first half of the 20th century were traded in London. Various scandals and abuses in prices coupled with non-delivery of the underlying assets resulted in the total ban of commodity options and the further formation of the Commodity Futures Trading Commission (CFTC) and the rising popularity of the futures contracts first in the US and then throughout the world.

MEANING OF FUTURES

Consider yourself as a farmer growing corn. Say, the month running is April, and your crop is likely to harvest in the month of July. There is an uncertainty about the price you will receive for the corn. In the years of low supply or scarcity of corn, you might obtain a relatively high price – especially, if you are not in a hurry. In the years of oversupply of corn, you may have to dispose at lower prices. In the latter case, you are exposed to a great deal of risk.

On the other hand, consider a merchant who has an ongoing requirement for corn. In the years of oversupply, he could fetch the corn at a competitive rate. But, in years of scarcity, he is exposed to price risk, as the prices may be highly exorbitant.

As you are uncertain about the price that you are likely to receive, you will be happy if you can know the price you are likely to receive beforehand with certainty. The futures market will enable you to enter into a contract, and lock the price. ‘Futures’ contracts are legally binding agreements to buy or sell a commodity sometime in the future. The ‘contract’ specifies the quantity, price and the date of delivery (negotiable to you and the merchant), and will enable you both to eliminate or minimize the risk, which otherwise will be faced due to uncertain price fluctuations of the future price of corn.

Let us consider an example to understand the concept of futures.

Say, you are a trader in Chicago. In March, you instructed a broker to buy 10,000 bushels of corn futures for July delivery. The broker would immediately pass these instructions on to a trader on the floor of the Chicago Board of Trade (CBOT) (an exchange). Say, at about the same time, another investor, Mr. Kelly, instructs a broker to sell 10,000 bushels of corn futures for July delivery (this example is cited to make you understand the concept. The time and the quantity may not always match). The instructions of Kelly would also be passed on to a trader. The traders would meet, agree on a price to be paid for the corn in July, and the deal would be struck.

Now, you are in ‘long futures position’, as you agreed to buy. Kelly, who agreed to sell is in ‘short futures position’. The act of buying is known as ‘going long’ and act of selling is known as ‘going short’. The ‘price agreed to’ by the two traders on your behalf to buy and Kelly’s behalf to sell on the floor of the exchange is known as the ‘futures price’. Suppose the price agreed is 196.50 cents per bushel. The price agreed is arrived or determined just like the price of any other good, i.e., determined by the laws of demand and supply. Say, if at any point of time, there are more traders willing to sell July corn than buy July corn, the price will go down and vice versa.

The prime objective of using future markets is to manage price risk. You can acquire insurance against adverse price changes, by establishing a price now, for items to be delivered later.

The principle underlying hedging (discussed later in this chapter) in the futures market is that one can establish a known price level even weeks or months before the actual outflow/inflow. A Futures position protects against the unfavorable price changes before the due date.

Trading in futures market acts as a substitute for cash market transactions, as the former allows one to know about the actual outflow/inflow before hand. On the other hand, in the latter, price fluctuations are possible.

The largest futures exchanges in the world are the Chicago Mercantile Exchange (CME) and the Chicago Board of Trade (CBOT).

DEFINITION OF FUTURES

A futures contract can be defined as an agreement to buy or sell a standard quantity of a specific instrument at a predetermined future date and at a price agreed between the parties through open outcry on the floor of an organized futures exchange.

Futures are considered to be better when compared to forwards because of the following reasons:

i. Standard volume

ii. Liquidity

iii. Counterparty guarantee by exchange

iv. Intermediate cash flows.

Difference between Futures and Forwards

There are some basic differences between the forwards and futures which are illustrated below:

Table 1

	Financial Futures Markets	Forward Market
Location	Futures Exchange	No fixed location
Size of contract	Fixed (Standard)	Depends on the terms of contract
Maturity/ payment date	Fixed (Standard)	Depends on the terms of contract
Counterparty	Clearing House	Known bank or client
Market place	Central Exchange floor with worldwide network	Over the telephone with worldwide network
Valuation	Marked-to-market everyday	No unique method of valuation
Variation Margins	Daily	None
Regulations in trading	Regulated by the exchanges concerned	Self-regulated
Credit risk	Almost non-existent*	Depends on the counterparty
Settlement	Through clearing house	Depends on terms of contract
Liquidation	Mostly by offsetting the positions; very few by delivery	Mostly settled by actual delivery Some by cancelation at a cost
Transaction costs	Direct costs such as commission, clearing charges, exchange fees are high; indirect costs, bid-ask spreads are low	Direct costs are generally low, indirect costs are high in the form of high bid-ask spread

** Except, of course, in "emerging" markets.*

These differences are applicable for almost all the futures and forwards contracts whether on commodity or on currency or on stock.

TYPES OF FUTURES

The different types of futures contracts traded, fundamentally fall into four different categories based on the underlying asset. The underlying asset may be:

i. A foreign currency (say Euro, Yen or Swiss Franc, etc.)

ii. An interest-earning asset (say a debenture or time deposit)

iii. An index (usually a stock index)

iv. A physical commodity (say, wheat, corn, etc.)

v. Futures on individual stock.

MECHANISM OF FUTURES MARKETS

Futures contracts are traded in auctions markets, where the prices are order driven. In these markets, each broker and trader can buy at the lowest offered price and sell at the highest bid price and the liquidity is maintained by the participation of these buyers and sellers. Some of these buyers and sellers are hedgers, seeking to protect their investments, some are speculators who are risk-takers seeking to trade in pursuit of profit incidentally keep bid and ask prices close together and to provide efficient trading in the system.

Futures contracts are designed in such a way so that their prices should always reflect the prices of underlying cash market. The activities of speculators and arbitragers also bring price alignment. In “calendar spreading” traders sell the current delivery-month contract and buy a later delivery-month contract, or vice-versa. This reduces price variance between the futures contracts. Arbitrage also helps keep the cash and futures prices aligned. For example, futures contracts seem to be overpriced in relation to the underlying commodity, arbitrageurs will sell the futures contract and simultaneously buy the commodity, thereby making a profit on the difference.

Organization of Futures Exchanges

An exchange is a physical location where futures trading (for that matter any financial instrument) take place. It is a voluntary, non-profit association of its members. The trading of each commodity/asset takes place at a specific location referred to as ‘pit’, through a system of ‘open outcry’ or ‘screen based online system’ during official trading hours.

The Exchange Memberships are also referred to as seats. They are held by individuals, and these seats are actively traded in the market like any other assets. Members have the right to trade on the exchange and can serve on committees. The committees regulate the exchange’s operations, rules and regulations, public relations, legal and ethical conducts of the members.

DEVELOPMENT OF ORGANIZED EXCHANGES

Chicago Board of Trade

The Chicago Board Of Trade (CBOT) is the oldest and the largest futures exchange in the world. It is organized as a not-for-profit membership association. Chicago’s strategic location at the base of lakes, close to fertile agricultural lands contributed to rapid growth and development as a grain center. It was established in 1848 to bring the producers (farmers) and buyers (merchants) together. In 1865, the CBOT took steps to formalize futures contracts. Although the trading and development of financial futures resulted after World War II, financial products started trading electronically only in 1994. Presently, CBOT offers futures contracts on many underlying assets, which includes corn, wheat, soybeans, soybean oil, Treasury bonds and Treasury notes.

Chicago Mercantile Exchange

Chicago Mercantile Exchange (CME) is one of the leading futures exchanges in the world. Initially, in 1874, CME was known as Chicago Produce Exchange. It was established to provide a systematic market for butter, eggs, poultry and other farm products. In 1919, the butter and egg board became Chicago Mercantile Exchange (CME) to accommodate public participation.

In 1981, CME introduced Eurodollar futures, which gave way to futures on stock indexes and option products. A post market Global Electronic Transaction System (GLOBEX) was finalized with Reuters in 1988 and live trading started in 1992. In 1998, it introduced GLOBEX 2R, the next generation of the first global electronic trading system.

In 1999, CME became the first American exchange to construct concrete plan for demutualization. Currently, CME trades for many underlying assets, including commodities like pork bellies, live cattle, live hogs and feeder cattle and contracts on stock indices and currencies are also traded on the exchange.

Other Exchanges

Currently, many other exchanges throughout the world trade futures contracts. Among them the popular exchanges are London International Financial Futures Exchange (LIFFE), Tokyo International Financial Futures Exchange (TIFFE), Singapore International Financial Futures (SIMEX), Swiss Options and Financial Futures Exchange (SOFFEX) and Sydney Futures Exchange (SFE). In order to fully appreciate the nature and uses of futures, it is necessary to acquire familiarity with the major features of futures contracts, organization of the markets and the mechanics of futures trading.

Futures Commission Merchants

A Futures Commission Merchant (FCM) acts as a broker of prospective futures trading clients. In the US, there are various Futures Commission Merchants who open accounts for prospective clients, maintain account balances and report all the trading activity undertaken by their clients. These FCM, who are akin to brokers in the stock exchange, then contact the future exchanges and execute the deals for their clients. The Commodity Futures Trading Commission (CFTC) regulates them, which is a central regulatory body in the US.

CLEARING HOUSE

A clearing house is an institution that clears all the transactions undertaken by a futures exchange. It could be part of the same exchange or a separate entity. It computes the daily settlement amount due to or from each of the members and from other clearing houses and matches the same.

Members who execute trade on the exchange floor are of two types:

i. Floor brokers

ii. Floor traders.

Floor Brokers

These brokers will execute the orders on others' account. These people are normally self-employed individual members of the exchange.

Floor Traders

These traders execute the trades on their own account. Some floor traders may also execute the orders for the account of others. This mechanism is known as dual trading and such traders are known as dual traders. Some of the floor traders are classified as "scalpers." A scalper is a person who stands ready either to buy or sell. Scalpers add to the liquidity of the market as they are market makers. Some of the floor traders are classified as "position traders." These persons tend to carry the positions for longer period of time. They also add to the liquidity of the markets.

CONTRACT SPECIFICATIONS FOR FUTURES

A futures contract between two parties should specify in some detail the exact nature of the asset, price, contract size, delivery arrangements, delivery months, tick size, limits on daily price fluctuation and trading unit.

The Asset

The delivery of the asset needs to be specified at the time of entering into a contract. When the underlying asset is a commodity, there may be variations in the quality of what is available in the market. It, therefore, becomes important to specify the grade of the commodity that is to be delivered. For example, on CBOT, one of the specifications for corn futures contract, the standard grade is 'No.2 Soft Red' or 'Dark Northern Spring No.1', etc.

The Price

The price agreeable to the buyer and the seller at the time of delivery of the future contract is specified at the time of agreement. The futures prices quoted are convenient and easy to understand. For example, corn prices on the Chicago Mercantile Exchange (CME) are quoted per bushel. The treasury bonds and notes on futures on CBOT are quoted in dollars with two decimals.

The Contract Size

This specifies the amount of the asset that has to be delivered under one contract. If the size of the contract is too large, many investors cannot use the exchange for hedging or for speculative purposes. This is because speculators may not wish to take large positions due to risk. However, if the contract size is too small, trading becomes expensive due to the cost associated with trading.

Delivery Arrangements

The place for delivery needs to be specified at the time of the contract to avoid controversy. The location or place of delivery becomes a major issue when the transportation costs are significant. However, if any alternative delivery locations are specified, the price received by the seller is sometimes adjusted according to the place chosen by him. Sometimes alternatives are specified for the grade of the asset that will be delivered or for the delivery locations.

Delivery Months

A futures contract is referred to by its delivery month. For example, July corn, means that the contract is for delivery in the month of July. The delivery months vary from one contract to the other depending upon the underlying asset, and also on the needs of market participants. For certain contracts the delivery period runs throughout the month. Trading on contracts generally ceases a few days before the last day on which the delivery can be made. The date on which the contracts cease to trade is specified by the exchange.

Tick Size

The contract also specifies the minimum price fluctuation or tick size. For example, in soybean contract, one tick is 1/4 cent per bushel as the minimum size of contract for soybean is 5000 bushels, which gives a tick size of $12.50 per contract.

Limits on Daily Price Movements

The daily price movement limits are specified by the exchange. If the price moves up by a limit, it is referred to as limit up and if it moves down by a limit, it is referred to as limit down. The prime purpose of the daily price limits is to prevent large price fluctuations that may occur due to excessive speculations and also to safeguard the interests of genuine traders. The limits are set by the exchange authorities. However, the price limits become artificial when the price of the underlying commodity is advancing or declining rapidly.

Trading Unit

This specifies the minimum number of units that are traded on the exchange. For example, the trading unit for soybean oil is 60,000 pounds on CBOT exchange. Apart from the above general specifications, there are certain definite specifications pertaining to each of the categories based on underlying assets. The trading unit for selected commodities is discussed in the subsequent pages.

How to Read Futures Prices

The pricing conventions differ from one commodity to the other. The gold prices are quoted in cents per troy ounce of gold bullion whereas the commodities contracts like oil are quoted in terms of cents per barrel, copper in cents per pound, soybeans and food grains in cents per bushel. However, the financial futures are quoted in US dollars per unit of foreign currency. On the other hand, the T-bills, Eurodollar futures are quoted on the basis of an index equal to 100 minus the interest rate on these instruments.

Futures quotations are found in many sources, such as newspapers, Reuters online software and websites of exchanges like NSE. A sample listing of currency futures and stock futures contracts are given below:

Table 2

Sterling Futures						Life Time		Open Interest
	Open	High	Low	Settle	Change	High	Low	
Mar. 01	1.4580	1.4604	1.4556	1.4600	+120	1.5400	1.4010	15305
Jun. 01	–	1.4620	–	1.4626	+120	1.5180	1.4060	2
Dec. 01	1.4610	1.4640	1.4610	1.4676	+118	1.4640	1.4500	7
Japanese Yen Futures						Life Time		Open Interest
	Open	High	Low	Settle	Change	High	Low	
Mar. 01	0.009171	0.009190	0.009145	0.009174	+50	0.010300	0.09088	48867
Jun. 01	0.009295	0.009295	0.009295	0.009303	+52	0.009821	0.009290	38
Sep. 01	–	–	–	0.009431	+54	0.009360	0.009360	96

Source: CME Website.

Now let us try to interpret the numbers by considering the March 01, Sterling Futures Contract. As you read across, the open price of 1.4580 for the March contract is the opening price for that day's trading. Moving to the right we notice that the next quote for the March contract is the high price (1.4604) of the day, followed by the low price (1.4556). This is followed by the settlement price (1.4600) which is the closing price of that day's trading session. The settlement committee for exchange determines this price, and it is intended to indicate the fair value for a futures contract at the end of a particular day's trading. (This is usually determined by using a formula.) The next column gives the change which is the net change in the closing price from the prior day's trading session. The change can be either positive or negative. A positive sign indicates that the price of futures increased over that of previous day's price. The next two columns give details about the lifetime high and lifetime low of the March 01 contract. It means that since its inception, the March 01 contract's lifetime high was 1.5400 and its lifetime low was 1.4010. Generally, the minimum price change in the exchange is called "Tick". It varies from currency to currency (see table 3). Such standardization of price movements speeds up the trading process as it makes price signaling by exchange trader easy. In IMM and SIMEX currency futures contracts against the US dollar and its tick sizes are as follows.

Table 3

	IMM/SIMEX	TICK
Pound Sterling	£62,500	$12.50
Canadian Dollar	CD100,000	$10.00
Japanese Yen	¥12,500,000	$12.50
Swiss Franc	SF125,000	$12.50
Australian Dollar	AD100,000	$10.00

Now, let us see how to read the prices of stock futures contracts. Look at the following tables:

Table 4: Stock Futures (As on 28th November, 2005)

Symbol	Expiry Date	No. of Contracts Traded	Contract Value (Rs. lakh)	Last Traded Price	% change from prev. close	Open Interest	Value of Underlying
SBIN	29-Dec-05	16420	76155.96	931.45	1.59	5806500	925.8
TATASTEEL	29-Dec-05	23134	54682.18	349.2	0.71	19250325	345.5
RELCAPITAL	29-Dec-05	10072	49013.27	438.4	-0.63	11861300	435.5
RELIANCE	29-Dec-05	9571	48854.02	849.5	0.02	17032800	847
SIEMENS	29-Dec-05	7659	38129.99	3376	8.02	235950	3364
TATAMOTORS	29-Dec-05	7703	37095.26	587.15	1.86	3855225	585.9
VSNL	29-Dec-05	8157	32330.6	375.3	-0.24	6893250	374.85
SRF	29-Dec-05	6817	30593.67	293.8	-0.36	6204000	291.4
SATYAMCOMP	29-Dec-05	7620	30299.1	660	0.2	3138600	657.85
MARUTI	29-Dec-05	4861	24446.16	629.5	1.12	2453600	628.55

Source: www.nseindia.com

In case of stock futures, (see table 4) the underlying is a stock traded at the exchange. In the above table, stocks of SBI, Tata Steel and Tata Motors, Reliance, Siemens, VSNL, SRF, Satyam Computers, and Maruti have been taken as underlying for the futures contracts. Expiry date is the last date on which the contract will be traded and at the end of which it will cease to exist. Last price represents the closing price on the current trading day. Numbers of contracts represent the open interest as explained in the following paragraph. Turnover depicts the total value of trade in futures contracts in rupees. Underlying value signify the closing price of the underlying stock.

OPEN INTEREST

This represents the number of outstanding futures contracts. In other words, the number of futures contracts that have to be settled on or before the maturity date. The open interest is reduced by 1 if an existing contract is liquidated. Example: A sold AVD futures maturing in December, 20x1 to B which is the first contract in December, 20x1 futures (see table below). The open interest will become 1. Later A bought AVD futures from C and liquidated his position. The open interest will remain at 1 since C replaced A. If C buys AVD futures contract from B then open interest is reduced to zero.

Table 5

Period	Trader A	Trader B	Trader C	Open Interest
0	–	–	–	0
1	Sells	Buys	–	1
2	Buys	–	Sells	1
3	–	Sells	Buys	0

Clearing House Mechanism

As the futures are exchange traded instruments, the contract obligation is not between the buyer and the seller of the contract even though the contract at the time of initiation is between two parties. Each contract is substituted by two contracts in such a way that clearing house becomes the buyer to every seller and seller to every buyer (see the following diagrams).

Figure 1:Transaction with Clearing House

Figure 2: Transaction without Clearing House

This mechanism effectively removes counterparty risk from the futures transaction. In a transaction where A sells futures to B and B is replaced by the clearing house the credit risk taken by A becomes insignificant. Same is the case for B as well. This means that the credit risk is now assumed by the clearing house instead of the individual. When this happens for all the transactions the credit risk assumed by the clearing house becomes disproportionately high. It becomes necessary for the clearing house to minimize the credit risk. The credit risk of the clearing house is minimized by the imposition of margins. Margins are the amounts, which buyers and sellers of futures contracts have to deposit as collateral for their positions. Margins levied on each contract reflect the volatility of the underlying instrument and these margins are adjusted everyday depending on the changes in the prices. If the price of a contract increases, then the buyer of the contract experiences a gain because the value of an asset increases. The gain will be credited to the buyer's account. In case of a loss, the amount will be debited to the account. This type of adjustment of gains and losses on each day is called marking-to-market.

Clearing House and its Importance

Normally, clearing house is an entity different from the exchange, but it works closely with the exchange for smooth functioning of the day-to-day operations. As the clearing house is the 'de facto' guarantor for all the transactions, it will never have open positions in the market. This situation increases the confidence of the trader which in turn increases volumes of trade and liquidity in the market. Clearing houses undertake many important functions which include maintenance of delivery schedules, delivery of underlying assets, delivery points, etc.

If a trader did not close his position till the expiration period, the trader would have to deliver or take delivery of the underlying asset. In this type of situation, the exchange will prescribe a set of rules for delivering the underlying asset. At the same time, if the underlying asset is a commodity then the exchange will specify the grade of commodity that should be delivered and also delivery points where the goods have to be delivered. These points will usually be the warehouses authorized by the exchange. These steps are taken to ensure delivery of an underlying asset with uniform quality as prescribed by the exchange. However, such problem is not seen in case of currencies by virtue of their nature.

Important Functions of a Clearing House

i. Ensuring adherence to system and procedures for smooth trading.

ii. Minimizing credit risk by being a counterparty to all trades.

iii. Accounting for all the gains/losses on daily basis.

iv. Monitoring the speculation margins.

v. Ensuring delivery of payment for the assets on the maturity date for all the outstanding contracts.

As mentioned earlier, the clearing house will be the guarantor for all the transactions that take place in the exchange. It, hence, stipulates margins to manage the increased default risk. These margins are of two types:

i. Initial margin

ii. Maintenance margin.

When a trader experiences a loss on account of the outstanding contracts, the loss is set-off on the same day with the margin maintained. Simultaneously, a demand is made on the trader to restore the level of margins. Thus, the risk involved in each contract is limited to one day's loss.

Clearing Mechanism in India at NSE

The open position of a Clearing Member (CM) is calculated by taking the aggregate of the open positions of all the Trading Members (TMs) clearing through them. A trading member's open position is calculated by adding up his proprietary open positions and client's open positions. The proprietary positions will be calculated on net basis (buy/sell) and client positions will be calculated on gross basis (i.e., a buy open trade will be offset by a sell close trade and vice versa).

Margining Mechanism

NSCCL has developed a risk containment mechanism for the futures and options segment. It has adopted a margining system to monitor the trading in the exchange. The actual margining will be done on a daily basis while on line position monitoring will be done on an intra-day basis.

The initial margin is collected in advance for all the open positions of a clearing member. A CM will collect the initial margin from the TMs and his respective clients. When a trading member wishes to take additional positions, then the clearing member is responsible for remitting additional base capital to NSCCL. This base capital can be in the form of a liquid security, a bank guarantee, fixed deposit receipt or cash in addition to the initial margin, the members are also charged premium margin till the premium settlement is complete. Assignment margin is to be paid on assigned positions of clearing members. This margin would be charged as follows:

- Exercise settlement value up to Rs.100 lakh for an exercise settlement: 10% of the exercise settlement value for that settlement.
- Exercise settlement value greater than Rs.100 lakh for an exercise settlement: 15% of assignment margin would be released to the clearing member after the scheduled pay-in day.

Settlement Mechanism

Nifty index futures and option contracts are cash settled. All CMs are required to open a separate bank account with NSCCL designated clearing banks.

The open positions in the index futures contracts are marked-to-market at the settlement price of the contract at the end of each trading day. The members who have loss position should pay the loss amount to NSCCL, which is then transferred to the members who have made profits. This is known as daily mark-to-market settlement. The daily settlement price of the Nifty index futures contract is the closing price of the index futures contract which is computed by taking the weighted average of the prices of the daily settlement price. The mark-to-market losses and profits are directly debited and credited to the CM's and clearing bank account respectively.

On the expiry of the futures contract, NSCCL marks the open position of a clearing member to the final settlement price and the resulting profit or loss is settled in cash. The final settlement price is the closing value of the index price on the expiration day of the relevant index futures contract. The final settlement profit is the difference between the last mark-to-market price and the final settlement price of the corresponding index futures contract. Final settlement loss or profit is debited or credited to the relevant CM's bank account on the next day to the expiry day.

As the price of the futures contract changes, gains or losses accrue to the holder of the contract. The gains or losses are credited or debited to the margin account. If the price movements are adverse, the balance in the account falls. In these circumstances, the trader is required to replenish the margin, bringing it on par with the initial value whenever the level or value of funds on deposit with the broker, reach a certain level. This level is referred to as the "Maintenance margin". The additional amount, which the trader deposits with the brokerage firm, is called the "Variation margin".

The maintenance margin is generally about 75% of the amount of the initial margin. In the US, most of the exchanges specify the initial and maintenance margins, for the top ten futures contract.

Orders in Futures Market

There are different orders that can be placed by the clients with members. The instructions given by the client should be reasonably unambiguous, so that the member can execute the order. Standardization always helps in reducing ambiguity and so is the case with the instructions. Some important orders are described here which are generally used in the futures markets.

a. **Market Order:** This order has to be executed immediately at the best possible rate after it reaches the trading floor. Example: "*Buy 1 December 2002 1000 Corn*". This means that 1000 bushels of corn are to be bought immediately at the market rate of the current date.

b. **Market-If-Touched (MIT):** A Market-If-Touched order is an order to execute a transaction at the best available price when the market reaches a price specified by the customer. An MIT order to buy becomes a market order to buy when the futures trade at or below the order price. An MIT order to sell becomes a market order to sell when the future trades at or above the order price. Example: "*Sell 1 December 2002 1000 Corn 22.00 MIT*". This means that 1000 bushels of corn are to be sold as a market order if the market touches or crosses $22.00.

c. **Time Orders:** Orders may be good for a specified period of time, or they may be opening, that is, effective unless explicitly canceled by the customer. An order that is entered may be good for a day, a week, a month, or until canceled.

   i. **Day Orders:** When the time limit is not indicated, the broker has to assume that the order expires at the close of the market.

   ii. **Good Till Canceled (GTC):** This contract remains in effect until executed or canceled by the customer.

   iii. **Good This Week (GTW):** This contract remains effective until the last day of trading of the week.

   iv. **Good This Month (GTM):** This contract remains effective until the last day of trading in that month.

   v. **Good Through Date (GTD):** This order is good until the close of business on the indicated date.

d. **Limit Order:** A customer who wishes either to buy or to sell only at a specified price (or one that is more favorable) places a limit on the price. A limit order tells the broker to execute a transaction only at a specified price or at one that is more favorable to the client. A limit order to buy is to be executed at or below the specified limit. A limit order to sell is to be executed at or above the price limit. Example: "*Sell 1 December 2002 1000 Corn 22.00*". This means that 1000 bushels of corn are to be sold when the price reaches $22.00 per bushel on the day the order is placed. If the price is not reached, the transaction is not made.

The important advantage in limit order is that the client determines the least favorable price he or she is willing to pay or to accept. The customer does not have to continuously stay in touch with the broker to get the result if the market moves to the specified limit.

e. **Market On Close (MOC):** This kind of order is an instruction to the broker to execute the order during the official period for the contract. It may not be the last traded price, but should fall within the range of the closing prices for the month for the said contract.

Example: *"Buy 1 December 2002 1000 Corn MOC"*. This means that 1000 bushels of corn are to be purchased at the closing time in the market irrespective of the price.

f. **Stop-Loss Order:** A stop-loss order is an order to buy or sell when the price reaches a specified level. A stop order to buy, enter above the prevailing market price, becomes a market order when the contract is either traded or bid at or above the price. A stop order to sell, entered below the prevailing market price, becomes a market order when the contract is either traded or offered at or below the stop price. Stop orders differ from MITs mainly in their relationships to prevailing price levels. Stop-loss orders to buy are entered above the prevailing market price; stop-loss orders to sell are entered below the prevailing price. MIT orders are entered in an opposite manner. Example: "*Buy 1 December 2002 1000 Corn 21.50 Stop*". This means that 1000 bushels of corn are to be bought at any price below 21.50 cents. The maximum price that can be paid is 21.50 cents and no purchase should be made above that price. Similarly, in case of sale, the stop order clearly states that the sale should not be executed at any price below the stop loss target.

g. **Exchange for Physical Order:** This kind of order permits the exchange of futures position for a physical position and is usually an off-the-exchange transaction.

Example: "*Sell 1 December 2002 1000 Corn EFP to ABC*". This means that 1000 bushels of corn are to be exchanged with ABC (party) for a current physical position as of date.

h. **Discretionary Order:** In this order, the broker is given some discretion to buy or sell when the market is falling very steeply or rising very fast in order to avoid losses.

Example: "*Buy 1 December 2002 1000 Corn 22.00 with 1 Point Disc*". This means that 1000 bushels of corn should be bought at 22.00 cents, but the broker can pay one point more if he feels that the order will otherwise not be fulfilled as the prices are racing fast.

i. **Not Held Order:** This is a type of discretionary order, where the broker is given a discretion to wait to buy if he feels that the prices will go further down or wait to sell if he feels that the prices may go further up. Anyway, the broker cannot be held responsible if he does not execute the order on the ground that the price did not reach his expectation.

Example: "*Buy 1 December 2002 1000 Corn 22.00 Not Held* ". This means that the broker can execute the order to buy at 22.00 cents or wait if he feels that the price may fall below 22.00 cents.

j. **Spread Order:** This order entails the broker to buy and sell two different contracts at the same time with a spread premium.

Example: "*Spread Buy 1 December 2002 1000 Corn Sell 1 December 2001 1000 Corn, $1.00 premium*". This means that 1000 bushels of corn are to be bought and 1000 bushels of corn are to be sold at a price differential to yield at a minimum of $1.00 of profit between the purchase and the sale.

Closing a Futures Position

Suppose a trader has an obligation under the terms of the futures contract either to deliver the underlying asset or to take delivery. The three common ways in which he can settle or liquidate a futures contract is by means of physical delivery or cash settlement, offsetting and Exchange Futures for Physicals (EFP).

Delivery or Cash Settlement

Physical delivery of a contract can be cumbersome to fulfill its obligation. If the underlying asset, for example is corn, it needs to be delivered according to the contract at the specific place and time. On the other hand, if the trader does not hold the underlying asset, it may be difficult for him to buy the asset of exact specifications (such as quality or color, etc.) at a price (so that he does not incur a loss). In order to facilitate the traders (who do not hold the asset) the exchange has introduced cash settlement. In cash settlement, traders make the payments at the expiration of the contract to settle any gains or losses, instead of making physical delivery.

Cash settlement has grown tremendously in the last few years as it entails much less trouble when compared to physical delivery of the underlying asset, which can be further complicated because of the distances between markets and scarcity in the availability of the underlying assets at times.

Offsetting

Most of the futures contracts can be completed through offsetting or reversing a trade. Suppose a trader holds a long position in wheat delivery for September, and he does not want to follow the above procedures. He can as well enter into another contract to offset the present position to bring his net position to zero, i.e., as he is holding a long position he can sell an identical futures contract (with same commodity and delivery month) to reverse the earlier position, so that his net position becomes zero.

Exchange of Futures for Physicals (EFP)

To understand the concept, let us assume that a trader holds a long position in oats delivered in the month of September and wishes to acquire oats. Also assume that another trader ‘X’, who owns oats, is willing to go short on oats. Both the traders agree on a price for the physical oats and also to cancel their complementary futures positions against each other. As the first trader buy the oats from ‘X’, both desire to cancel their positions on the futures exchange. The futures exchange will note their positions and cancel future obligations. This type of transaction sometimes is also referred to as ‘ex-pit’ transaction.

MOTIVES BEHIND USING FUTURES

Price Discovery

Price discovery is expectation of the future cash prices on the basis of prices of the futures contract. As mentioned earlier, while buying or selling a futures contract, a trader agrees to receive or deliver a specified commodity at a certain future time that is fixed now.

By using the information available in the futures market today, the market participants can estimate the prices of a given commodity at a certain point of time. The forecasts of the futures prices that can be taken from the futures market compare in accuracy quite favorably with other kinds of forecasts. Futures markets provide a better estimate of the future prices, so that the market participants can make their investment decisions in a more proper way.

Hedging

As mentioned above, futures markets were formed originally to meet the needs of farmers and merchants. One can take position solely for the purpose of establishing a known price level – weeks or months in advance – or for either going long or short in the cash market to minimize the risk. An individual who hedges is called the 'Hedger' and the activity of trading in futures to control or reduce risk is called as 'Hedging'.

Let us consider an illustration to understand how the futures market is used for hedging. Suppose it is now June and a manufacturer of cotton apparels needs 2,00,000 pounds of cotton in October 20x1 and is of the opinion that the price would rise. Currently on the New York Cotton Exchange (NYCE) the October cotton no.2 futures are trading at 57.00 cents per pound. He enters into a futures contract for 2,00,000 pounds, for which he will need to buy 4 contracts (a minimum contract size is 50,000 pounds on NYCE) and lock his price at 57.00 cents per pound (i.e., his total outflow in October will be $1,14,000).

Assume that in October the cash market price of cotton is 58.55 cents per pound. He will have to pay the supplier $1,17,100 to procure cotton. However, the extra cost of 1.55 cents per pound ($3,100) that he will have to pay to procure cotton will be offset by a profit of 1.55 cents per pound when the futures contract is sold at 58.55. In other words, hedging provides insurance against an increase in price. However, had the price of cotton declined instead of rising, he would have incurred a loss on his futures position but this would have been offset by the lower cost of acquiring cotton in the cash market.

Hedgeable and Non-hedgeable Risks

The futures market has two main types of foreseeable risks:

i. Price Risks

ii. Quantity Risks.

While price risks relate to unexpected changes of prices of a commodity in the future, quantity risks relate to the future output of a commodity. Price risks can be hedged by taking positions in the futures or options markets and the hedging can be quite accurate so as to ensure no losses. Price risks are also known as hedgeable risks. Quantity risks are also known as non-hedgeable risks, as they cannot be accurately quantified and hedged, as quantity output is more an act of God and depends on the outcome of nature.

Long Hedging and Short Hedging

There are two types of hedging, namely short hedging and long hedging. Short hedging is also known as selling hedge and it happens when the futures are sold in order to hedge the cash commodity against declining prices.

Long hedging is also known as buying hedge and it happens when the futures are purchased to hedge against the increase in the prices of a commodity to be acquired either in the spot or future market. Short and long hedges can be with or without risk. Depending on the extent of minimization of basis risks, there are four outcomes possible:

i. Short Hedge Without Basis Risk

ii. Short Hedge With Basis Risk

iii. Long Hedge Without Basis Risk

iv. Long Hedge With Basis Risk.

Out of which the outcomes without basis risk are less practical as the risks can be minimized but seldom nullified.

Optimal Hedging Ratio

A general question that arises in the mind of anyone dealing with futures is what is the optimal hedging ratio or how many futures contracts should be acquired or sold to minimize the risks. The optimal hedging ratio can be understood as under:

Given that Hedge Ratio (HR) = Qf (Quantity of futures units)/Qc (Quantity of current units being hedged)

Or

Value of HR = Qc x ΔCP (Change in price of current units) – Qf x ΔFP (Change in price of future contracts) which is taken from the formula of Basis. Equalizing the variance to 0, we get

$$Qc \times \Delta CP = Qf \times \Delta FP$$

$$\text{So, } Qf = Qc \times \Delta CP / \Delta FP$$

or n other works.

$$Qf = Qc \times HR$$

Now, let us assume that No. of Future Contracts = NFC and the quantity of the commodity represented by the futures contract is Qfc, therefore,

$$Qf = NFC \times Qfc$$

Equalizing both the equations we get

$$NFC \times Qfc = Qc \times HR$$

$$\text{So, } NFC = Qc/Qfc \times HR$$

Which is the standard formula of the optimal hedging ratio.

SPECULATION

Speculation is taking a view and acting accordingly for making profit in a short span of time. Buying a futures contract in anticipation of price increase is known as ‘going long’. Selling a futures contract in anticipation of a price decrease is known as ‘going short’.

Speculators will be looking for the risks that hedgers are willing to avoid. They have no intention of taking delivery; instead they seek a profit from price volatility. We have seen that hedgers use futures as a tool to avoid an exposure by minimizing the adversity. Let us see how speculators take a position to gain from the futures.

Consider yourself to be a speculator who thinks in May that the price of wheat will go up in next three to four months. Assume, you do not have enough of funds. So, you borrow dollars, and buy wheat of say 1,500,000 bushels at 270.25 per bushel that is the current spot rate. You waited cents till September. In September, the prices reached the level you expected and you sold the wheat and paid-off the borrowed funds along with interest, and realized your profit. But, in this process, you have undertaken some risks associated with the ownership of the wheat – the need to store the wheat, protect it from pests, transport it from the seller and to the buyer – all these involve either outflow of money or risk.

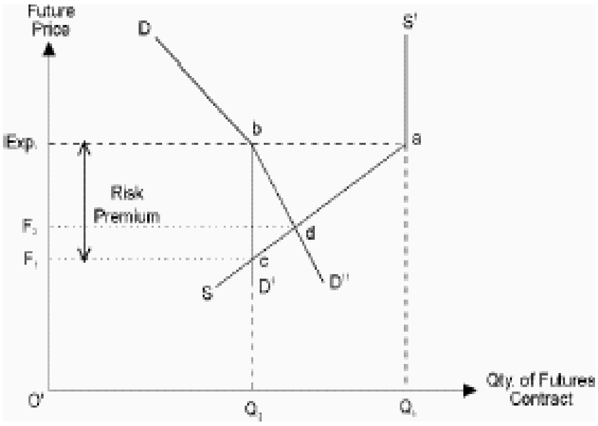
To avoid all this risk and trouble, you could choose the alternative of futures contracts. Futures contracts on wheat are deliverable in future. That is you agree to buy the wheat you want at the time you want it at a price that is fixed today. Futures contracts are easy to buy, as they are traded on the exchanges. Also, you can save yourself the trouble of checking the quality of the wheat you get and ensuring that you receive the one you bought. This is because futures contracts are standardized not only in terms of quantity, but also in terms of quality.

You can make the same speculation using the futures contracts. You may buy a contract today, for delivery at the end of say, six months and sell if when you think the price reached the level you want. This is easier to put through – just two transactions at the futures exchange – compared to buying real wheat. The first alternative that involves purchasing the asset upfront will involve more funds and costs. Whereas, for the second alternative, you require only a small amount of cash as deposit. If we consider the interest loss on the amount blocked in the purchase of wheat, the second option seems to be more attractive, although risky.

Various studies have criticized the rationale of speculators terming them as mobsters who act as per the rumors rather than technical analysis, but nevertheless, speculation is one of the main causes of the tremendous growth of the futures market.

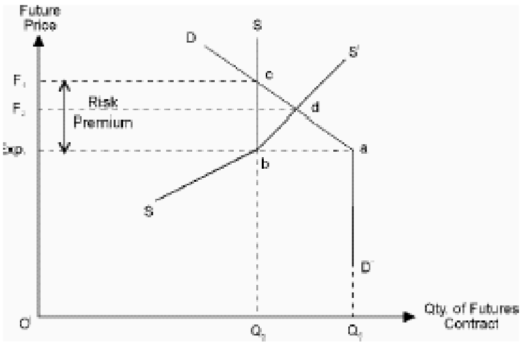
The following charts show the effects of speculation, both in the short-term and long-term.

Figure 3: Effect of Speculation in the Short-term



In the above figure, we can see that when the futures prices fall below the expected spot prices, long speculators enter the market and purchase futures contracts pulling the line DD' to the position DD". This implies that the demand for futures for speculative purposes increases as the futures prices reduces when compared to the spot prices.

Figure 4: Effect of Speculation in the Long-term



In figure 4, we can see that the speculative supply of contracts at futures prices is above the expected prices. At this position line SS' is pulled down to SS", implying that the futures prices fall in comparison to the spot prices.

ARBITRAGING

Arbitraging is a simultaneous purchase and sale of similar assets in different markets to take advantage of price discrepancy.

Arbitrageurs are third group of participants in these markets. The act of arbitraging involves locking in riskless profits by simultaneously entering into different transactions in two or more markets.

Consider an IBM stock traded on the NYSE and on LSE. Suppose the stock price is \$155 in NY and 88 pounds in London and the exchange rate is \$1.75 per pound. An arbitrageur could simultaneously buy 100 shares in LSE and sell in NY and make a risk-free profit of

100 x [155 – \$(1.75 x 88)] = \$100.

Transaction costs would reduce the profit of the arbitrageur to the minimum. As you buy the stock on the London Exchange the demand will increase. Similarly, the price at NYSE will fall as they sell the stock, reducing the arbitraging opportunities. In short, arbitrage opportunities cannot last for very long periods of time in a stock, but the very existence of arbitrageurs implies that there are opportunities in the markets for sometime.

FUTURES PRICES

Futures market prices bear economically important relationships to other significant observable as well. For example, the futures price for delivery of wheat in three months must be related to the current spot price of wheat or current cash price of wheat at a particular physical location.

As the futures contract requires the delivery of some good at a particular time in future, we can make it sure that the expectations of the market participants assists to determine the futures prices. Similarly, the cost of storing the goods underlying the futures contract helps to determine the relationship between the futures prices and the cash prices. So, we can conclude that all these futures pricing issues are interconnected.

The Relationship between Futures Price and Cash Price

Any commodity you buy in the market has a price, which is referred to as cash or spot price for immediate delivery. Similarly, in a futures market, the commodity is delivered at a later date as per the futures contract. There may be more than one cash price for a commodity at one point of time. For instance, petrol is quoted at different rates at different geographical locations. This variation in costs occurs due to time and the costs associated with transporting petrol from one part of the globe/country to the other. The cash price varies from one country to the other and one commodity to the other and depends on the demand and supply of the commodity. If a good has two prices, at two different locations, a trader would normally buy the good from a cheaper market and sell at a market with high price and make a profit. Although one could think that can happen, the transportation costs involved and taxes paid will nullify the profit, unless the price difference is large enough to still result in a profitable situation.

Basis

The basis is the relationship between the cash price of a good and the futures price of that good. Basis represents the difference between the cash price and the future price of a single commodity.

Basis = Current cash price – Futures price

The futures market can portray a pattern of either normal market or inverted market. If the prices for more distant futures are higher than the nearby futures, it is referred to as 'normal market' condition. For example, the cotton No.2 futures traded on New York Cotton Exchange (given in the table below) is showing the pattern of normal market.

Table 6

Contract	Prices	The Basis
Cash		
June 20x1	53.25	
July 20x1	53.55	–0.30
October 20x1	57.00	–3.45
December 20x1	58.85	–1.85
March 20x2	60.25	–1.40
May 20x2	60.20	–0.95
July 20x2	62.09	–0.89
October 20x2	62.50	–0.41

In an inverted market, the distant futures prices are lower than the prices that are near to expiration. When the futures contract is at expiration, the futures price and spot price of a commodity should be the same; hence, the basis must be zero. This behavior pattern of the basis over a period of time is referred to as 'convergence'.

If the current cash price lies above the futures price, and as the time elapses, and futures contract is nearing maturity, the basis narrows, and at the time of maturity, the futures price should be equivalent (approximately) to cash price. Thus, basis would be zero, leading to no-arbitrage situation.

Basis Risk

The meaning of basis has been discussed above. If the hedge can eliminate the full risk it is a situation known as perfect hedging, but as some uncertainty is associated always with the future and the difference between the spot prices and future prices may change, there are chances of basis risks. In short, basis risk may occur because of imperfect hedging between the spot price of the asset to be hedged and the futures price of the contract used.

Spreads

A spread is the difference between two futures prices.

The difference between two futures price is referred to as 'spread'. For the same underlying good, if there are two different prices on two different expiration dates, the underlying spread is referred as 'intra commodity' spread (also known as a 'time spread'). If the spread is between two futures prices for two different but related commodities, such as corn oil futures and cottonseed oil futures, it is referred to as 'inter commodity spread'. If the price difference is between two markets for the same commodity, it is known as 'inter-market spread'. The spread relationships are significant due to the act of speculation. Theoretically, there should be no inter-market spread as the difference in rates is adjusted by the cost-of-carrying or transportation cost, but as discussed above, if the price difference is large enough and there is a seasonality of demand and supply, price differences may occur giving rise to inter-market spreads.

The Cost-of-Carry Model of Determining Futures Prices

The extent to which the futures price exceeds the cash price at one point of time is determined by the concept called 'cost-of-carry' that refers to the carrying charges. The carrying charges can be further classified into storage, insurance, transportation and financing costs. The significance of carrying costs cannot be ignored because they play a crucial role in determining pricing relationships between the spot and futures prices. Moreover, it plays a key role in determining the prices of various future contracts of maturities.

The following formula determines the relationship between the cash price and the futures price of any commodity:

$$F_{t,T} = C + C_t \text{ x } S_{t,T} \text{ x } \frac{T-t}{365} + G_{t,T}$$

Where,

C_t = Cash price at time t

$S_{t,T}$ = Annualized interest rate on borrowings

$G_{t,T}$ = Storage costs

$T - t$ = Time period

$F_{t,T}$ = The futures price at time t, which is to be delivered at time period T.

In common parlance, the industry refers the cost-of-carry as 'full carry futures price' (which is nothing but estimated cost of futures price). Hence, in the market there will be two market prices namely the actual market price and calculated full-carry price (which is obtained by using formula). The interest rate futures are contracts with underlying assets of fixed income securities or fixed instruments (a fixed income instrument has the payment of amount of interest at specific points of time, as well as the repayment of the principal on maturity).

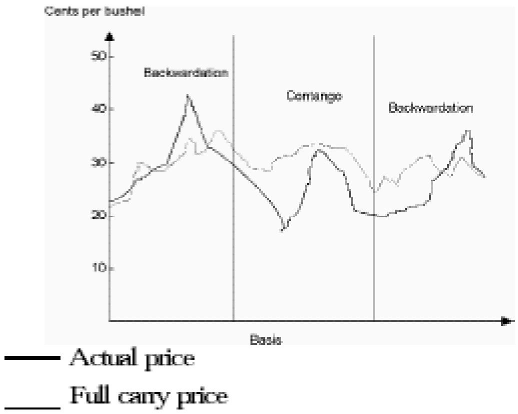
Convenience Yield

The shortage of the physical commodity is probably one of the reasons for having additional costs other than cost-of-carrying. When there is a shortage in a commodity, there is an implied yield (return) by holding the commodity. This yield is referred to as 'convenience yield'.

Contago and Backwardation

If the futures prices obtained by full-carry relationship are accurately projected, the basis is negative, as the futures prices are higher than the cash prices. This condition is referred to as 'contango' market (which means the prices of futures market are only determined by the cost-of-carry). This sort of market is featured by progressively rising futures price as the time to delivery becomes more distant. If the futures price is less than the cash price, the basis is positive. This condition prevails only if the futures prices are determined by some other factors other than cost-of-carrying. When the futures prices are lower than the cash prices it is referred to as 'Backwardation'. It is featured by lower futures prices as delivery becomes more distant.

Figure 5: Contango and Backwardation



SUMMARY

- The futures market was the development followed the forwards market and was originally developed to meet the needs of the farmers and merchants.
- The largest futures exchanges in the world are the Chicago Mercantile Exchange (CME) and the Chicago Board of Trade (CBOT).
- With its features like standard volume, liquidity, counterparty guarantee by exchange and intermediate cash flows, futures are considered to be better option than forwards.
- A futures contract between two parties should specify in some detail the exact nature of the asset, price, contract size, delivery arrangements, delivery months, tick size, limits on daily price fluctuation and trading unit.
- The cost of storing the goods underlying the futures contract helps to determine the relationship between the futures prices and the cash prices.

Chapter VI

Currency Futures

After reading this chapter, you will be conversant with:

- Hedging with Currency Futures
- Currency Futures in India

In 1972, Chicago Mercantile Exchange (CME) was the first exchange to introduce the financial futures contracts. All developed countries started importing a plethora of foreign goods, which in turn created a demand for foreign currencies. Thus, huge volumes of international transactions led to the development of foreign currency markets, which in turn created the necessity for foreign currency futures.

The foreign currency futures contracts need to specify a trading unit (such as British Pound, Euro, a Swiss Franc, etc.), quotations (such as US$ per pound, US$ per Franc, etc.) minimum price change contract months, US$ value of currency as on day and delivery date. In the early 1970s, contracts were traded on British Pound, Canadian Dollar, Japanese Yen, Swiss Franc and German Mark. Currency contracts on French Francs, Dutch Guilders and Mexican Peso were not successful, thus, no longer were traded. Presently, Euro, Japanese Yen, Swiss Franc, British Pound, Canadian Dollar, and Australian Dollar are traded on CME.

Currency futures can thus be defined as "a binding obligation to buy or sell a particular currency against another at a designated rate of exchange on a specified future date."

The contract size specifications for the few currencies traded in the CME are as follows:

i. British Pounds – 62,500 as minimum trading quantity.

ii. Canadian Dollars – 100,000 as minimum trading quantity.

iii. Japanese Yen – 12,500,000 as minimum trading quantity.

iv. Swiss Francs – 1,25,000 as minimum trading quantity.

v. Australian Dollars – 1,00,000 as minimum trading quantity.

Following are some of the important futures exchanges and the currencies traded on these exchanges:

- CME: Chicago Mercantile Exchange
- SIMEX: Singapore International Financial Futures Exchange
- PBT: Philadelphia Board of Trade
- SFE: Sidney Futures Exchange
- TIFFE: Tokyo International Financial Futures Exchange
- NZFOE: New Zealand Futures and Option Exchange.

Table 1

	CME	SIMEX	PBT	SFE	TIFFE	NZFOE
German (Euro)	*	*	*	–	–	–
Canadian Dollar	*	–	*	–	–	–
Swiss Franc	*	–	*	–	–	–
British Pound	*	*	*	–	–	–
Japanese Yen	*	*	*	–	*	–
Australian Dollar	*	–	*	*	–	–
New Zealand Dollar	–	–	–	–	–	*

HEDGING WITH CURRENCY FUTURES

The advantages of derivate products emanate from the flexibility they have in providing hedge to the persons who have exchange exposure. We know that exports and imports are exposed to currency risk. This exposure can be hedged through derivatives like futures, options, etc. Futures are one of the derivatives where an exporter and importer can hedge their positions by selling or buying futures. Since the futures market does not require upfront premium for entering into contract as in the case of options, it provides a cost-effective way for hedging the exchange risk. The basic advantage of using currency futures is that it provides a means to hedge the trader's position or anybody who wishes to lock-in exchange rates on future currency transactions. By purchasing (long hedge) or selling (short hedge) foreign exchange futures, a corporate or an individual can fix the incoming and outgoing cash flows in one currency with respect to another currency. Anyone who is dealing with a foreign currency is faced with an exchange risk since the cash flows in terms of domestic currency are known only at the time of conversion. The objective of avoiding exchange risk can be achieved by using different tools including futures. A person who is long or is expected to go long in a foreign currency will have to sell the same on a given day. A hedge can be obtained now by selling futures in that currency against the domestic currency. Similarly, a person who is short or is expected to go short in a foreign currency will have to go long on the same on a given day. A hedge can be obtained now by buying futures in that currency against the domestic currency instead of buying the currency latter in the spot market. However, the major disadvantage in foreign exchange futures is that they are limited to a few currencies only. The following illustration explains how a US exporter, using futures, hedges his Euro inflows.

Illustration 1

Assume that a US exporter is exporting goods to his German client. On September 14, 20x1, the exporter got the confirmation from the German importer that the payment of Euro 625,000 will be made on November 1, 20x1. Here, the US exporter is exposed to the risk due to currency fluctuations. If the Euro depreciates there will be loss on his dollar receivables. To cover this risk the exporter can sell Euro futures contract on the CME. The following working explains how the exporter is hedged.

September 14, 20x1

Spot Market Exporter gets confirmation of receivables equal to Euro 625,000 on November 1, 20x1. Spot rate on September, 14, 20x1 \$/Euro is 0.4407; Expected cash inflows are \$275,437.5, i.e., Euro 625,000 x 0.4407 if he were able to convert Euro to US dollars. But he cannot do so since he did not receive the Euro. However, he can go to futures market and sell futures in Euro.

Futures Market

Sell five December Euro futures contracts, since size of each contract is Euro 125,000 at the rate which is prevailing in the market. Let the rate be \$/Euro 0.4442. Hence, the equivalent notional amount in US dollars will be \$277,625 (i.e. 0.4442 x Euro 625,000).

November 1, 20x1

Spot Market

Dollar has appreciated and spot exchange rate is 0.43908. The dollar value of Euro 625,000 now is \$ 274,425.

Loss on spot market position = \$275,437.5 – \$274,425 = \$1,012.5

Futures Market

Buy five December Euro futures contracts. The quantity of futures contracts bought should be same as that sold on September 14. Let the futures rate be 0.44258. This gives the exporter the notional right to buy Euro 625,000 by paying \$276,612.5 i.e., Euro 625,000 x 0.44258.

Profit on futures contracts = \$277,625 – \$276,612.5

= \$1,012.5.

The loss in the spot market, arising from the appreciation of dollar, is offset by the profit in the futures market. In the above illustration, the exporter received the same amount of US dollars as if he had sold Euro in the market on September 14, 20x1. This is because the change in the rate of Euro during the period and the change in the price of futures during the same period are equal.

Spot Price (t_0) – Spot Price (t_1)

= 0.4407 – 0.43908 = 0.00162

Futures Price (t_0) – Futures Price (t_1)

= 0.4442 – 0.44258 = 0.00162

The same has been explained in a simple table:

Date	Spot Exchange Rate $/Euro	December Futures Rate $/Euro
Sept.14, 20x1	0.4407	0.4442
Nov. 1, 20x1	0.43908	0.44258
Difference	0.00162	0.00162

The difference between spot price and futures price is known as basis. The basis at time to in the above illustration is 0.0035 and the basis at time t_1 is also 0.0035.

Date	Spot	Futures	Basis
14 September, 20x1	0.5900	0.6000	–0.1000
01 November, 20x1	0.5400	0.5500	–0.1000

We observe that the basis remained unchanged. When the basis remains unchanged, the gain/loss in spot market matches with the loss/gain in futures market and hence the amounts are exactly offset. However, it is unlikely that the basis remains the same throughout the period.

Illustration 2

We have seen that the rate in the futures market moved in line with that in the spot market, and absolute price change is equal in both markets. However, the change in futures rate need not be equal to the change in the spot exchange rate. If the spot and futures rates change by different amounts, there will be a change in the basis. Due to this, a degree of imperfection enters the hedge. This situation is explained in this illustration, which is different from the earlier illustration only in the assumption that the rate of exchange for December futures would be 1Euro = $0.4460 rather than 1Euro = $0.44258. Due to this the basis changes from 0.1000 to $0.3000 and, as a result, the hedge will not be perfect.

Date	Spot	Futures	Basis
14 Sep., 20x0	0.5900	0.6000	0.1000
01 Nov., 20x1	0.5400	0.5700	0.3000

The change in basis enables the hedger to replace outright risk with basis risk and consequently brings down the loss from $1,012.5 to $312.5.

September 14, 20x1

Spot Market

Exporter gets confirmation of receivables equal to Euro 625,000 on November 1.

Spot rate is 0.4407; Expected cash inflows are $275,437.5, i.e., Euro 5 x 125,000 x 0.4407 if he were able to convert Euro to US dollars. But he cannot do so since he did not receive the Euro. However, he can go to futures market and sell futures in Euro.

Futures Market

Sell five December Euro futures contracts. Size of each contract would be EURO 125,000 at the exchange rate which is prevailing in the market. The rate is 0.4442. Hence, the equivalent notional amount in dollars will be $277,625 (i.e. 0.4442 x 5 x 125,000).

November 1, 20x1

Spot Market

Dollar has appreciated and spot exchange rate is 0.43908. The dollar value of Euro 625,000 now is $274,425. Loss on spot market position = $275,437.5 – $274,425 = $1,012.5.

Futures Market

Buy five December Euro futures contracts. The quantity of futures contracts bought will be the same as that of sale. The buying rate is 0.44308. This gives the exporter the notional right to buy Euro 625,000 by paying $276,925, i.e., 5 x Euro125,000 x 0.44308.

Profit on futures contracts = $277,625 – $276,925

= $700.

The same can be explained in a simple table:

Date	Spot Exchange Rate $/Euro	December Futures Rate $/Euro
Sept.14, 20x1	0.4407	0.4442
Nov. 1, 20x1	0.43908	0.44308
Difference	0.00162	0.00112

In the above illustration we have seen that the Euro inflows are being hedged by using Euro futures. This type of hedge is called direct currency hedge. A direct currency hedge involves the two currencies which are directly involved in the transaction. Thus, an Indian firm which has a dollar payable maturing after three months may buy dollar futures priced in terms of rupees or sell rupee futures priced in terms of dollars. If such futures are not available, a cross hedge can be used. Let us assume that the rupee and sterling movements are strongly interlinked. In that case, the firm can buy dollar futures priced in terms of sterling or sell sterling futures priced in terms of dollars. For a cross hedge to be effective, the firm has to choose a contract on an underlying currency which is almost perfectly correlated with the exposure which is being hedged. This effectively means that dollar exposure is converted to a sterling exposure.

Determining the Effective Price using Futures

Let Sp_1 be the spot price at time T_1

Sp_2 be the spot price at time T_2

Ft_1 be the futures price at time T_1

Ft_2 be the futures price at time T_2.

$Sp_1 - Ft_1$ = Basis at T_1

$Sp_2 - Ft_2$ = Basis at T_2.

In the earlier illustration, US exporter hedged Euro receivables by selling futures on Euro. Let us assume that the transaction has taken place at T_1 and closed at T_2. Profits made in futures markets by closing out position at $T_2 = Ft_1 - Ft_2$ (of course, this represents a loss if $Ft_1 < Ft_2$).

Price received for asset while selling in the spot market = Sp_2 which implies, the effective price at which the US exporter sold the Euro is

$$= Sp_2 + (Ft_1 - Ft_2)$$
$$= Ft_1 + (Sp_2 - Ft_2)$$
$$= Ft_1 + b_2$$

where, b_2 represents basis at time t_2.

Since b_2 is unknown, the futures transaction is exposed to basis risk. If $b_2 = b_1$, then the effective price at which Euro sold will be $Ft_1 + Sp_1 - Ft_1 = Sp_1$. Due to this, the risk is completely eliminated and the dollars inflows will be at today's spot price.

HEDGE RATIO

A hedger has to determine the number of futures contracts that provide best hedge for his/her risk-return profile. The hedge ratio allows the hedger to determine the number of contracts that must be employed in order to minimize the risk of the combined cash-futures position. We can define hedge ratio "as the number of futures contracts to hold for a given position in the underlying asset."

$$HR = \frac{\text{Futures Position}}{\text{Underlying Asset Position}}$$

We considered that the US exporter will hedge Euro 625,000 receivables by selling 5 contracts on Euro futures i.e., 5 x 125,000. In that case, the hedge ratio is 1.0. The hedge ratio 1.0 will give a perfect hedge when there is no change in the basis. The loss on the underlying asset position is offset by profit on the futures position and vice versa. In illustration 2, we mentioned that when the US exporter took a short position on 5 contracts, he made a profit on the futures position which was less than the loss on the spot position. This resulted in an imperfect hedge. Had the US exporter taken a short position on 7.23214 contracts he would have got perfect hedge. Let us rework assuming that the US exporter takes short position on 7.23214 futures contracts.

Illustration 3

November 1, 20x1

Spot Market

Dollar has appreciated from 0.4407 on September 14, 2000 to 0.43908. The dollar value of Euro 625,000 now is $274,425.

Loss on spot market position = $275,437.5 – $274,425

= $1,012.5

Futures Market

The value of the futures contract sold on September 14, 20x1 is $401,564.57 i.e., 7.23214 x Euro125,000 x 0.4442.

To close the above short position, buy 7.23214 December Euro futures contracts at 0.44308. This gives the exporter the notional right to buy Euro by paying $400,552.07, i.e., Euro 7.23214 x Euro 125,000 x 0.44308.

Gain on futures contracts = $401,564.57 – $400,552.07

= $1,012.5

As seen from the above, the hedge becomes a perfect hedge when 7.23214 contracts are sold instead of 5. The hedge ratio of 1.446 (i.e. 7.23214 x Euro 125,000/625,000) gave a better hedge than when the hedge ratio is 1. However, this could be observed only in retrospective (since we have rates at the time of reversing the transactions) whereas one needs to know the hedge ratio prospectively. Therefore, it becomes necessary to estimate the hedge ratio. The number of contracts to go short/long depends on the expected change in the price level of spot prices and the expected change in the price level of futures and the co-variance between them. Since the expected changes are generally calculated based on the historical price changes, the exact calculation of hedge ratio will be difficult. There are different methods for estimating the hedge ratio. Out of many models the minimum variance hedge ratio model is the commonly used one.

The Minimum Variance Hedge Ratio Model

Ederington and Johnson employ portfolio theory to derive the mathematical model that defines the minimum-variance hedge ratio (h) as the proportion of the futures to the cash position that minimizes the net price change risk.

The minimum-variance hedge ratio is obtained as under:

h = Fp σ Sp/ σ Ft

Let,

h = Hedge ratio

Fp = Coefficient of correlation between Sp and Ft

σ Ft = Standard deviation of Δ Ft

σ Sp = Standard deviation of Δ Sp

Δ Ft = Change in futures price during the period of hedging

Δ Sp = Change in the spot price during the period of hedging.

The examples taken above have shown the hedging of currency futures against the US dollar. It is also possible to hedge any currency against any other currency by creating foreign currency hedging contracts based on US dollar-denominated future contracts. This is known as Synthetic Foreign Currency Contracts.

Synthetic Foreign Currency Contracts

Let us take a simple example to understand this.

Assume that there are market expectations that the Australian dollar may depreciate in comparison to the Swiss Franc. A money manager can sell Australian dollar futures while simultaneously buying Swiss Franc futures, thus assuring a future exchange rate between the two said currencies. This can be depicted easily through a simple equation:

$F_{t,T}$ (SFr/AD$) = $F_{t,T}$ ($/SF$_r$)/$F_{t,T}$ ($/AD$)

The money manager will see real benefits only in the following situations:

i. Both the Australian Dollar and the Swiss Franc depreciate in relation to the US Dollar, but the Australian Dollar depreciates more.

ii. Both the Australian Dollar and the Swiss Franc appreciate in relation to the US Dollar, but the Swiss Franc appreciates more.

iii. The Swiss Franc appreciates and the Australian Dollar depreciates, both in relation to the US Dollar.

Obviously in the first two cases, the money manager will lose on one of the transactions and gain in the other, but he can expect a net gain in the deal.

Speculation Using Currency Futures

Speculators differ from hedgers in that their basic objective is to capitalize on the difference between their own forecasts and market expectations. When a speculator is betting on the price movement associated with a particular contract, it is called open position. When the speculator is trying to take advantage of movements in the price differential between two separate futures contracts, it is called spread trading. This type of trading can involve:

i. The same currency but contracts of different maturities.

ii. Two contracts of same maturity but different currencies.

iii. A combination of the above.

Illustration 4

On February 14, 2005, the following spot and future prices were being quoted.

Rs./$	Spot	= 45.10
	March Futures	= 45.30
	June Futures	= 45.34
	September Futures	= 45.60

Mr. Aman Singh, a forex dealer, holds the view that the market is wrong and the $ will actually depreciate. Another speculator, Mr. Naveen Jaiswal, agrees with the market that the dollar will appreciate but thinks that the market is over estimating the extent of appreciation.

What strategy should they adopt in order to make profits? Also calculate their profit if on September 10, the following rates materialize.

Spot Rs/$	: 45.50
September future	: 45.70

(We can assume that the standard size of a future contract is $1,000,000)

Solution

The suggested strategy would be to sell futures now and reverse later as they expect the dollar to depreciate.

Sale Price = 45.60 Buyback Price = 45.70

Total loss per contract = Rs.1,000,000 × (45.60 45.70)

= Rs.100,000

i.e., There will be a loss of Rs.100,000 per contract. This loss is due to the dollar not moving as per their expectations. The dollar has actually appreciated against the rupee.

Similarly, if on September 10, the following rates materialize.

Spot	: 45.30
September Future	: 45.40

The speculator can buyback futures contract at a price of 45.40

Profit per contract = Rs.1,000,000 × (45.60 45.40)

= Rs.2,00,000.

CURRENCY FUTURES IN INDIA

In the past few years, currency futures have witnessed significant growth in the use of different hedging techniques to address the FX exposures that companies face. SEBI has constituted the LC Gupta Committee to formulate the regulations through which exchange-traded derivatives can commence in India. This step in the policy making has been supported by the NSE and commodity future began in 1995. After that a continuous development has been seen in derivative market. Now NSE has Index future, Stock future, Interest rate option, and Rupee option.

Hurdle in Developing Futures Market in India

What are the problems which seem to launch currency future in India? Let us discuss the different factors, that become hurdle in developing future market in India. These are:

Poor Infrastructure: One source of difficulty is poor infrastructure, particularly in clearing and settlement.

Further, one of the key motivations underlying futures markets in India is the weakness of commercial law both in precept and in practice. Under a weak legal environment, individuals and firms in the economy face problems in their contractual arrangements with each other. There are strong temptations to renege on a contract given the poor legal support for contract enforcement. In this situation, the futures clearinghouse is a vital institution which enables the functioning of the economy by supplying credit guarantees and producing contract performance. Indeed, the derivatives Clearing Corporation is often referred to as a Credit Guarantee Corporation.

CAPITAL ACCOUNT CONVERTIBILITY

The rupee has appreciated from Rs.49 to Rs.44, with no noticeable effect in slowing down exports growth. In fact, imported goods have become cheaper owing to this appreciation, and this is good for Indian consumers as it helps to keep inflation at low level.

In spite of appreciation of rupee, complete capital accounts convertibility is still far from reality. The main hurdle behind the capital account convertibility is the lack of depth in the money market and RBI should take steps to reform first. Once we have capital account convertibility any amount of money can move freely from the country. In a broader sense, it can be freely transformed into foreign currencies (for current account transactions) at a unified rate. CAC would empower banks and others to convert rupees into foreign exchange and vice versa without any restriction. Recently, the following noticeable steps have been taken by the RBI for capital account convertibility:

- Resident Indians were allowed to open a domestic foreign currency account without any limit on balances. This facility was earlier applicable only to certain categories of resident Indians such as exporters.
- An Indian resident can remit an amount of up to $25,000 per calendar year for any current or capital account transaction, or a combination of both.
- Removal of existing requirement of repatriation of the amount of investment by way of dividend within five years.
- Allowing exporters/exchange earners to keep 100% of their forex earnings in the exchange earners foreign currency accounts.
- Permitting individual residents to invest in financial assets up to $25,000 abroad and gradually raising the limit to $50,000 and $1,00,000.
- Allowing mutual funds to invest in securities abroad within an overall limit of $500 mn in phase I, $1 bn in phase II and $2 bn in phase III.

Though RBI and the government have taken several steps for full capital account convertibility, they are still far from fulfilling certain other conditions recommended by the Tarapore Committee. The recommendation includes bringing fiscal deficit to GDP ratio down to 3.5%, inflation to the range of 3.5% and gross NPA of banks down to 5%. So, the government should reschedule the Tarapore Committee's "road map to CAC".

SUMMARY

- The exchange exposure can be hedged through derivatives like futures, options, etc.
- The hedge ratio allows the hedger to determine the number of contracts that must be employed in order to minimize the risk of the combined cash-futures position.
- With the increasing currency volatility in the Indian market, there is a great need for a better risk management system that enables the corporate to hedge currency risk.
- Though forwards, options and swaps are the existing instruments to hedge currency risk, companies require both customized instruments and a risk management platform that can accommodate a much wider variety of instruments than has previously been available.
- However, given the status of convertibility of rupee whereby residents cannot freely transact in currency markets, the introduction of futures may have to wait for further liberalization on the convertibility front.

Chapter VII

Interest Rate Futures

After reading this chapter, you will be conversant with:

- Short-term Interest Rate Futures
- Hedging Interest Rate with the Interest Rate Futures
- Long-term Interest Rate Futures
- Interest Rate Futures in India

Introduction

In the currency futures, the underlying assets for the futures contract will be different currencies and in case of interest rate futures the underlying assets will be different interest bearing instruments like T-bills, T-notes, T-bonds, deposits, etc.

Interest rate futures can be defined as follows:

"An interest rate futures contract is an agreement to buy or sell a standard quantity of specific interest bearing instruments, at a predetermined future date and at a price agreed upon between the parties."

It is a known fact that moneylenders stand to lose if the interest rates go down in future and the money borrowers stand to lose if the interest rates go up in future. The dislike of these two sections of society to uncertainty in interest rate fluctuation has led to the innovation of techniques to hedge such risks. Interest rates futures is one such method of doing the same.

The main factors behind the growth rate of interest rate futures are as follows:

- Enormous growth of the market for fixed income securities.
- Increased fluctuation in interest rates worldwide.

Interest rate futures can be based upon both short-term (less than one year) and long-term debt obligation (more than one year) but in the US only short-term interest rate futures like futures on US 90-day treasury bills and 3 months Eurodollar time deposits are popular. In the case of long-term interest rate futures, the most important contracts are the treasury bond futures contract, the 10-year treasury note futures contract and municipal bond futures contract. The long-term and intermediate term futures in the US are traded on the Chicago Board of Trade (CBOT) but short-term contracts are traded on the International Monetary Market (IMM) of the Chicago Mercantile Exchange (CME). There are contracts on 5-year notes which are traded on the CBOT and the Financial Instrument Exchange (FINEX). There are also some dollar-denominated interest rate futures that are traded in London International Financial Futures Exchange (LIFFEX) and the Singapore International Monetary Exchange (SIMEX). There can be automatic offset of a contract by trading simultaneously in two different markets. For example, one can buy in Chicago in the morning and sell the identical contract in Singapore at night.

Following is the list of most actively traded short-term interest rate futures:s

US Exchanges

i. 3-month Eurodollar (CME)

ii. 90-day T-bill (CME)

iii. 1-month LIBOR (CME).

Foreign Exchanges

i. 3-month Euroyen TIFFE, Japan

ii. 3-month Sterling LIFFE, UK

iii. 90-day bank bill Sydney Future Exchange, Australia

iv. 3-month Eurodollar LIFFE, UK

v. 3-month Euromark MATIF, France

vi. 3-month HIBOR Hong Kong Future Exchange

vii. 3-month Euroyen SIMEX, Singapore.

SHORT-TERM INTEREST RATE FUTURES

Treasury Bill Futures

The 90-day Treasury Bill (T-bill) contract was the first short-term interest rate futures contract traded on the International Monetary Market (IMM), a division of the Chicago Mercantile Exchange, in 1976.

T-bill futures call for delivery of $1 million in face value of 90-day, 91-day or 92-day bills (13 weeks) and are available for delivery dates in March, June, September and December. The popularity of T-bills decreased with the introduction of the Euro-Dollar time deposit futures later on in the market.

Treasury bill yields are quoted on a discount basis with relation to the face value. As such, the difference between the purchase price and the redemption value is the interest earned by the buyer. The discount on the face value is always as a percentage of the face value.

Eurodollar Time Deposit futures are most actively traded in short-term and this futures along with 90-day Treasury Bill futures are the main short-term futures.

Following are the basic contract characteristics of two short-term futures.

Table 1

Specification	13-week US Treasury Bill	3-month Eurodollar Time Deposit
Size	$1,000,000	$1,000,000
Contract grade	Dated T-bills with 13 weeks maturity	Cash Settlement
Yields	Discount	Add on
Trading months	March, June, September, December	March, June, September, December
Minimum change in price	.01 (1 basis pt)	.01 (1 basis pt)
Symbol	TB	ED

Price quotation for T-bill futures are on an index basis, i.e., the index is 100 minus the annualized discount rate (in percent). If discount is, say, 7% then index price will be 93. The minimum price change allowed is one basis point (0.01%) which amounts to $25 ($10,00,000 x 0.01% x 3/12) per contract.

The T-bill purchase price =

$$\text{Face Value x} \left[\frac{1 - \text{Percentage discount}}{100} \text{ x } \frac{\text{Days to maturity}}{360} \right]$$

If discount is 7%, the corresponding price paid for the 90-day T-bills

$$= \$1{,}000{,}000 \left[1 - 0.07 \text{ x } \frac{90}{360} \right]$$

$$= \$982{,}500$$

Now, we can calculate the return or yield on purchase of 90-day T-bill

$$\text{i.e.} \left[\frac{\text{Face Value} - \text{Issue Price}}{\text{Issue Price}} \text{ x } \frac{360}{\text{No. of days to maturity}} \right]$$

$$\frac{10{,}00{,}000 - 9{,}82{,}500}{9{,}82{,}500} \text{ x } \frac{360}{90} = 7.13\%$$

The Treasury bill futures contract is simpler than the T-bond and T-note future contracts. The 3-month bills may be new 3-month bills for, older bills that can have remaining 3-month maturity. Since there is little uncertainty or choice related to delivery date (within 3 days) the rules of the exchange make clear well in advance the exact dates on which delivery will take place. Again there are no conversion factors so there will not be any major fluctuation in T-bills. Although, the Treasury bills futures contracts are quite simple and not having the characteristics of medium- and long-term futures, it does give good means of hedging or speculating on the short end of the yield curve.

Another point of interest is the Implied Repo Rate (IRR) which is the rate of return on an annual basis that yields if one buys a cash T-bill and sells a T-bill futures at the same time. The IRR is defined by the following formula:

$$IRR = (FP_{t,T} - CP_{t,T} / CP_{t,T}) \times 360/T - t$$

Where,

$FP_{t,T}$ = Price of futures T-bill

$CP_{t,T}$ = Cash price of T-bill.

The Eurodollar Futures

Eurodollar futures contracts are non-negotiable, 3-month time deposits in dollars at banks located outside the US mainly in Europe with particular presence in London. They are issued by both American and other developed countries banks. The futures on Eurodollars were introduced in 1981, at the IMM (Chicago).

As Eurodollar and LIBOR sectors are growing rapidly in recent years, so has volume in the IMM's Eurodollar time deposit futures contract. This had a major impact on the popularity of the T-bills. These contracts are without actual delivery. The settlement price is determined by the 3-month Eurodollar deposit rate. Settlement is made in cash. Eurodollar futures contract size is US$ 1 million.

This instrument provides a very good vehicle for hedging or speculating on short-term Eurodollar and LIBOR based debt. The yield on the Eurodollar futures contract is quoted in terms of an add-on or simple interest rate. Rates on Eurodollar contracts are directly comparable to the rates on domestic CDs or interbank deposits. But to compare the Eurodollar rate to the Treasury bill rate, one of the rates must be converted.

The following factors have contributed to the speedy growth of Eurodollar futures:

i. Most of the major banks in the world depend on Eurodollar market for short-term loans.

ii. Many corporates depend heavily on Eurodollar market for their borrowing requirements.

iii. Eurodollar futures are traded in Singapore, London and Chicago and can be used globally on twenty-four hour basis.

The main difference between the Eurodollar time deposits and the T-bills is that the Eurodollar deposits pay an add-on interest to the face value while the T-bills are issued at a discount to the face value.

Eurodollar futures appear to be the same as T-bill futures, but there are some important differences between these two contracts:

i. Unlike T-bill futures, Eurodollar futures are cash settled.

ii. The Eurodollar futures contract is a futures contract on an interest rate whereas Treasury bill futures contract is a futures contract on price of a Treasury bill or a discount rate.

TED Spread

TED spread is the difference between the price of a 3-month T-bill futures contract and a 3-month Eurodollar time deposit futures contract, both expiring at the same day. Given the fact that the T-bills are less risky than Eurodollars, the TED spread varies considerably over the life of the futures contracts. The T-bills being guaranteed by the US government are less risky than the guarantee given by the commercial banks issuing the Eurodollar time deposits.

HEDGING INTEREST RATE WITH THE INTEREST RATE FUTURES

There are two ways to hedge the interest rate risk with the use of interest rate futures. In the first case, we can use interest rate futures to protect against rising interest rate by selling interest rate futures, i.e., short hedging and in the second case, for limiting the declining interest rate, we can buy interest rate futures, i.e., long hedging. Hence, hedging with interest rate futures can be of two types:

i. Hedging a rise in interest rate (for borrowing decisions) or Short-term Hedging.

ii. Hedging a fall in interest rate (for investing decisions) or Long-term Hedging.

Hedging a Rise in Interest Rate (for Borrowing Decisions)

Hedging a rise in interest rate can be executed by selling or going short in interest rate futures (Also popularly known as Short-term Hedging).

Let us assume that on April 12, 20x1 a firm came to know that it will have to raise $10 million on June 10, 20x1 for a 3-month period. A bank is willing to provide this loan at 3-month LIBOR rate prevailing on June 10. Now, the borrowing firm is concerned about the rise in LIBOR rate, so it decides to go short on June 20x1 Eurodollar futures contract to hedge against an increase in interest rate between April 12 and June 10. Here, ten contracts will be equivalent to $10 million loan amount because, one future contract is equivalent to $1 million. Suppose on April 12, the June 20x1 Eurodollar future price is 98.11 and the implied three-month Eurodollar rate is 7.55% while the three-month LIBOR in April 20x1 is 7.65%. Please note that LIBOR rates are always quoted for one year. So while the rate is 7.65%, it should be read as 7.65% p.a.

If LIBOR does not change between April 12 and June 10, the firm's borrowing cost for its three-month loan at LIBOR rate will be

$10,000,000 x (7.65%) x 3/12 = $191,250

While the firm cannot lock in April 12 borrowing rate, it can lock in the three-month Eurodollar futures rate of 7.55% on April 12, a rate very close to the Eurodollar rate on April 12. So, the firm can limit its borrowing cost

$100,00,000 x (7.55%) x 3/12 = $188,750.

The following two cases show that the borrowing cost can be fixed by selling ten June 20x1 Eurodollar futures contract on April 12.

Case 1

Three-month LIBOR rises to 8% by June 10 (June futures are 92)

Interest expense = (Principal) x (Annual rate) x 3/12
= $10,000,000 x 8% x 3/12
= $200,000

Less: Futures gain = (Price change) x ($25/BP) x 10
= (92.45 – 92) x 100 x 25 x 10
= $11,250

Net borrowing cost = $(2,00,000 – 11,250)
= $188,750

Case 2

Three-month rate falls to 7% by June 10 (June futures are 93)

Interest expense = (Principal) x (Annual rate) x 3/12
= $10,000,000 x 7% x 3/12
= $175,000

Add: Futures loss = (Price change) x ($25/BP) x 10

= (92.45 – 93) x 100 x 25 x 10

= $13,750

Net borrowing cost = $188,750

So, in the first case, a rise in the three-month LIBOR is offset by a gain on the short futures positions. In the second case, cost reduction due to fall in the three-month LIBOR rate is balanced by loss on the short hedge. In both cases, the firm has locked up its borrowing cost at $188,750.

Hedging a Fall in Interest Rates (for Investment Decisions)

This form of hedging can be used to protect an investment yield. It is also popularly known as Long-term Hedging. Suppose an investor will soon have a large sum of cash inflow to invest for a short period of time. The investor can wait for the cash inflow and then invest at that time, or he can buy T-bill or Eurodollar futures now, locking-in a yield.

Let us assume that on April 12, a firm is expecting $10 million from a foreign branch on June 12. After receiving the amount, the firm intends to invest in three-month T-bills. On April 12, 20x1, the three-month T-bill discount yield is 7.60% and the current implied discount yield on the June 20x1 T-bill futures is 7.25%. The firm infers from the futures yield that the market expects the interest rate to decline. So, it decides to buy ten June 20x0 T-bill futures contract on April 12 at a price of $92.75, locking in a discount yield of 7.25% on the $10 million it expects to invest in June.

Following two situations, illustrate how the firm can lock in the 6.5% (June futures are 93.50).

Case 1

Price of cash T-bills

= $10,000,000 x 1 – 0.065 x 3/12

= $9,837,500

Less: Futures gain

= (93.50 – 92.75) x 100 x 25 x 10

= $18,750

Effective purchase price = $9,818,750

Annualized discount yield

= 10,000,000 – 9,818,750/10,000,000 x 12/3 x 100

= 7.25%

Case 2

On June 10, the three-month cash T-bill has a discount yield of 8% (June futures are 92.00).

Price of cash T-bills

= $10,000,000 x 1 – 0.08/4

= $9,800,888

Add: Futures loss

= (92 – 92.75) x 100 x 25 x 10

= $18,750

= $9,818,750

Annualized discount yield

= $10,000,000 – $9,818,750/$10,000,000 x 12/3 x 100 = 7.25%

In the first case, the firm purchased futures contracts at a discount rate of 7.35% (T-bill price $92.65) and sold them at 6.5% (T-bill price $93.50) so there is a gain of $18,750 on the long future position. In the second case, there is loss on the future position, because the three-month discount yield rose to 8% but in both cases, however, the hedging has produced a yield of 7.35%.

Synthetic Hedging with Short-term Interest Rate Futures

Synthetic futures contracts can be created having the same cash flow as an alternative investment. This is possible by combining long-term and short-term interest rate futures positions in the underlying cash asset. So, in other words, Spot security + Futures contract = Synthetic security.

For example, it is possible to create a synthetic T-bill for a period of 6-months by simultaneously investing in a 10-month cash T-bill and selling a 4-month T-bill futures contract.

Strip and Stack Hedging Strategies

There are two popular hedging strategies in futures contracts which are used by those investors who would like to ensure the surety of their earnings for a longer period of time. One of the strategies is called the Stack Hedging and the other is the Strip Hedging.

i. **Strip Hedging:** Strip hedging implies buying various futures contracts with different delivery times which are matching the investor’s risk exposure dates. The basis risk is less in this strategy.

ii. **Stack Hedging:** Stack hedging implies buying various futures contacts which are concentrated in the nearby delivery months. While the basis risk is more in this strategy, the liquidity position is far superior to the strip hedging.

LONG-TERM INTEREST RATE FUTURES

The market for long-term Treasury bonds consists of Treasury Notes (which have maturity period of less than 10 years) and Treasury Bonds (which have maturity period of more than 10 years but less than 30 years). The most widely recognized long-term interest rate futures are US treasury bond contracts. Other popular long-term futures contracts are 10-year, 5-year US Treasury note contracts and other exchanges traded interest rate futures like 10-year Japanese Government bond contract traded on Tokyo Stock Exchange and the 10-year French government bond contract traded on MATIF in Paris, France.

Again the London International Financial Futures Exchange (LIFFE) trades futures on long UK government bonds and the Sydney Future Exchanges trade 10-year Australian Government bonds.

The main purpose behind using long-term interest futures is to hedge the interest rate risk associated with cash positions in government and other long-term debt obligations.

The table below indicates leading US long-term interest rate futures contracts.

Table 2

	US T-bond	10-year US T-note	5-year US T-note
Exchange	CBOT	CBOT	CBOT
Symbol	US	TY	FV
Face Value or (contract size)	$100,000	$100,000	$100,000
Price of quotation	Points and 1/32 of a point	Points and 1/32 of a point	Points and 1/32 of a point
Delivery (for all)	7th business day preceding the last business day of the delivery month.	7th business day preceding the last business day of the delivery month.	7th business day preceding the last business day of the delivery month.
Trading months	Mar., June, Sept., Dec.	Mar., June, Sept., Dec.	Mar., June, Sept., Dec.
Minimum change in price allowed	1/32 of a point i.e. $31.25	1/32 of a point i.e. $31.25	1/32 of a point i.e. $31.25

Table 3

List of Actively Traded Long-term Interest Rate Futures	
US Exchanges	
T-bonds (15 years) CBOT	
T-notes (10 years) CBOT	
T-notes (5 years) CBOT	
Foreign Exchanges	
Japanese Government Bonds (10 years)	Tokyo Stock Exchange, Japan
French government bonds (10 years)	MATIF, France
UK Government bonds	LIFFE, UK
Australian T-bonds	Sydney Futures Exchange (10 years)
US T-bonds	LIFFE, UK
Japanese Bonds	LIFFE, UK
Japanese Government Bonds (20 years)	Tokyo Stock Exchange, Japan

Treasury Bond Futures Contract

The most popular long-term interest rate futures contract is the Treasury bond futures contract traded on the Chicago Board of Trade (CBOT). The underlying instrument for a Treasury bond futures contract is $100,000 par value of a hypothetical 20-year coupon bond. The coupon rate on the hypothetical bond is called the notional coupon. Since the inception of T-bond futures contract, the notional coupon had been 8%. However, beginning with the March 2000 contract, the notional coupon was changed to 6%.

The T-bond futures price is quoted in terms of par being 100. Quotes are in 32nds of 1%. Thus, a quote for a T-bond futures contract of 94-16 means 94 and 16/32 or 94.50. So, if a buyer or a seller agrees on a futures price of 94-16, this means that the buyer agrees to accept delivery of the hypothetical underlying T-bond and pay 94.50% of the par value and the seller agrees to accept 94.50% of par value. Since the par value is $ 100,000, the futures price that the buyer and seller agree to for this hypothetical T-bond is $94,500.

The minimum price fluctuation for the Treasury bond futures contract is $\frac{1}{32}$ of 1%, same as Treasury bond prices. The dollar value of a 32nd for $100,000 par value is $31.25. Thus, the minimum price fluctuation is $31.25 for Treasury bond futures contract.

We have been referring to the underlying asset as a hypothetical Treasury bond. Delivery can take place at any time during the delivery month. The seller of a Treasury bond futures contract who decides to make delivery rather than liquidate his position by buying back the contract prior to the settlement date must delivery some treasury bond. But which T-bond to be delivered? The CBOT allows the seller to deliver one of several T-bonds that the CBOT specifies are acceptable for delivery. The CBOT makes its determination of the Treasury issues that meet the following criteria:

An issue must have at least 15 years to maturity from the first day of delivery month if not callable; in the case of callable bonds, the issue must not be callable for at least 15 years from the first day of delivery month.

It is important to remember that while the underlying bond for this contract is a hypothetical issue and therefore cannot itself be delivered into the futures contract, the contract is not a cash settlement contract. The only way to close out a Treasury bond futures contract is to either initiates an offsetting futures position, or to deliver a Treasury issue satisfying the above-mentioned criteria into the futures contract.

Conversion Factors

The contract assumes delivery of a bond with a 6% 20-year Treasury bond, since no such bond may exists, the seller must choose from one of the acceptable deliverable Treasury bonds that the CBOT specified. Suppose the seller is entitled to deliver \$100,000 of a 5% 20-year T-bond to settle the futures contract. The value of this bond is less than the value of a 6% 20-year T-bond. If the seller delivers the 5% 20-year T-bond, this would be unfair to the buyer of the futures contract who contracted to receive \$100,000 of a 6% 20-year T-bond. Alternatively, suppose the seller delivers \$100,000 of a 7% 20-year T-bond, whose value will be greater than that of a 6% 20-year T-bond, so this would be disadvantage to the seller. To make delivery equitable to both the parties, the CBOT has introduced conversion factors for adjusting price of each Treasury issue that can be delivered to satisfy the Treasury bond futures contract. The conversion factor, CF, is defined for each eligible bond for a given contract. The CF is the price of a bond with a face value of \$1, coupon and maturity equal to that of the deliverable bond, and yield of 6 percent. The adjusted price of a deliverable issue is found by multiplying the conversion factor by the futures price. The adjusted price is called ‘converted price’.

The price that the buyer must pay the seller when a Treasury bond is delivered is called the ‘invoice price’. The invoice price is the futures settlement price plus accrued interest.

Invoice price

= (Futures settlement price × Conversion factor) + Accrued interest

The conversion factor system is designed to place all bonds on an equivalent basis for delivery purposes. If the holder of the short position delivers a bond with a coupon greater than 6 percent, the CF will be greater than 1. The short will then receive more than the futures price in payment for the bond. If the coupon is less than 6 percent, the CF will be less than 1 and the short will receive less than the futures price in payment for the bond.

The conversion factor for a bond is equal to the value of the bond per dollar of principal on the first day of the delivery month on the assumption that the interest rate for all maturities equals 6% per annum (with semiannual compounding). The bond maturity and the times to the coupon payment dates are rounded down to the nearest three months for the purpose of calculation. The practice enables CBOT to produce comprehensive CF tables. If, after rounding, the bond lasts for an exact number of six-months periods, the first coupon is assumed to be paid in six months. If, after rounding, the bond does not last for an exact number of six-month periods, i.e., there is an extra three months, the first coupon is assumed to be paid after three months and accrued interest is subtracted.

For example, consider an 8% coupon bond with 20 years and two months to maturity. For the purpose of calculating conversion factor, the bond is assumed to have exactly 20 years to maturity. The first coupon payment is assumed to be made after six months. Assume that the face value is \$100. When the discount rate is 6% per annum with semiannual compounding, the value of the bond is

$$\sum_{i=1}^{40} \frac{4}{(1.03)^i} + \frac{100}{(1.03)^{40}} = \$\,123.11$$

Dividing by the face value give a conversion factor of 1.2311.

As a second example, consider a 7% coupon bond with 18 years and 4 months to maturity. For the purposes of calculating the conversion factor, the bond is assumed to have exactly 18 years and 3 months to maturity. Discounting all the cash flows back to a point in time three months from today gives a value of

$$3.5 + \sum_{i=1}^{36} \frac{3.5}{(1.03)^i} + \frac{100}{(1.03)^{36}} = \$\,114.42$$

The interest rate for a 3-month period is $(1.03)^{1/2} - 1 = 1.4889\%$. Hence, discounting back to the present gives the bond's value as 114.42/1.014889 = \$112.74. Subtracting the accrued interest of 1.75, this becomes \$110.99. The conversion factor is therefore 1.1099.

Cheapest-to-Deliver Bond

In selecting the issue to be delivered, the seller of T-bond futures will select from all the deliverable issue the one that will give the largest rate of return from a cash and carry trade. A cash and carry trade is one in which a cash bond that is acceptable for delivery is purchased with borrowed funds and simultaneously the T-bond futures contract is sold. The bond purchased can be delivered to satisfy the short futures position. Thus, buying the Treasury issue that is acceptable for delivery and selling the futures, an investor can effectively replicate the position of selling the bond at the settlement price (i.e. converted price).

A rate of return can be calculated for this trade. This rate of return is referred to as the implied repo rate and is determined by

i. The price plus accrued interest at which the Treasury issues could be purchased.

ii. The converted price plus accrued interest that will be received upon delivery of that T-bond.

iii. The coupon payments that will be received between today and the date the issue is delivered.

iv. The reinvestment income that will be realized on the coupon payments between the time the interim coupon payment is received and the date at which issue is delivered to satisfy short position in futures contract.

The general formula for the implied repo rate is:

$$\text{Implied repo rate} = \frac{\text{Dollar return}}{\text{Cost of investment}} \times \frac{360}{\text{days}}$$

Where, 'days' is equal to the number of days until settlement of the futures contract. The dollar return for an issue is the difference between proceeds received and the cost of investment. The proceeds received are equal to the proceeds received at the settlement date of the futures contract and any interim coupon payment plus interest from reinvesting the interim coupon payment. The proceeds received at the settlement date include the converted price and the accrued interest received from the delivery of the issue, i.e.,

Proceeds received = Converted price + Accrued interest received +Interim coupon payment + Interest for reinvesting the interim coupon payment

The cost of investment is the amount paid to purchase the issue. This cost is equal to the purchase price plus accrued interest paid, i.e.,

Cost of investment = Purchase price + Accrued interest

Thus, the dollar return of the formula for the implied repo rate is

Dollar return = Proceeds received – Cost of investment

Once the implied repo rate is calculated for each deliverable issue, the issue selected will be the one that has the highest implied repo rate. The issue with the highest return is referred to as the Cheapest-To-Deliver issue (CTD). In reality, the adjustment provided by the conversion factor is not perfect. It would have been perfect only if the term structure of interest rate is flat at a level equal to the coupon rate of the notional bond. This means that the futures seller can make a profit by choosing Cheapest-To-Deliver (CTD) bond.

The seller receives

(Futures settlement price × Conversion factor) + Accrued interest

And the cost of purchasing a Treasury issue is

Quoted price + Accrued interest

The cheapest-to-deliver bond is the one for which

Quoted price – (Futures settlement price × Conversion factor),

is least. Once the party with the short position has decided to deliver, it can determine the CTD bond by examining each of the bonds in turn.

For example, suppose a seller of a futures contract has decided to deliver and is trying to choose among the following five bonds:

Bond	Coupon (%)	Quoted Price	Conversion Factor
A	8.50	133-03	1.2522
B	9.00	138-11	1.3021
C	7.25	120-11	1.1268
D	8.00	127-23	1.2000
E	6.25	107-20	1.0086

Assume the current futures settlement price is 106-06, or 106.1875. The cost of delivering each bond as follows:

Bond A: 133.0938 – (106.1875)(1.2522) = \$0.1258

Bond B: 138.3438 – (106.1875)(1.3021) = \$0.0771

Bond C: 120.3438 – (106.1875)(1.1268) = \$0.6917

Bond D: 127.7188 – (106.1875)(1.2000) = \$0.2938

Bond E: 107.6250 – (106.1875)(1.0086) = \$0.5243

So, the cheapest-to-deliver bond is Bond B.

A number of factors determine the cheapest-to-deliver bond. When bond yields are excess of 6%, the conversion factor system tends to favor the delivery of low-coupon, long maturity bonds. When yields are less than 6%, the system tends to favor the delivery of high-coupon, short maturity bonds. Also, when the yield curve is upward sloping, there is tendency for bonds with a long time to maturity to be favored, whereas when it is downward sloping, there is a tendency for bonds with a short time to maturity to be delivered.

Other Delivery Options

In addition to the choice of which acceptable, Treasury issue to deliver based on the cheapest-to-deliver bond today – sometimes referred to as the ‘quality option’ or ‘swap option’ – the seller of T-bond futures has at least two more options granted under CBOT delivery guidelines. The short is permitted to decide when in the delivery month, the delivery actually will take place. This is known as the ‘timing option’. Here the short can deliver on the last day of delivery month known as ‘positive carry’ or he can deliver on the first day of delivery month known as ‘negative carry’. The other option is the right of the short to give a notice of intent to delivery up to 8.00 PM on any eligible delivery date at settlement price determined when the futures settlement price has been fixed at the closing of the exchange. This option is known as the ‘wild card option’. The quality option, the timing option, and the wild card option, mean that the long position can never be sure which Treasury bond will be delivered or when it will be delivered.

Delivery Procedure

For a short who wants to deliver, the delivery procedure takes three days. The first day is the ‘position day’. On this day, the short notifies the CBOT that it intends to deliver. The short has until 8.00 P.M. central standard time to do so. The second day is the ‘notice day’. On this day, the short specifies which particular issue will be delivered. The short has until 2:00 P.M. central standard time to make this declaration. (On the last possible notice day in the delivery month, the short has until 3:00 P.M.). The CBOT then selects the long to whom the delivery will be made. This is the long position that has been outstanding for the greatest period of time. The long is then notified by 4:00 P.M. that delivery will be made. The third day is the delivery day. By 10:00 A.M. on this day the short must have in its account the Treasury issue that it specified on the notice day and by 1:00 P.M. must deliver that bond to the long that was assigned by CBOT to accept delivery. The long pays the short the invoice price upon receipt of the bond.

Pricing of T-bond Futures Contracts

Since the seller gets to choose which bond to deliver he computes the cost of delivery for each deliverable bond as follows:

Cost = (Bond price + Accrued interest) – Futures invoice price,

and chooses to deliver the cheapest-to-deliver bond. For now, assume that we know the cheapest-to-deliver bond and that this is the only bond that can be delivered at the maturity.

We will define the following:

- F = Theoretical price of a futures contract at time '0' that matures on date 't'. This is a flat price and the accrued coupon as of the delivery date should be added at the time of delivery
- P = The current spot price of the bond
- AI_0 = Accrued bond interest as of today (date 0)
- AI_t = Accrued bond interest as of futures maturity date (date t)
- C = Bond coupon
- r = Interest rate, quoted as simple interest basis
- CF = Conversion factor.

Assume that CF =1. Consider the following strategy:

Position today	Cash flow today	Position at t	Cash flow at t
Sell futures at F Purchase bond Borrow $(P + AI_0)$ at r	0 $-(P + AI_0)$ $(P + AI_0)$	Deliver bond Repay loan	$F + AI_t$ $-(1 + rt)(P + AI_0)$
Net cash flow	0		$F + AI_t - (1+ rt)(P + AI_0)$

Note that the potential cash outflow at time t is known with certainty. Since the cash flow at time 0 is zero, the net profit from the strategy at time t should also be zero in order to prevent arbitrage. Therefore,

$$F + AI_t = (1 + rt)(P + AI_0)$$
$$= (P + AI_0) + rt(P + AI_0)$$
$$\text{or,}\quad F = P - (AI_t - AI_0) + rt(P + AI_0)$$

If the conversion factor, CF is not equal to 1, then the futures price is given by:

$$CF \times F = P - (AI_t - AI_0) + rt(P + AI_0)$$

$$\text{Or,}\quad F = \frac{1}{CF}\left[P - (AI_t - AI_o) + rt\,(P + AI_o)\right]$$

Now, Basis = $P - CF \times F_{market}$

Basis After Carry (BAC) = $CF \times F$ (theoretical) $- CF \times F_{market}$

$= P - (AI_t - AI_0) + rt(P + AI_0) - CF \times F_{market}$

$= [P - CF \times F_{market}] - (AI_t - AI_0) + rt(P + AI_0)$

= Basis – Change in accrued coupon from time 0 to t + Interest cost from time 0 to t

If the market price equals theoretical price then BAC = 0.

In that case,

Basis = Change in accrued coupon from time 0 to t – Interest cost from time 0 to t.

If Basis > 0, then, Spot flat price > Flat futures price = Positive carry

If Basis < 0, then, Spot flat price < Flat futures price = Negative carry.

For example, let a 6% T-bond, which is quoted today at \$101.00, be the cheapest-to-deliver bond for a futures contract that matures in 91 days. The last coupon the bond was paid 30 days back. The three-month interest rate is 4% p.a. (quoted on Actual/360 basis). Determine the theoretical futures price. What would be the total price paid by the buyer on delivery? When in the contract month do you expect the short position to deliver against the contract?

The accrued coupon as of time 0 and t are:

$$AI_0 = \frac{6}{2} \times \frac{30}{182} = 0.49$$

$$AI_t = \frac{6}{2} \times \frac{30 + 91}{182} = 1.99$$

The time to maturity is 91 days. Therefore,

$$F = 101 - (1.99 - 0.49) + (101 + 0.49) \times 0.06 \times \frac{91}{360} = 100.039$$

Total invoice price = $\frac{100,000}{100} \times (100.039 + 1.99) = \$103,029.$

The conversion factor of this bond is 1, since the coupon on the bond is same as the coupon of the notional bond underlying futures contract.

The short position has a delivery option and can choose to deliver at any time in the futures maturity month. As shown below, the seller will typically choose to deliver at the beginning or at the end of the month and not in the middle of the month, and the delivery timing can be anticipated based on the shape of the term structure.

To determine when in the contract month the seller will deliver against the futures contract, we have to compute the cost and benefits for the seller to delay delivery.

Benefit: Increase in AI per day = $\frac{6}{2} \times \frac{1}{182} = \$0.0165$

Cost: Financing cost per day = $(101 + 0.49) \times 0.04 \times \frac{1}{360} = \$0.0113$

$\therefore$ Net cost-of-carry per day = \$0.0052

Since there is a benefit for delaying delivery, the seller will optimally deliver on the last day of the contract month.

Hedging with T-Bond Futures

Treasury bond futures provides an effective means of hedging interest rate risk exposure for fixed income investors. For example, a bond portfolio manager disposing of a relatively illiquid bond position that would likely require an extended period for disposal could sell futures against the bond position to avoid possible loss in the interim period. If interest rates rise, the loss on the bond position would be offset by the increase in value of the futures position. Naturally, if interest rates declined, the bond position would be more valuable but the gain would be offset by the loss on the futures position. This sort of positioning is known as a 'short hedge' and should create a situation of no net loss but no net gain as well.

Assuming we have identified the cheapest-to-deliver bond, the Hedge Ratio (HR) is given by:

$$HR = -\left(\frac{\text{Cash Market Principal}}{\text{Futures Market Principal}}\right) \times \text{Conversion Factor}$$

The negative sign indicates that one must take a futures market position opposite to the cash market position. For example, if the hedger is long in the cash market, the hedger should sell futures.

To illustrate, we assume that a bond manager holding \$5 million face value of the current cheapest-to-deliver. Treasury bond is concerned about a potential rise in interest rates and the effect this would have on the value of the bonds. In order to protect the bonds from a decline in value, the bond manager decides to fully hedge by selling T-bond futures. Again, for illustration we assume that the period for protection is 30 days. The following table shows current period T input data as well as bonds and futures price outcomes at the end of 30-day holding period (T + 30).

Table 4: Input Data

	T	T + 30
Treasury bond (CTD)		
Price	131-02	130-05
Coupon	8%	
Conversion factor	1.3782	
T-bond futures price	94-22	94-03

Number of futures contracts required to hedge

$$= \frac{\$5,000,000}{\$100,000} \times 1.3782 = 69 \text{ contracts}$$

The bond manager needs to sell 69 T-bond futures contracts in order to hedge the portfolio. In determining the number of contracts, we need to apply a conversion factor that will equate bonds with differing coupons to the equivalent of an 6% coupon notional T-bond.

Table 5: Comparative Results

	T	T + 30
Without futures:		
Portfolio value	\$6,553,125	\$6,507,812.50
Accrued interest		+ \$33,333.33
Total value		6,541,145.83
Annualized return		– 0.022%
With futures:		
Portfolio value	\$6,553,125	\$6,507,812.50
Futures gain		\$40,968.75
Accrued interest		\$33,333.33
Total value		\$6,582,114.58
Annualized return		5.31%

By comparing the results of the hedged portfolio over the period against an unhedged portfolio, with an assumed decline in bond prices over the period, the unhedged portfolio shows a capital loss that is partially offset by accrued interest results in a negative return of –0.022%. For the hedged portfolio, the bond price decline is compensated by a gain on the futures, giving a positive return of 5.31%.

Correspondingly, we characterize a ‘long hedge’ as one involving the purchase of interest rate futures contracts to offset adverse price movements related to the futures purchase of bonds. An example of appropriate use of a long hedge would involve a portfolio manager who expected a future cash flow that would be used to buy bonds. In order to lock in current yields that are deemed to be attractive and avoid positioning at a lower yield, the manager could buy futures contracts on T-bonds. If rates declined in the interim period, the manager could simply use the gain in the futures to offset the lower yield available on bonds purchased at the later date. Naturally, if yields rose, the long futures position would show a loss, but the investor would be able to purchase higher-yielding bonds at that time.

Hedge Ratio to Hedge a Deposit or Withdrawal

T-bond futures can be used to maintain a desired exposure to bonds while the portfolio receives or disburses cash. To determine the correct number of futures contracts to trade:

Hedge ratio =

$$\frac{\text{Cash flow to be hedged}}{\text{Value of 1 futures contract}} \times \text{Conversion factor} \times \frac{\text{Portfolio duration}}{\text{CTD bond duration}}$$

The conversion factor is necessary because the bond to be delivered will probably not be a 6% coupon bond. The conversion factor adjusts the current CTD bond to reflect the fact that it is not a 6% coupon bond.

The ratio of portfolio duration and CTD bond duration also known ‘duration adjustment factor’ reflects the difference in interest rate sensitivity between the portfolio and the CTD bond. Here we are assuming that the yield curve is flat, and all yield curve shifts are parallel.

For example, assume a portfolio manager will receive a \$5 million cash inflow today and the current conversion factor of cheapest-to-deliver bond is 0.90. The bond portfolio has duration of 7.5 years and the duration of the CTD bond is 6.5 years. The T-bond futures contract has a price quote of 114-26 (Thus, the dollar value is \$114,812.50). The number of T-bond futures required to hedge the \$5 million cash flow is:

$$\frac{\$5,000,000}{\$114,812.50} \times 0.90 \times \frac{7.5 \text{ years}}{6.5 \text{ years}} \text{ or, 45.22 contracts}$$

Since we cannot buy a fractional number of contracts the manager will buy 45 contracts to hedge the cash inflow. These 45 contracts will be sold over time as the \$5 million in cash is invested in bonds.

Changing Duration of a Portfolio

Treasury bond futures is useful in facilitating the implementation of active investment strategies. In striving to generate above-average returns, bond portfolio managers will attempt to anticipate interest rate movements and change the duration of the portfolio in line with projected change. If the manager expected a decline in interest rates, he or she would increase the duration of the portfolio, and expectation of increase in interest rates should be accompanied by a decrease in duration to reduce the volatility of the portfolio. T-bond futures provide a way of implementing these portfolio changes quickly and at a relatively low cost. Accordingly, a manager may wish to maintain the portfolio duration at a target level over time and could use futures to adjust the portfolio duration when it drifted away from the target.

The basic technique for hedging using T-bond futures uses the concept of 'Basis Point Value (BPV)'. The basis point value of a bond is the change in the bond's price for a one basis point movement in yield. The change in the value of a bond or a portfolio of bonds if interest rates change by one basis point is given as:

$$dB = -\frac{\text{Duration}}{(1+y)} \times B \times dy$$

Where, B is the value of the bond and dy is the change in yield. If dy = 0.0001 (1 basis point), then dB is called the Basis Point Value (BPV).

If y is defined to be one-half of the bond's Yield to Maturity (YTM), then for a bond, or a portfolio of bonds:

$$BPV = \frac{\text{Duration}}{(1+YTM/2)} \times \text{Market Value of Bond} \times 0.0001$$

The portfolio manager chooses a target duration so that it will have a particular BPV, i.e., a targeted change in portfolio value if interest rates change by one basis point.

To determine the BPV for a T-bond futures contract, the Cheapest-To-Deliver (CTD) bond must first to be identified. The BPV of the futures price is generally given as:

$$\frac{\text{BPV (futures)}}{\text{CF}}$$

Where, BPV (futures) is the BPV of the cheapest-to-deliver bond and CF is the CTD's conversion factor. The appropriate number of futures contract needed to change the duration of an existing portfolio to a target duration:

$$\frac{\text{BPV (target)} - \text{BPV (existing)}}{\text{BPV (futures)}}$$

To illustrate the use of futures for changing the duration of a portfolio, we assume a portfolio manager has strong conviction that a deep decline in bond yields is imminent. The portfolio is tied to a broad-based bond index, and the portfolio manager would prefer to avoid disrupting this externally manager portfolio. Because of these factors, portfolio manager decided to more than double the portfolio duration by hedging through T-bond futures.

The following table shows the current yield to maturity and duration of the portfolio along with current (T) and future (T + 60) portfolio values, bond index levels, and T-bond futures prices.

Table 6: Input Data

	T	T + 60
Portfolio duration (Macauley)	4.6	
Target duration	10.0	
Broad-based index	219.40	229.35
Bond futures price	88-20	92-01
Portfolio value	$100,000,000	$102,535,095
BPV of futures	$89.59	
Portfolio yield to maturity	7.25%	

Determining number of futures contract required using BPV method:

Converting portfolio duration to a BPV

$$= \frac{4.6}{\left(1+\frac{0.0725}{2}\right)} \times 100,000,000 \times 0.0001 = \$44,390.83$$

Converting target portfolio duration to a BPV

$$= \frac{10.0}{\left(1+\frac{0.0725}{2}\right)} \times 100,000,000 \times 0.0001 = \$96,501.81$$

Number of futures contracts required to achieve the desired portfolio duration

$$= \frac{\$96,501.81 - \$44,390.83}{\$89.59} = 581.66 \cong 582 \text{ contracts}$$

Table 7: Comparative Results

	T	T + 60
Without futures:		
Portfolio value	\$100,000,000	\$102,535,095
Annualized return		15.21%
With futures:		
Portfolio value	\$100,000,000	\$102,535,095
Futures gain (109 × 31.25 × 582)		+ \$1,982,437.50
Total value		\$104,517,532.50
Annualized return		27.11%

Another Method of Changing Duration

Suppose a portfolio of bonds has a face value of S and duration of DURs. The futures contract has duration of DUR_f and a price of f. The investor wishes to change the duration of portfolio to DUR_T, which is the target duration. One way to do is to put more money in high-duration bonds and less money in low-duration bonds. However, this involves substantial transaction costs on the purchase and sale of at least two bonds. T-bonds futures are used to adjust duration easily and at lower transaction costs.

The number of futures required to change the duration to DUR_T is

$$N_f = -\left(\frac{DUR_S - DUR_T}{DUR_f}\right)\left(\frac{S}{f}\right)\left(\frac{1+y_f}{1+y_s}\right)$$

Where, y_f is the yield implied by the futures price and y_s is the yield on the spot portfolio.

If we want to make target duration zero, so that there will not be any change in portfolio value, then the above formula becomes

$$N_f = -\left(\frac{DUR_S}{DUR_f}\right)\left(\frac{S}{f}\right)\left(\frac{1+y_f}{1+y_s}\right)$$

This is known as price sensitivity hedge ratio or duration based hedge ratio.

To illustrate, let us assume on February 25, a portfolio manager holds $1 million face value of a government bond, the 11.7/8s which mature in 25 years. The bond is currently priced at 101, has duration of 7.83, and yield of 11.74%. The manager plans to sell the bond on March 28. The manager is worried about rising interest rates and would like to reduce the bond's sensitivity to interest rates by lowering its duration to 4. This would reduce its interest sensitivity, which would help if rates increase, but would not eliminate the possibility of gains from falling interest rates.

The manager identified June T-bond futures for hedging, which is quoted at 70-16, price per contract is $70,500. The futures price and the characteristics of deliverable bond imply duration of 7.20 and a yield of 14.92%.

The number of futures contracts require to hedge,

$$N_f = -\left(\frac{7.83 - 4}{7.20}\right)\left(\frac{1,010,000}{70,500}\right)\left(\frac{1.1492}{1.1174}\right)$$

$$= -7.84$$

So it has to sell 8 contracts.

On March 28, the bonds are sold at their current price of 95-22.

Sales proceeds = $956,875

June T-bond futures is at 66-23, and price per contract is $66,718.75.

Profit on futures = 8 (70,500 – 66,718.75) = $30,250

So, the loss in the portfolio of $53,125 (i.e., 1,010,000 – 956,875) is reduced to the extent of $30,250 by the gain in the futures.

Treasury Bond Futures Spread

In the interest futures market, it is possible to speculate by holding an outright position, or by trading a spread. An outright position, such as buying T-bond futures, is a simple bet on the direction of interest rates. More sophisticated speculative strategies involve trading spreads. Suppose a trader takes a long position in a futures contract. If this is the only position, risk is quite high. One way to modify the risk is to short sell a T-bond, but short selling requires that the trader execute a transaction in the spot market. In addition, there are large margin requirements on short sales. An alternative that is easy to execute is simply sell another T-bond futures contract. The margin requirement on such spread is much lower than the margin requirement on either a long or a short position.

Treasury Bond Spread/Implied Repo Rate

The concept of implied repo rate also applies to T-bond spreads. The implied repo rate can be used to determine if the spread is correctly priced.

Suppose there is a futures contract expiring at time 't' and another expiring at time 'T', and T > t. Suppose we sell the longer-term contract and buy the shorter-term contract, at time t, the shorter-term contract expires. We take delivery of the bond, financing at the repo rate, r, and hold until time T, when longer-term contract expires. Because we short that contract, we simply deliver the bond. Assume we can identify today the cheapest bond to be delivered on the shorter-term contract.

Consider the following notation:

CF_t = Conversion factor for bond delivered at t

CF_T = Conversion factor for bond delivered at T

f_t = Today's futures price for contract expiring at t

f_T = Today's futures price for contract expiring at T

AI_t = Accrued interest on bond as of time t

AI_T = Accrued interest on bond as of time T.

The implied repo rate, $\hat{r} = \left[\frac{f_T(CF_T) + AI_T}{f_t(CF_t) + AI_t}\right]^{1/(T-t)} - 1$

The numerator is the amount received for the bond, and the denominator is the amount paid for it. The implied repo thus is the annualized return we could earn over the period (T – t). If the bond can be financed at less than this rate, the transaction will be profitable.

One-way traders determine if the implied repo rate on the spread is attractive is to evaluate what is called turtle trade. The implied repo rate is an implied forward rate; it can be compared to the implied repo rate in the T-bill futures market. If the T-bill futures rate is lower, the trader sells the T-bill futures and buys the T-bond spread. This creates a risk-free position and earns the difference between the implied repo rate on the T-bond spread and the implied rate on the T-bill futures. If the implied rate on the T-bill futures is higher, the investor reverses the T-bond spread and buys the T-bill futures.

Intermarket Spreads

There is numerous numbers of intermarket spreads or intercommodity spreads. These are transactions in which two futures contracts are on different underlying instruments. For example, many traders execute Notes Over Bonds (NOB) spread. This spread involves a long (short) position in T-note futures and a short (long) position in T-bond futures. This trade would be used to capitalize on shifts in the yield curve. For example, if a trader believes that the rates on 7 to 10 year range of the yield curve will fall and rates on the 15-plus-year range will either rise or fall by a less amount, a long position in the NOB might be warranted. If the investor’s expectations prove correct, a profit could be made as T-note futures will rise and T-bond futures will either rise or fall by a smaller amount. Of course, if yields on the long-term end of the market fall, the trader could end up losing money because long-term bond prices will be expected to rise by a greater amount for a given yield change. Thus, the trader might prefer to take a weighted position in which the ratio of T-note to T-bond futures is something other than one-to-one. Thus, the NOB spread is designed to capitalize on changes in the relationship between T-note and T-bond futures prices.

TREASURY NOTE FUTURES

Treasury bonds and Treasury notes share a very similar structure, but they differ in the term to maturity at which they are initially offered. Both the instruments pay semi-annual coupons. Just as the spot market instruments are very similar, the T-bond and T-note futures contracts are also very similar. Both T-note and T-bond contracts use the same system of conversion factors, and they have the same delivery system.

There are three Treasury note futures contracts: 10-year, 5-year, and 2-year. All three contracts are modeled after the Treasury bond futures contracts and are traded on the CBOT. The underlying instrument for the 10-year T-note futures contract is \$100,000 par value of a hypothetical 10-year 6% T-note. There are several acceptable Treasury issues that may be delivered by the seller. An issue is acceptable if the maturity is not less than 6.5 years and not greater than 10 years from the first day of the delivery month. The tick size is same as T-bond futures.

For the 5-year Treasury note futures contract, the underlying is \$100,000 par value of a 6% notional coupon bond that satisfies the following conditions (i) an original maturity of not more than five years and three months, (ii) a remaining maturity of not less than four years and two months. The minimum price fluctuation for this contract is 1/64 of 1%. The dollar value of a 64th for a \$100,000 par value is \$15.625.

The underlying for the 2-year Treasury note futures contract is $200,000 par value of a 6% notional coupon bond with remaining maturity of not more than two years and not less than one year and nine months. Moreover, the original maturity of the note delivered to satisfy the 2-year futures contracts could not be more than five years and three months. By having a larger denomination for the 2-year contract, the CBOT brings the volatilities of the contracts in the same range. The minimum price fluctuation for this contract is 1/128 of 1%. The dollar value of a 128th for a $200,000 par value is $15.625, and is therefore the minimum price fluctuation.

INTEREST RATE FUTURES IN INDIA

In tune with the changing times, Indian financial markets have undergone a virtual transformation with the emergence of new products that are now available on the Indian bourses. These products are the outcome of the removal of longstanding regulatory restrictions. The basket of investment instruments has expanded steadily to include index futures and options, stock futures and options, commodity futures, and interest rate swaps. In this era of changing interest rates, the only thing certain about them is uncertainty. You may lose out on returns on your investments when interest rates go down, or you may lose out on a floating rate loans when they go up. These risks could be hedged through interest rate futures!

As mentioned above, derivative trading in India till date is limited to equity, index and commodities only. Interest rate derivatives and currency derivatives are yet to make their presence in the Indian markets. Also according to the Invest India Derivatives Markets Poll 2002, sponsored by the National Stock Exchange of India and Geojit Securities, 95.74% of the participants polled in favor of the interest rate derivatives to be traded on exchange. This shows how much the Indian markets need them. Therefore to address this issue, the government took the initiative to commence trading in interest rate derivatives on fixed income securities at NSE as well as BSE. A SEBI appointed committee also submitted a report on the matter, chalking out the needs of the financial industry as well as individual investors to hedge interest rate risks using exchange-traded derivatives.

Fixed income derivatives existed in the Indian markets in the form of ‘interest rate swaps’, which are traded over-the-counter. The RBI has also given green signal for the introduction of Exchange Traded Interest Rate Futures. However, in the first phase, only 10-year notional bond futures and futures on notional treasury bills with the 91-day tenor are introduced. The interest rate futures have started trading on the NSE June 23, 2003. The current interest rate futures products traded at NSE are:

- Notional 10-year Zero Coupon Bond – Symbol: NSE10YZC
- Notional 10-year Coupon Bearing Bond (6%) – Symbol: NSE10Y06
- Notional 91-day Treasury Bill – Symbol: NSETB91D.

Nitty-Gritty of Interest Rate Futures

Interest rate futures are the forward contracts based on a benchmark interest rate traded on a stock exchange. It is a contract whose underlying security is a debt obligation. It is an agreement to buy or sell a standard quantity of a specific interest bearing instrument, at a predetermined future date at a price agreed upon between the parties. The Financial settlement of all trades is guaranteed by National Securities and Clearing Corporation Ltd. (NSCCL). The Interest rate futures allow participants to take a view on movement of interest rates in the foreseeable future and accordingly enter into contracts, which would protect the underlying positions. For instance, you can sell a futures contract on T-Bills to lock-in a borrowing rate, or buy a futures contract to lock-in a lending rate. A typical example is the futures contract on 3-month sterling LIBOR traded on the

London International Financial Futures Exchange (LIFFE), which is known as a short sterling future. Unlike swaps, where two counterparties exchange streams of payments over a given period, in futures, participants enter into contracts and pay margins on a daily basis over the period of the contract and settle differences due to changes in interest rates by paying margins to the stock exchanges.

The table highlights the main features of the interest rate futures being traded on NSE and BSE. In futures contract, one tick means one basis point or 0.01%. The value of the tick is nothing but a change in the value of Rs.2,00,000 invested in a notional T-bill or bond for a one basis point change in the yield. For a short futures contract at a yield of 5%, the price of the notional T-bill would be {100/(1 + 0.05 x 91/365)} = Rs.98.7688 (Assuming the face value of the bond would be Rs.100). In case the yield rises to 5.01%, then the price of the notional T-bill would be {100/(1+ 0.0501x 91/365)} = Rs.98.7663, the change in the price for a Rs.100 investment is = 0.0025. Thus, the change in the value for a Rs.2,00,000 investment would be Rs.5. For a bond future, the tick value will be the change in value of an investment in a notional 10-year zero coupon bond for a one basis point change in yield: 2,00,000 {1/(1 + 0.05)^10 – 1/(1 + 0.0501)^10} = Rs.120.

Table 8: Characteristics of the Interest Rate Futures at NSE

Contract underlying	Notional 10 year bond (6 % coupon)	Notional 10 year zero coupon bond	Notional 91 day T-Bill
Contract Value	Rs.2,00,000	Rs.2,00,000	Rs.2,00,000
Lot size	2000	2000	2000
Tick size	Re.0.01	Re.0.01	Re.0.01
Quotation Basis	Price Based	–	Yield Based (100 - yield)
Notional Coupon Interval	Six months	–	–
Expiry date	Last Thursday of the month	Last Thursday of the month	Last Thursday of the month
Settlement Basis	Cash	Cash	Cash
Settlement Period	T+1	T+1	T+1
Contract months	Three near months and fixed quarterly months of March cycle with upto 12 months coverage.		
Initial Margins	Higher of 3.5 standard deviations or 2%	–	Higher of 3.5 standard deviations or 0.2%
Price limits	Not applicable	Not applicable	Not applicable
Exposure Margins (II line of Defense)	1%	–	0.10%
Position Limits	Only Client level limits (Higher of Rs.100 Crore Or 15% of open interest in the near month contract.		
Settlement Price	As may be stipulated by NSCCL in this regard from time to time.	As may be stipulated by NSCCL in this regard from time to time.	As may be stipulated by NSCCL in this regard from time to time.

Source: ICFAI Research Team.

The following table depicts the summation of trades in Interest Rate Futures at NSE.

Table 9

Month	June 2003	July 2003	August 2003	September 2003
No. of trading days	5	23	20	22
Total traded value in Rs. Cr	181.85	19.32	1.04	0
Avg. daily traded value in Rs. Cr	36.37	0.84	0.05	0
Total no. of contracts traded	9768	963	50	0
Avg. no. of contracts traded	1954	42	2.5	0

Source: www.nseindia.com

SUMMARY

- Moneylenders stand to lose if the interest rates go down in future and the money borrowers stand to lose if the interest rates go up in future. Interest rate futures hedge the risk of interest rate fluctuation.
- The Short-term Interest Rate Futures comprises Treasury bill futures and Eurodollar futures. The Short-term Interest Rate Futures comprises Treasury notes and Treasury Bonds.
- The interest rate futures have started trading on the NSE since June 23, 2003. The current interest rate futures products traded at NSE are Notional 10-year Zero Coupon Bond, Notional 10-year Coupon Bearing Bond (6%) and Notional 91-day Treasury Bill.

Chapter VIII

Index and Stock Futures

After reading this chapter, you will be conversant with:

- Reporting of Index Futures
- Hedging through Index Futures
- Index Futures in India
- Futures on Individual Stocks

Introduction

The first index futures contract was introduced in 1982 at the Kansas City Board of Trade and today, index futures are one of the most popular types of futures as far as trading is concerned. An index futures contract is basically an obligation to deliver at settlement, an amount equal to 'x' times the difference between the stock index value on the expiration date of the contract and the price at which the contract was originally struck. The value of 'x', which is referred to as the multiple, is predetermined for each stock market index. For example, futures contracts on S&P 500 Stock Index use a multiple of 250 while the futures contracts on BSE Sensex use a multiple of 50. Stock index futures are based on complex cash instruments.

The multiple enables us to calculate the monetary value of an index futures contract. For example, if the settlement price of the S&P 500 futures contract is 350, the value of the contract in monetary terms is 350 x 25 = $87,500.

The salient features of the index futures contracts are as follows:

i. The index futures contracts are cash settled; there is usually no delivery of the underlying stocks or stock certificates, as matching the physical stocks as per the index may be quite difficult and costlier than settling the contract by cash.

ii. An investor can either buy or sell an index futures contract. When an investor goes long in the index futures contract, he will receive a cash settlement on the expiration date, if the closing price exceeds the contract price. On the other hand, if the closing price is less than the contract price, the investor will be required to pay the difference.

iii. Since index futures contracts are listed and traded on futures exchanges, the investor can offset his position on any day prior to the expiration day.

iv. The performance of all index futures contracts are guaranteed by the exchange clearinghouse. As in case of options exchanges, the clearinghouse becomes the counterparty to both the buyer and the seller.

v. The index future carries the margin requirements that are applicable to both the buyer and the seller. The purpose of maintaining margin money is to minimize the risk of default by either party. The payment of margin ensures that the risk is limited to the previous day's price movement on each outstanding position. Margin money is a kind of security deposit or insurance against a possible future loss of value. The margin can be maintained either in the form of risk-free short dated government securities or in the form of cash.

   Additional margin is imposed only when the exchange fears that the market has become too volatile and may result in some critical situation, like payment crisis. This is a protective measure available to the exchange to prevent any breakdown.

Illustration 1

The settlement price of sensex futures contract on a particular day was Rs.4,600. The initial margin is set at Rs.10,000, while the maintenance margin is fixed at Rs.8,000. The multiple of each contract is 50. The settlement prices on the following four days are as follows:

Day	Settlement Price Rs.
1	4,700
2	4,500
3	4,650
4	4,750
5	4,700

Calculate the mark-to-market cash flows and the daily closing balances in the accounts of

a. an investor who has gone long, and

b. an investor who has gone short at 4,600.

Calculate net profit (loss) on each of the contracts:

a. Status of the investor who has gone long on the contract.

Day	Settlement Price	Margin Account			
		Opening Balance	Mark-to-Market	Margin Call	Closing Balance
1	4,700	10,000	+ 5,000	–	15,000
2	4,500	15,000	(–) 10,000	5,000	10,000
3	4,650	10,000	7,500	–	17,500
4	4,750	17,500	+ 5,000	–	22,500
5	4,700	22,500	(–) 2,500	–	20,000

Net Profit (loss) on the contract

= +5,000 – 10,000 + 7,500 + 5,000 – 2,500

= Rs.5,000.

b. Status of the investor who has gone short on the contract.

Day	Settlement Price	Margin Account			
		Opening Balance	Mark-to-Market	Margin Call	Closing Balance
1	4,700	10,000	–5,000	5,000	10,000
2	4,500	10,000	(+)10,000	–	20,000
3	4,650	20,000	(–)7,500	–	12,500
4	4,750	12,500	(–)5,000	2,500	10,000
5	4,700	10,000	(+) 2,500	–	12,500

Net Profit (loss) on the contract

= –5,000 + 10,000 – 7,500 – 5,000 + 2,500

= –Rs.5,000.

REPORTING OF INDEX FUTURES

The price and volume data on index futures contracts are reported in the financial press in the following format:

Table 1: S&P 500 Index

Expiration Month	Open	High	Low	Settle	Chg	High	Low	Open
June	365.9	368.05	364.15	365.15	–1.30	373.20	324.70	43.769
Sep.	370.8	373.25	369.30	370.40	–1.20	374.90	329.00	84.428

The first three columns denote the opening, high and low values recorded during the trading day. The fourth column provides the closing value for that day. The value under the settlement price becomes the basis for marking the contracts to market. Investors holding long positions in the June contract have lost $650 (1.3 times 500) and investors short on this contract have gained $650. The next two columns provide information on the highest and lowest prices registered by the contract since the time it was listed on the exchange. The last column provides information on the number of contracts outstanding.

On the last day of trading the final settlement price of S&P futures contract is set equal to the spot S&P 500 index value.

Theoretical Futures Contract Price

Based on the cost-of-carry model discussed above, we can also find out the theoretical price of a futures contract based on the following formula:

$FP_{t,T} = CP_t + CP_t \times (R_{t,T} - D_{t,T}) \times (T - t)/365$

Where,

$FP_{t,T}$	=	Price of the stock index futures contract.
CP_t	=	Price of the cash index at a time t.
$R_{t,T}$	=	Annualized financing rate for period (T – t).
$D_{t,T}$	=	Expected average annual dividend.
T – t	=	Carrying period or number of days due to next dividend or maturity.

Let us take an example to understand the same.

On December 15, the S&P 500 Index was 1,295. What will be the theoretical price of a futures contract which is expected to declare a dividend of 10 cents per share and which will mature on December 31? The 3-month annual T-bill rate is 9.66%.

$FP_{t,T} = 1{,}295 + 1{,}295 \times (0.0966 - 0.010) \times 15/365$

$FP_{t,T} = 1{,}299.58$ or say, 1,300.

Pricing of Index Futures Contracts

Unlike options, the valuation of index futures is easy to understand. To start with, let us consider an investor who wants to hold a portfolio which is identical to the composition of a stock market index for a period of one year. During the course of the year, he will receive dividends and at the end of the year, the principal value would have changed in line with the change in the index. If we denote the current index value as, I_0 the expiration day index value as I_t, and the dividends received as D_t, the rupee return earned by the investor is given by the equation

$$(I_t - I_0) + D_t \qquad \text{....Eq.1}$$

If the investor contemplated investment in an index futures contract as an alternative to investing in the underlying portfolio, he will buy the index futures contract and invest all his money in risk-free treasury bills or short-dated government securities. If we denote the current price of the index futures contract as F_0, the expiration day price as F_t, and the interest earned as R_f, the rupee return earned by the investor is given by the equation

$$(F_t - F_0) + R_f \qquad \text{....Eq.2}$$

If the investor has to be indifferent between the two alternatives then

$$(I_t - I_0) + D_t = (F_t - F_0) + R_f \qquad \text{....Eq.3}$$

Since $F_t = I_t$, i.e., the final settlement price of the index futures contract is set equal to the spot index value, Equation 3 can be simplified as

$$F_0 = I_0 + (R_f - D_t) \qquad \text{..... Eq.4}$$

Equation 4 states that the current index futures price must be equal to the index value plus the difference between the risk-free interest and dividends obtainable over the life of the contract. The difference between R_f and D_t is referred to as the ‘cost-of-carry’ and we can say that the futures contract must be priced to reflect the ‘cost-of-carry’.

The ‘cost-of-carry’ or the ‘basis’ is typically positive because the annualized risk-free rate of interest (about 10% in the Indian context) exceeds the annualized dividend yield (which is around 1% for the BSE National Index). But then this need not always be true. The following example illustrates this point.

Illustration 2

The current value of Sensex is 4,400 and the annualized dividend yield on the index is 3%. The risk-free rate of interest is 10% p.a. Futures contracts are trading on the sensex at multiples of 50. Calculate the fair price for a three-month index futures contract assuming that:

a. 25% of the stocks included in the index will pay dividends during the 3-month period.

b. 50% of the stocks included in the index will pay dividends during the 3-month period.

c. All the stocks included in the index will pay dividends during the 3-month period.

Solution

a. The fair price (F_0) of the index futures contract is given by the equation:

FC = 4,400 + [(4,400 x 0.10 x 0.25) – (4,400 x 0.03 x 0.25)]
= 4,400 + 77
= 4,477

b. FC = 4,400 + [(4,400 x 0.1 x 0.25) – (4,400 x 0.03 x 0.5)]
= 4,400 + 44
= 4,444

c. FC = 4,400 + [(4,400 x 0.1 x 0.25) – (4,400 x 0.03)]
= 4,400 – 22 = 4,378

Thus, we find that depending upon the timing of the settlement date and the initiation of the position, the impact of cost-of-carry, i.e., difference between R_f and D_t can vary substantially. We can have a situation where the dividend yield exceeds the risk-free return and in that case, the theoretical price of the index futures can be below that of the index.

Applications of Index Futures

Stock Index Arbitrage

If the price of the index futures contract is out of line with the theoretical price suggested by Equation 4, then an arbitrageur can earn abnormal riskless profits by trading simultaneously in the spot (cash) and futures markets. This process is called the stock index arbitrage or basis trading or program trading. The following example illustrates the mechanics involved.

Illustration 3

The current value of sensex is 4500 and the annualized dividend yield on the index is 4%. A three-month-futures contract on the sensex can be purchased for a price of Rs.4,600, the risk-free rate of interest is 10%. Can an investor earn an abnormal (risk-free) rate of return by resorting to stock index arbitrage? Assume that 50% of the stocks included in the index will pay dividends during the next three months. Ignore margin requirements, transaction costs and taxes.

The fair price of the index futures contract is given by the equation

F_0 = 4,500 + (4,500 x 0.10 x 0.25) – (4,500 x 0.04 x 0.50)
= 4,500 + 112.5 – 90
= 4,522.5.

The index futures is obviously overpriced. The arbitrageurs can exploit this opportunity by

a. Buying a portfolio which is identical to the index.

b. Going short on the index futures contract.

The following calculations will show that the arbitrageurs can earn an abnormal rate of return irrespective of the outcome on the expiration date.

If the sensex closed at 4200 on the expiration date, the arbitrageurs profit will be as under:

A.	Profit from short sale of futures (4,600 – 4,200) x 50	20,000
B.	Cash dividend received on the Portfolio (4,500 x 0.04 x 0.5 x 50)	4,500
C.	Loss on sale of the Underlying portfolio (4,500 – 4,200) x 50	–15,000
D.	Interest foregone (4,500 x 0.10 x 0.25 x 50)	–5,625
	Net arbitrage profit	3,875

On the other hand, if the index closed at 4,800 on the expiration date, the arbitrageurs profit can be calculated as follows:

A.	Profit on sale of the underlying portfolio (4,800 – 4500) x 50	15,000
B.	Cash dividend received on the Portfolio (4,500 x 0.04 x 0.5 x 50)	4,500
C.	Loss on short sale of futures (4,800 – 4,600) x 50	–10,000
D.	Interest foregone (4,500 x 0.10 x 0.25 x 50)	–5,625
	Net arbitrage profit	3,875

As more and more arbitrageurs start buying the portfolio of stocks and selling the index futures contracts, the current price of the index futures contracts will decline and the mispricing will disappear.

What will happen if the index futures contract is priced at a level below its theoretical price? The arbitrageurs will exploit this opportunity by buying the index futures contract and simultaneously (short) selling the underlying basket of stocks. The reader can verify that the arbitrage position results in riskless profit irrespective of the outcome on the expiration date. This process of index arbitrage will result in an increase in the price of the index futures contract and will continue until the mispricing disappears.

The reader would have realized that stock index arbitrage or program trading is not as simple as illustrated by the aforesaid example. Since mispricing does not persist for a long period of time, the arbitrageur who wants to be ahead of the pack in exploiting the opportunity must have extensive resources including elaborate telecommunications networks to quickly spot and act upon such opportunities.

i. Large orders are not guaranteed and any price or prices can change quickly (to the disadvantage of the arbitrageurs) in the few minutes that it takes to perform all of the desired trades. In fact, arbitrageurs' own orders to buy stocks can create upward price pressure on those stocks and similarly program selling can cause sharp price declines in the spot market.

ii. There can be a potential tracking error. That is, the arbitrageurs portfolio need not be identical to the composition of the index underlying the futures contract being bought or sold.

iii. There is a dividend risk. For example, some stocks may lower (or raise) dividends and timing of dividend payments can change causing a deviation between the realized and expected rate of return on the arbitrage position.

iv. There are transaction costs involved in the trading, which will reduce the arbitrage profits.

v. It may not be easy to duplicate the underlying stocks comprising the index which is being imitated. This happens mainly because the said stocks may not be easily available or may not have takers while selling the same.

vi. The index may not give the latest data on bid/ask prices of all the stocks but may depict the last quoted prices of those stocks. Unless the arbitrageurs have the latest data, they may make wrong conclusions.

vii. It is also difficult to borrow the necessary underlying assets to short the entire portfolio.

HEDGING THROUGH INDEX FUTURES

Pension funds, mutual funds, life insurance companies, bank trust funds, endowment funds, etc., invest huge amount of money in stock. Whenever there is a fall in the stock price, portfolio managers want to reduce their exposure in the stock. There are several ways this can be done. Simply selling the stock and repurchasing it latter is one way. But this strategy involves substantial costs, as already discussed above. It is relatively expensive to buy and sell stocks because of the transaction costs in the form of bid-ask spreads and commissions. Again, trading in large amount of stock can influence the market resulting in poor realization of prices. Hedging with futures basically involves taking a position in future as a temporary alternative for transactions to be executed in the cash market at a future period. Hedging tries to avoid price risk by trying to fix the price of the transaction to be made at a later date. If cash and futures prices move together, any loss realized in one market will be compensated by the profit in other market. When the profit and loss from each position are equal, the hedge is said to be perfect. The liquidity of stock index futures have made them the markets of choice especially for institutional investors. When using stock index futures to reduce stock market risk, the anticipation is that any losses arising from movements in stock prices are offset by gains from parallel movement in future prices. A portfolio manager might be worried about the possibility that the prices of his or her stock portfolio might fall. He or she could reduce the possibility of erosion in the value of the portfolio by taking position in the futures market that would provide a gain in the event of a fall in stock prices. In such a case, the investor would take short position in the stock index futures contract. By taking a short position, he or she ensures a notional selling price of a quantity of stock for a specific date in future. Should stock prices fall and stock index futures behave in a corresponding manner, the notional buying price on that date would be less than the predetermined notional selling price. The portfolio manager could close out his or her position in futures by taking a long position in the same number of contracts. The excess of selling price over the buying price is paid out to the portfolio manager. Had the prices of stock risen the portfolio manager would have gained from his or her portfolios of equities but lost on futures dealings. In either case, the portfolio manager has suceeded in reducing the extent to which the value of the portfolio fluctuates. The use of futures to hedge the risk of a fall in stock prices does not require any alteration of the original portfolio.

Let us say that a fund manager holds a balanced portfolio of equities valued at $10,000,000 on 5 April but fears a fall in its value due to general fall in equity prices. Assume that S&P 500 is at $500 and so to hedge the portfolio the fund manager has to sell 40 June contracts at a price of $500 each. He has thus committed himself to the notional sale of $10,000,000 of the stock on the June delivery date at the level of equity prices implied by the futures on 5 April (40 x 500 x $500 = $10,000,000).

Now suppose that on 10 May S&P 500 has fallen to 490. Correspondingly, the value of the portfolio has declined to $9,800,000 (loss on portfolio $10,000,000 – $9,800,000 = $200,000). The fund manager will close out the future position by buying 40 June future contracts at a price of $490. The notional buying price of each contract is thus $10 below the notional selling price. Therefore, the net gain from future trading will be $200,000 (40 x 500 x $10), which will compensate for the loss of the portfolio value. Similarly, a long position in futures can be used to hedge a position where a fund manager anticipates receipt of money and intends to use the money to buy a balanced portfolio of equities. He fears that the stock price will rise before the money is received. In this case, the fund manager can protect from the possible increase in the buying cost of the portfolio by purchasing the equivalent number of futures. In this example, we assume that beta = 1.

In India, trading on index futures contracts on NSE is based on the S&P CNX Nifty. The S&P CNX Nifty can be used as a hedging tool.

While trading in index futures, the participants buy or sell the 'entire stock market' as a single entity. While using Index futures as a hedging tool, the following should be noted:

a. If you are long on a stock, your hedging strategy would be to go short on index futures.

b. If you are short on a stock, your hedging strategy would be to go long on index futures.

Beta Management

As already known to a student of finance, there are two types of risks while holding an investment, namely market risk or systematic risk and individual firm specific risk or unsystematic risk. While the unsystematic risk can be controlled by having a well diversified portfolio, the systematic risk cannot be diversified and affects each and every industry to some extent. Systematic risk can, however, be measured and hedged with the help of futures contracts.

The following is the formula to calculate Beta (or measure of systematic risk):

$$\text{Beta} = \text{Cov}(R_i, R_m)/\text{Var}(R_m)$$

Where,

R_i = Return on stock I,

R_m = Return on market portfolio.

Let us now try to understand the hedging with futures contracts.

Consider the case of an investor who feels that a particular stock is undervalued. Based on this understanding he takes a long position of Rs.200,000 in the stock. When doing this, he is faced with two kinds of risks:

i. Either his understanding itself may be wrong.

ii. The market as a whole moves against him, resulting in losses being incurred.

The second outcome happens most of the time. If after a few days, the index drops resulting in a general decline in stock prices, the investor makes losses in spite of the fact that his understanding of the stock was correct. It should be noted that every long position on a stock is a long position on the index as well. This means that Long stock is actually Long stock + Long index.

In order to hedge his position, the investor simply sells the index futures contract. By doing so, he is said to have hedged away his index exposure. This strategy would result in the investor taking a position on the individual stock alone.

In order to determine the number of futures he has to sell, the beta of the stock should be known. The beta of the stock is the average impact of a 1 percent move of the index upon the stock.

For example, a stock with a beta of 1.2 moves by 1.2 percent average when the index moves by 1 percent. Assuming that the beta of stock is 1.2, the size of the position that the investor needs to hedge his index exposure is 1.2 x 2,00,000 = 2,40,000.

Now assuming that the index is at 1200 and the market lot for futures contract is 100, he will have to sell 2 index futures contracts.

Once he does this his position will be as follows:

Long stock	:	2,00,000
Short index futures	:	2,40,000

This position will reflect price changes intrinsic to the stock alone.

Illustration 4

On 4th January 20x1, Ravi takes a long position in ITC stock to the tune of Rs.1 million. He plans to hold this position till 26th January, which is a Friday. The beta of ITC stock happens to be 1.2. The dividend is 3000. Assume that on January 4th, the S&P CNX Nifty is 1,200 and the nearest futures contract (i.e. expiration January) is trading at 1,210. In order to hedge his position, Ravi will have to take a short position in S&P Nifty index futures to the tune of 1.2 x 10,00,000 = Rs.12,00,000. Since the Nifty futures on January 4th are trading at 1,210, and value of each futures contract (100 Nifty) 121,000. In order to sell 1.2 million, Ravi will have to sell 9.917 contracts.

His position will be

Long ITC	:	10,00,000
Short S&P CNX Nifty Futures	:	11,99,957

A few days later the Nifty crashed and on January 26, Ravi closed both his positions at Nifty spot and Nifty futures at Rs.1,080.

Ravi lost Rs.1,20,000 on his position on ITC, while his position on index futures resulted in a gain of Rs.1,28,921. Over all he gained Rs.8,921.

Similarly, an investor who takes a short position in a stock, based on the understanding that the stock is overvalued can hedge his position by going long on index futures. This strategy would result in hedging away the index exposure.

Illustration 5

On January 4th, 20x1 you short the Infosys stock to the tune of Rs.1,000,000. The expiry date of Nifty January futures is January 26, 20x1. On January 4th, the Nifty spot is at Rs.1,250 and the Nifty futures are trading at Rs.1,270. The beta of Infosys is 1.2. In order to hedge your position, you should go long on the Nifty futures to the extent of 1.2 x 10 lakh = 120 lakh. As the Nifty futures are trading at Rs.1,270, you will be required to buy 9.45 contracts x 100 each. Your position will be as follows:

Short Infosys	:	10,00,000
Long Nifty Futures	:	12,00,150

Assume that the Nifty gained and you are able to close your position on January 26th, with Nifty spot and Nifty futures both at Rs.1,310.

You lose Rs.57,600 on your position on the stock, but gain Rs.37,800 on your position in index futures. Overall your loss is reduced to Rs.19,800.

Having seen the use of index futures as a hedging tool, it should be remembered that hedging does not eliminate loss. The best that can be achieved by hedging is the removal of unwanted exposure i.e., unwanted risk.

Minimum Hedge Ratio

A point which is always under debate for any investor in the futures market is the minimum hedge ratio to minimize risk. As discussed above, this can be done by the following formula:

$$HR = \Delta\,\% \text{ in weighted average portfolio price} / \Delta\,\% \text{ in futures index.}$$

Portfolio Insurance

Portfolio insurance is one of the ways of hedging a futures contract. It is a dynamic hedging strategy which uses stock index futures and which implies buying and selling securities periodically to achieve the desired results of not incurring a loss greater than a predetermined value or to maintain a desired minimum limit of the portfolio value. The working of the portfolio insurance is akin to buying an index put option.

Portfolio insurance can also be done by selling and buying stocks directly or by using listed index options.

Box 1: Universal Stock Futures

The Universal Stock Futures launched with much fanfare by LIFFE was touted an instrument with the potential to revolutionize global equity trading. Universal Stock Futures are a global range of standardized futures contracts on shares of individual companies. For the first time international investors will be able to gain exposure to the price movements of global equities on a single exchange, under a single regulatory regime, and without the costs of transacting the underlying equities themselves. Universal Stock Futures provide opportunities to retail and institutional investors alike and offer flexibility and efficiency.

LIFFE has selected those stocks that are the most actively traded and highly capitalized on the world arena. The initial stock list of 122 covers fourteen countries and has a combined market capitalization exceeding €7.93 trillion. The stocks account for 88.65% of the Eurostoxx 50 Index and 67.26% of the FTSE 100 Index. The Stocks have been selected globally from the thirteen most popular and heavily capitalized industry sectors by index provider's benchmarks. Industries include Telecommunications, Technology, Banking, Insurance, Automobiles, Media, etc. LIFFE plans to add new contracts progressively to suit the varied requirements of investors. Some of the benefits which these instruments are expected to deliver are as follows:

Greater Access

- Will open up equity trading to a wider audience and deliver greater efficiency and liquidity to the underlying market.
- Will circumvent many of the difficulties faced by investors attempting to trade across jurisdictional boundaries by providing access to UK, European and US shares on a single trading platform.
- Direct, easy access — The electronic trading system used, LIFFE CONNECT™, is currently available to around 14,000 traders and 455 different companies, in 25 countries around the world. Retail investors will have access via the internet.

Cost Effective

- Futures on UK stocks will not be subject to stamp duty, which will mean they have lower transaction costs than cash equity transactions.
- Universal Stock futures transactions will be clear of costs of accessing settlement systems across international borders.
- Trading futures is around one third the cost of trading shares. Some brokers charge as little as £3 to £5 per contract (retail).

Capital Efficient

Reduced capital required upfront compared to trading on the traditional cash market as the trader is only required to pay margin upfront with Stock Futures. Typical margin required by the London Clearing House is approximately 7% to 15% of contract value, depending on volatility of stock. Therefore, capital investment only amounts to the margin payable, which frees up capital to pursue other investments.

Greater Performance

- Allows traders to profit no matter what direction the market moves. If a trader is of the opinion that the stockmarket is going to fall, a trader can sell a contract. A profit will be made if the trader then buys that contract back later when the price decreases. Avoids the hassle of stock borrowing.

- Allows investors to switch exposure from one stock to another without disturbing the underlying stock holding.
- Can be bought and sold more easily than shares – as futures do not require cross-border settlement and the trade is cleared by the London Clearing House.
- Apart from providing advantages to investors these instruments are expected to appeal to both Hedgers and Speculators. Universal Stock Futures contracts come in units of 1000 shares for UK stocks and 100 shares for European (except for Italian contracts which come in units of 1000 shares) and US stocks, which means the product will be attractive to retail investors as well as institutional investors.

Pricing

Buying a Universal Stock Future is similar to agreeing to buy shares at a future date, but agreeing the price at the time of trade. The key difference is that Universal Stock Futures are cash settled, so no shares change hands. Conversely, selling a Universal Stock Future is similar to agreeing to sell shares at a future date (although the seller does not need to own shares to enter into this agreement).

Both the buyer and the seller face a risk that the share price changes between the date the future is traded and the end of the futures life. To cover this risk, the seller of the future could buy shares and hold them until the future's last trading day.

The futures price should be equal to the cost of buying the shares and holding them until the expiry of the futures contract – any more and a trader buying stock and selling futures would make a guaranteed positive return – any less and a trader selling stock and buying futures would make a guaranteed positive return. If a futures price were to move away from the correct theoretical price, the process of buying/selling stock and selling/buying futures – usually referred to as arbitrage – would bring the price back in line. The total cost of buying stock and holding it until the expiry of the future is made up of three main elements – the price of the underlying stock; any interest income foregone by holding shares rather than cash; and any dividends paid to the holder of the stock before the expiry of the future. The futures price should be:

Fair Futures Price = Today's Share Price + Interest Costs – Dividends Received.

As LIFFE's Universal Stock Futures are available in an open market, their prices are subject to the normal forces of supply and demand.

Trading

These instruments can be traded through access to LIFFE CONNECT™, LIFFE's state-of the-art electronic trading system. The access to LIFFE CONNECT™ is available in a variety of ways. Direct access is available only to members of LIFFE and allows the direct entry of orders into the system. Non-members must enter their orders into LIFFE CONNECT™ via a LIFFE member. Universal Stock Futures may be traded, via LIFFE members, by customers within and outside the UK, subject to any regulatory restrictions which may exist.

LIFFE expects Universal Stock Futures to be accepted widely by investors and volumes to improve on account of innovative instruments being launched from time to time.

Source: www.liffe.com

INDEX FUTURES IN INDIA

NSE has introduced trading in Index based futures contracts with a cash market index as the underlying asset as well as futures on the underlying stocks. NSE will define the characteristics of a futures contract such as the underlying index, market lot, and the maturity date of the contract. The contracts will be available for trading from introduction to the maturity date. The following table depicts the overall status of Futures on Indices at National Stock Exchange.

Table 2: Futures on Indices at NSE

Month	Apr-03	May-03	Jun-03	Jul-03	Aug-03	Sep-03
No.of days	20	21	21	23	20	22
Total traded value Rs. Crs.	6994	6283	9348	14743	24989	45861
Avg. daily traded value Rs.Crs.	350	299	445	641	1249	2085
Total No. of contracts traded	362157	325784	439151	641002	990731	1676358
Avg. No. of contracts	18108	15514	20912	27870	49537	76198

Source: www.nseindia.com

Specifications of a Contract

A futures contract is specified as follows:

Instrument Type : FUTIDX
Symbol : NIFTY

Expiry Date: The expiry date identifies the date and month of expiry of the contract, say December 26, 2002. The minimum lot size to be used for trading and settlement of contracts will be 200. If NIFTY futures contract is traded at 1000 and the lot size is 200, then the contract value would be Rs.2,00,000 (200 x 1,000). The price step is Rs.0.05.

All NIFTY index futures contracts will expire on the last Thursday of the expiry month. In the above example, NIFTY 26 DEC. 2002 futures contracts will expire on December 26, it being the last Thursday of the month. This date is also known as the maturity date of the contract. No further trading in this contract will be permitted beyond this date. In case the last Thursday is a holiday then the contract shall expire on the preceding day.

NIFTY futures contract will have a 3-month expiration cycle. On expiry of a contract, a new futures contract will be introduced on the trading day following the expiry of a contract. The new contract will be introduced for three-month duration. This way, at any point in time, there will be 3 contracts available for trading in the market, i.e. one near month, one mid month and one far month duration respectively.

Table 3: Nifty Futures (As on 15th October, 2003)

Contracts	Open Price	High	Low	Close	Traded Volume	Traded Value (Rs. Cr)	Open Interest Contracts
Oct-2003	1524	1550	1500	1542	21246000	3235.63	5063200
Nov-2003	1528	1550	1502	1543	201600	30.72	151400
Dec-2003	1085	1545	1502	1544	25200	3.83	12400

Source: The Hindu Business Line.

In the month of October 2003, three NIFTY futures contracts will be available for trading viz. October, November, and December respectively. On October 30, 2003, the October contract will expire and hence the January contract would be introduced. Hence the three NIFTY futures contracts that will be available for trading will be November, December and January contracts.

FUTURES ON INDIVIDUAL STOCKS

The Securities and Exchange Board of India board on November 1st, 2001 approved the scheme and risk containment measures for individual stock futures contracts and now 53 scrips are available on which derivatives trading is currently permitted and the following table depicts those stocks.

Table 4

No.	Underlying
1	S&P CNX Nifty
2	CNX IT
	Derivatives on Individual Securities
1	Associated Cement Co. Ltd.
2	Andhra Bank
3	Arvind Mills Ltd.
4	Bajaj Auto Ltd.
5	Bank of Baroda
6	Bank of India
7	Bharat Electronics Ltd.
8	Bharat Heavy Electricals Ltd.
9	Bharat Petroleum Corporation Ltd.
10	BSES Ltd.
11	Canara Bank
12	Cipla Ltd.
13	Digital Globalsoft Ltd.
14	Dr. Reddy’s Laboratories Ltd.
15	Gas Authority of India Ltd.
16	Grasim Industries Ltd.
17	Gujarat Ambuja Cement Ltd.
18	HCL Technologies Ltd.
19	Housing Development Finance Corporation Ltd.
20	HDFC Bank Ltd.
21	Hero Honda Motors Ltd.
22	Hindalco Industries Ltd.
23	Hindustan Lever Ltd.
24	Hindustan Petroleum Corporation Ltd.
25	ICICI Bank Ltd.
26	I-FLEX Solutions Ltd.
27	Infosys Technologies Ltd.
28	Indian Petrochemicals Corpn. Ltd.
29	Indian Oil Corporation Ltd.
30	ITC Ltd.
31	Larsen & Toubro Ltd.
32	Mahindra & Mahindra Ltd.
33	Maruti Udyog Ltd.
34	Mastek Ltd.
35	Mahanagar Telephone Nigam Ltd.
36	National Aluminium Co. Ltd.
37	NIIT Ltd.
38	Oil & Natural Gas Corp. Ltd.
39	Oriental Bank of Commerce
40	Polaris Software Lab Ltd.
41	Punjab National Bank
42	Ranbaxy Laboratories Ltd.
43	Reliance Industries Ltd.
44	Satyam Computer Services Ltd.
45	State Bank of India
46	Shipping Corporation of India Ltd.
47	Syndicate Bank
48	Tata Power Co. Ltd.
49	Tata Tea Ltd.
50	Tata Engineering and Locomotive Co. Ltd.
51	Tata Iron and Steel Co. Ltd.
52	Union Bank of India
53	Wipro Ltd.

Source: www.nseindia.com

The security descriptor for the futures contracts is:

Market type	:	N
Instrument type	:	FUTSTK
Underlying	:	NIFTY
Expiry date	:	Date of contract expiry

Underlying symbol denotes the underlying security in the Capital Market (equities) segment of the Exchange. Expiry date identifies the date of expiry of the contract.

Underlying Instrument: Futures contracts are available on 41 securities stipulated by the Securities and Exchange Board of India (SEBI). These securities are traded in the Capital Market segment of the exchange. Expiry day and trading cycle are the same as that of Index futures.

Difference between Trading Securities and Trading Futures on Individual Securities

For trading in securities, a customer has to open security trading account with securities broker and a demat account with a securities depository. The customer has to put all the money upfront while making purchase of securities. Whereas for trading futures on individual securities, the customer has to open a futures trading account with derivatives broker and simply put in the margin money to buy futures. This helps the futures trader for taking position in underlying security without opening an account with a securities broker.

With every purchase of securities, the holder becomes the part owner of the company and gets all the rights and privileges associated with the security such as receipt of dividends, invitation to the annual shareholders meeting and the power to vote, etc. Through purchase of futures on a security, it creates a legal binding or obligation on the holder to buy the underlying security at some point in future. Security futures do not indicate any ownership in the company.

For selling securities it is mandatory for the customer to buy it beforehand. Even in case of short selling, it is assumed that the security is owned by securities broker and he lends it to the trader for being sold. Whereas in case of futures contract, it is not necessary to buy security before selling it. Selling security futures without previously owning them simply creates an obligation for the trader to sell a certain amount of the underlying security at some point in the future.

Uses of Security Future

Hedging: Stock futures can be used effectively as a risk management tool. In case the prices of investor’s shares are falling, he can enter into a short futures position. If the price of his security falls any further, then the loss he suffered by him on securities could be offset by the profits he makes on his short futures position.

Speculation: if an investor is of the opinion that particular security is undervalued and the price of the same will go up in next few months, he can buy security futures for the same. Security futures provide high leverage to the investors on the expiration of the contract and thus form an attractive offer for speculators.

Similarly, if the investor is of the opinion that the particular security is over valued and the price of the same will fall in next few months, he can sell a two-month future contract. If on the expiration of contract the spot and future price converges, he can make a clean profit.

Arbitrage: The cost of carry ascertains that the futures price stay in line with the spot price. The opportunity for arbitrage arises whenever the future price deviates significantly from its fair value. An arbitrageur can make the best use of this opportunity and make risk less profits by entering into futures contract if he observes that the particular security is overpriced or underpriced.

Futures and Options Trading System

NEAT-F&O, the futures and options trading system of NSE, offers an entirely automated screen based trading for Nifty as well as stock futures & options and an online monitoring and surveillance mechanism throughout the country. It maintains an order driven market endowed with complete transparency of trading operations. It is similar to that of trading of equities in the cash market segment.

Table 5: Contract Specification: Stock Futures

Underlying	Individual securities
Exchange of trading	National Stock Exchange of India Limited
Security descriptor	N FUTSTK_____
Contract size	100 or multiples there of (minimum value of Rs.2 lakh)
Price steps	Re.0.0
Price bands	Not applicable
Trading cycle	The futures contracts will have a maximum of three month trading cycle – the near month (one), the next month (two) and the far month (three). New contract will be introduced on the next trading day following the expiry of near month contract.
Expiry day	The last Thursday of the expiry month or the previous trading day if the last Thursday is a trading holiday.
Settlement basis	Mark to market and final settlement will be cash settled on T + 1 basis.
Settlement price	Daily settlement price will be the closing price of the futures contracts for the trading day and the final settlement price shall be the closing price of the underlying security on the last trading day.

Source: www.nseindia.com

Eligibility of Stocks for Futures and Option Trading

The Securities Contract (Regulation) Act, 1956 has laid down the following eligibility criteria futures and option trading of stocks:

i. The stock should be amongst the top 200 scrips, on the basis of average market capitalization during the last six months and the average free float market capitalization should not be less than Rs.750 Crore.

ii. The stock should be amongst the top 200 scrips on the basis of average daily volume (in value terms), during the last six months and the average daily volume should not be less than Rs.5 Crore in the underlying cash market.

iii. The stock should be traded on at least 90% of the trading days in the last six months.

iv. The holding of non-promoters in the company should be at least 30%.

v. The ratio of the daily volatility of the stock with regard to the daily volatility of the index (either BSE-30 Sensex or S&P CNX Nifty) should not be more than 4, at any time during the previous six months.

vi. The stock on which option contracts are permitted to be traded on one derivative exchange/segment would also be permitted to trade on other derivative exchanges/segments.

SUMMARY

- An index futures contract is basically an obligation to deliver at settlement, an amount equal to ‘x’ times the difference between the stock index value on the expiration date of the contract and the price at which the contract was originally struck.
- If the price of the index futures contract is out of line with the theoretical price, then an arbitrageur can earn abnormal riskless profits by trading simultaneously in the spot (cash) and futures markets.
- When using stock index futures to reduce stock market risk, the anticipation is that any losses arising from movements in stock prices are offset by gains from parallel movement in future prices. While trading in index futures, the participants can buy or sell the ‘entire stock market’ as a single entity.

Chapter IX

Commodity Futures

After reading this chapter, you will be conversant with:

- Types of Commodity Futures
- Trading Procedure for Metals
- Commodity Futures in India

A futures contract, where the underlying asset is a commodity, is referred to as a commodity futures contract.

TYPES OF COMMODITY FUTURES

Agricultural Commodities

The commodities such as corn, soybeans, sugar, cotton, coffee seeds, etc., which indeed form a part of daily consumption, are traded on the futures exchange. Though all of them form a part of agricultural commodities, they are further segregated into grains, soft commodities and meat futures.

Red beans, corn, wheat, soybeans and soybean meal, etc., form a part of grains, whereas commodities like cocoa, coffee, dried cocoon, cotton yarn and raw sugar, etc., form a part of soft commodities. Animal products like live hogs, live cattle, pork bellies, eggs and poultry products form a part of meat futures.

The following table shows the specifications of the major futures contracts for grains, soft commodities and meat futures in the US.

Table 1: Specification of Major US Grain Futures Contracts

	Soybeans	Corn	Soybean Meal	Soybean Oil	Wheat
Exchange	CBOT	CBOT	CBOT	CBOT	CBOT
Symbol	S	C	SM	BO	W
Trading unit	5,000 bushels	5,000 bushels	100 tons	60,000 pounds	5,000 bushels
Deliverable grade	No. 2 Yellow at par and substitutions at differentials set by the exchange	No.2 Yellow at par and substitutions at differentials set by the exchange	One grade of meal only with minimum protein of 44%	One grade of crude soybean oil only	No. 2 Soft Red No.2 Hard Red Winter, No. 2 Dark Northern Spring, at par and No. 1 Northern Spring at par, and other permissible substitutions
Price quotation	Cents and quarter cents per bushel	Cents and quarter cents per bushel	Dollars and cents per ton	Dollars and cents per pound	Cents and quarter cents per bushel
Tick size	1/4 cent per bushel, $12.50 per contract	1/4 cent per bushel, $12.50 per contract	10 cents per ton, $10 per contract	1/100 of a cent per pound, $6 per contract	1/4 cent per bushel, $12.50 per contract
Contract months	Jan, Mar, May, Jul, Aug, Sep, Dec.	Mar, May, Jun, Sep, Dec.	Jan, Mar, May, Jul, Aug, Sep, Oct, Dec.	Jan, Mar, May, Jul, Aug, Sep, Oct, Dec.	Mar, May, Jul, Sep, Dec.
Last trading day	Seven business days before the last business day of the contract month	Seven business days before the last business day of the contract month	Seven business days before the last business day of the contract month	Seven business days before the last business day of the contract month	Seven business days before the last business day of the contract month

Source: Futures & Options, by Edwards & Ma.

Table 2: Specifications of Major US Soft Commodities Futures Contracts

	Sugar # 11	Cotton # 2	Cocoa	Coffee "C"
Exchange	CSCE	NYCE	CSCE	CSCE
Symbol	SB	CT	CC	KC
Trading unit	112,000 pounds	50,000 pounds	10 metric tons	37,500 pounds
Deliverable grade	Raw centrifugal cane sugar	Strict low middling $1\frac{1}{6}$ inch US grown white cotton	Exchange-set tolerances for defects, bean count, bean size, and other standards	Arabia Coffee
Price quotation	Cents per pound	Cents per pound	Dollars per ton	Cents per pound
Tick size	1/100 cent per pound, $11.20 per contract	1/100 cent per pound, $5 per contract	$1 per metric ton, $10 per contract	1/100 cent per pound, $3.75 per contract
Contract months	Jan, Mar, May, Jul, Oct.	Mar, May, Jul, Oct, Dec.	Mar, May, Jul, Sep, Dec	Mar, May, Jul, Sep, Dec.
Last trading day	Last business day of the month preceding the contract month	17th business day of the contract month	11th business day before the first business day of the contract month	One business day prior to the first business day of the contract month

Source: Futures & Options, by Edwards & Ma.

Table 3: Specifications of Major U S Meat Futures Contracts

	Live Cattle	Live Hogs	Pork Bellies
Exchange	CME	CME	CME
Symbol	LC	LH	PB
Trading unit	40,000 pounds	30,000 pounds	40,000 pounds
Deliverable grade	USDA Choice Grade or better fat cattle (steers)	USDA Grade No.1 No.2 and No.3 barrows and gilts	USDA Approved frozen pork bellies, cut and trimmed
Price quotation	Cents per pound	Cents per pound	Cents per pound
Tick size	$0.00025 per pound, $10 per contract	$0.00025 per pound, $7.50 per contract	$0.00025 per pound, $10 per contract
Contract months	Feb, Apr, Jun, Aug, Sep, Oct, Dec.	Feb, Apr, Jun, Jul, Aug, Oct, Dec.	Feb, Mar, May, Jul, Aug.
Last trading day	20th calendar day of the contract month	20th calendar day of the contract month	6th business day prior to the end of the contract month

Source: Futures & Options, by Edwards & Ma.

The months chosen for delivery of futures contracts of seasonal crops, generally fit into the crops harvesting pattern, while the number of contracts available for each contract depends on the level of active trading.

Apart from the specifications mentioned above, in agricultural commodities, each of the commodities traded has specific symbol while trading on the exchange. For example, on CBOT, Soybeans, Corn, Soybean Meal and Wheat are referred with symbols, ‘S’, ‘C’, ‘SM’ and ‘W’ respectively.

Crush Spread

Under agricultural futures, there is a popular type of spread known as Crush Spread. It implies the simultaneous purchase of a commodity (say, soybean) futures coupled with the sale of the same commodity’s by-products futures. Example: Soybean oil futures and soybean meal futures.

The crush spread is nothing but the expected profit margin of the commodity processors. The following formula is helpful in calculating the crush spread:

C = (Price of by-product 1 x Yield expected) + (Price of by-product 2 x Yield expected) – Price of commodity.

Obviously, the formula should be adjusted to take the same unit of measurement in all the by-products and commodities. This is required because the unit of sale of different products may be different. For example, soybean may be sold in bushels, oil in lb. and so on.

Sometimes, the margin becomes negative. In that case, a reverse crush spread should be opted for, which means selling the commodity futures while buying the futures of the by-products.

The CBOT trades on commodities such as corn, soybeans, soybean meal, wheat, soybean oil, etc. The CME trades on live hogs, live cattle and pork bellies, etc.

Metallurgical Commodities

The metallurgical category includes the genuine metals and petro products. The metals are further grouped into precious and industrial metals. In general, the precious metals are in relative short supply and they retain their value irrespective of the conditions of the economy.

On the other hand, the value of the industrial metals are based on the demand and supply conditions. There is no seasonal demand or an apparent demand-supply cycle for industrial metals. London Metal Exchange (LME) is the most popular and organized exchange for trading metals.

LME mostly trades on precious metals such as Gold, Silver, Platinum, Palladium, etc., and industrial metals like Aluminum, Copper, Zinc, Lead, Nickel, Tin, etc.

The following table shows the specifications of the major futures contracts for precious metals in London.

Table 4: Contract Specifications of LME Industrial Metal Futures

	Aluminum	Copper	Zinc	Lead	Nickel	Tin
Price quotation	US $/ton	Sterling/ton	US $/ton	Sterling/ton	US $/ton	US $/ton
Contract size	25 ton	25 ton	25 ton	25 ton	6 ton	5 ton
Minimum price fluctuation	$1 per ton	50 pence per ton	$1 per ton	25 pence per ton	$1 per ton	$1 per ton
Contract months	Daily to 3 months then monthly to 27 months	Daily to 3 months then monthly to 27 months	Daily to 3 months then monthly to 27 months	Daily to 3 months then monthly to 15 months	Daily to 3 months then monthly to 15 months	Daily to 3 months then monthly to 15 months
Quality *	Primary aluminum of minimum 99.70% purity with maximum permissible iron content 0.2% and maximum permissible silicon content 0.10% 2%	Electrolytic copper in the form of either cathode (Grade A) or wirebars (Grade A of standard dimensions in the weight range 110 kgs to 125 kgs)	Special high-grade zinc of minimum 99.995% purity and weighing not more than 55 kgs each	Refined pig lead of minimum 99.97% purity and not more that 55 kgs each	Primary nickel of minimum 99.8% purity	Refined tin of minimum 99.85% purity and weighing range between 12kgs & 50 kgs.
Quantity tolerance	2%	2%	2%	2%	2%	2%

* Deliveries of all metals must be of brands listed on the LME approved list for that metal.

Source: Futures & Options, by Edwards & Ma.

TRADING PROCEDURE FOR PRECIOUS METALS

In addition to the London Metal Exchange (LME), the Commodity Exchange (COMEX) is the other major exchange trading in precious metals. The COMEX has a three-day delivery period. The contracts are usually for a period of one month and the delivery of metal which is stamped by a recognized dealer is accepted at the exchange's warehouses.

Under the three-day delivery period, the first day is the presentation day in which the short investor states his intention to deliver the metal. The invoice is calculated using the settlement prices of the presentation date. The second day is known as the notice day in which the exchange announces the delivery of the position on the next day. On the third day (the delivery day) the short investor delivers the precious metal and the payment is made by the long investor.

The following is the formula used to calculate the invoice price of the deal:

Invoice Price = Settlement Futures Price x Weight in ounces x Fineness of metal.

Gold to Silver Ratio

In the precious metal market, the Gold to Silver ratio is a common spread ratio used. It implies the number of silver ounces required to equal the value of one gold ounce. Once the ratio is set which is usually 40, the trading (hedging) is done by observing the ratio on a daily basis.

If the ratio declines, the traders sell gold and buy silver to maintain the ratio and vice versa.

Trading Procedure for Industrial Metals

The industrial metals are traded mostly at the LME where volumes of some of the metals is more than double of those of the American Exchanges. The trading is done as per the operations of the LME described above. Despite the strict controls maintained by the LME and other major metal exchanges, it is observed that the prices of precious and industrial metals vary throughout the year, showing more volatility than expected.

ENERGY COMMODITIES

Petroleum products consist of heating oil, crude oil, gasoline and propane that are traded on futures market and are referred to as energy futures.

New York Mercantile Exchange (NYMEX) is the world's leading energy futures exchange.

The following table shows the specifications of the major futures contracts for petroleum products in the US.

Table 5: Specifications of Major US Energy Futures Contracts

	Crude Oil	Heating Oil	Unleaded Gasoline
Exchange	NYMEX	NYMEX	NYMEX
Symbol	CU	HO	HU
Trading unit	1000 barrels	42000 gallons	42000 gallons
Deliverable grade	Par crude: West Texas Intermediate 0.4% sulfur 40 API gravity; other deliverable crude oil grades with 0.05% sulfur by weight or less not less than 34 API gravity and not more than 45 API gravity		
Price quotation Tick size	Dollars per barrel $0.01 per barrel	$10 per contract	Cents per gallon $0.01 per gallon
Contract months	All months	All months	All months
Last trading day	3rd business day prior to the 25th calendar day of the month preceding the delivery month	Last business day of the month preceding the delivery month	Last business day of the month preceding the delivery month

Source: Futures & Options, by Edwards & Ma.

Contracts are traded for delivery in all months, for at least 15 months into the future. NYMEX uses symbol such as CU for Crude Oil, HO for Heating Oil and HU for Unleaded Gasoline.

The trading specifications at the exchange include price quotation, trading unit (such as 1,000 barrels for crude oil and 42,000 gallons for unleaded gasoline, etc.) deliverable grade (industry standards for fungible No.2 heating oil specifications), tick size ($0.01 per barrel, $10 per contract for crude oil, $0.01 per gallon, $4.20 per contract, etc.) and contract months. Backwardation is a very common feature in energy fuel futures.

International Trends

The potential benefits and risk-management challenges is the major evidence for the potential growth in the commodity market with the continuous demand for commodity derivative products, the size of the global derivatives markets including commodity derivative reached a notional principal value of $8,112.73 mn in 2003 from mere $1587.70 mn in 1994.

Table 6: Trend in Commodity Market
(in millions, including options on individual equities)

Year	US Exchanges	Non-US Exchanges	Total
1994	807.87	779.83	1,587.70
1995	776.64	905.99	1,682.63
1996	793.63	975.34	1,717.31
1997	905.16	1,025.07	1,931.31
1998	1,033.20	1,142.65	2,175.81
1999	1,100.86	1,301.98	2,405.80
2000	1,313.65	1,675.80	2,989.18
2001	1,578.62	2,768.70	4,382.22
2002	1,844.90	4,372.38	6,217.28
2003	2,172.52	5,940.22	8,112.73

Source: Futures Industry Association.

Though the overall trading volume of derivatives market has increased in the past 10 years, the volume for agricultural commodities and precious metals has declined sharply in past two consecutive years. The Energy Products are in the boom phase and it grew by 9.1% during Jan-Oct 2004 as compared to Jan.-Oct. 2003. For the period of Jan.-May 2005, energy trading increased globally by 13.9% to 106.2 mn contracts.

Table 7: Global Futures and Options Volume by Sector

Sector	Jan-Oct 2004	Jan-Oct 2003	% Change	Jan-May 2005	Jan-May 2004	% Change
Equity Indices	3,181,124,152	3,283,896,887	-3.1	1,481,191,567	1,609,264,744	-8
Interest Rate	1,904,380,990	1,610,422,074	18.3	1,077,955,413	930,289,610	15.9
Individual Equities	1,655,604,644	1,289,569,674	28.4	962,672,976	881,417,401	9.2
Ag Commodities	236,496,821	214,674,164	10.2	129,784,902	133,333,009	-2.7
Energy Products	202,561,512	185,588,869	9.1	106,230,698	93,271,444	13.9
Non-Precious Metals	88,108,840	73,239,075	20.3	58,371,959	39,249,779	48.7
Foreign Currency/Index	83,194,448	63,775,407	30.4	38,914,843	47,001,663	– 17.2
Precious Metals	51,220,592	55,407,734	-7.6	19,365,941	28,607,902	– 32.3
Other	683,571	561,068	21.8	595,047	321,555	85.1
Total	7,403,375,570	6,777,134,952	9.2	3,875,123,346	3,762,757,137	3

Source: Futures Industry Association.

COMMODITY FUTURES IN INDIA

Although the commodity derivatives market has been in existence for long in India, the first organized trade took place in 1875 through the establishment of Cotton Trade Association followed by oilseeds, jute, wheat and some other commodities. Since then, contracts on various other commodities have been introduced through various local exchanges throughout the country. But the commodities market was in deep slumber post independence, when the country moved down the socialist path. The Indian Government banned the cash settlement and options trading for few commodities under the Forwards Contract (Regulation) Act in 1952 and introduced minimum support prices to many agricultural products directly to protect farmers. Commodity trading further started in 1970 when the government permitted trading forwards on few commodities, but the volume was quite low. Finally, commodity future picked up again with the government promotion of various exchanges and liberalization of the policies. With a view to improve exchange function, price discovery mechanism and price risk management the regulatory role went to the Forward Markets Commission.

Table 8: Chronological Order of the Development of Commodity Futures Exchanges

Year	Exchange Established	Commodity Traded
1875	Bombay Cotton Trade Association	Cotton
1893	Bombay Cotton Exchange Limited	Cotton
1900	Gujarati Vyapari Mandali	Groundnut, Castorseed and Cotton
1913	Chamber of Commerce, Hapur	Wheat
1919	Calcutta Hessian Exchange Limited	Raw Jute and Jute Goods
1920	Gold and Silver Exchange, Mumbai	Gold and Silver
1921	East India Cotton Association	Cotton
1927	East Indian Jute Association	Raw Jute
1945	East India Jute and Hessian Limited	Raw Jute and Jute Goods
1951	Rajkot Seeds Oil and Bullion Merchants' Association Limited	Oil and Bullion
1956	Bombay Commodity Exchange	Castor seed
1956	Ahmedabad Commodity Exchange	Castorseed, Cottonseed, Cottonseed oil and oil cake
1956	The Spices and Oilseeds Exchange Ltd.	Turmeric
1957	India Pepper and Spices Trade Association	Spices
1970	Vijai Beopar Chamber Limited, Muzaffarnagar	Gur
1973	Bhatinda Om Oil and Oilseeds Exchange Ltd.	Gur
1982	The Rajdhani Oils and Oilseeds Exchange	Gur
1984	The Meerut Agro Commodities Exchange Co. Ltd.	Gur
1997	Coffee Futures Exchange Limited	Coffee
1998	Bombay Commodity Exchange	Castor oil
1999	National Board of Trade	Soybean oil, Mustard seed oil and cake
2000	Bombay Commodity Exchange	RBD Palmolein
2000	The Kanpur CommodityExchange Limited	Mustard oil and cake
2002	National Multi-Commodity Exchange of India Limited	Edible oils

Source: Forward Markets Commission.

In 2001, financial derivatives trading started with the index future. In 2002, the FMC also decided to encourage the modern commodity exchange, that can work electronically and at the end of November 2002, the National Multi-Commodity Exchange of Ahmedabad (NMCE) came out with the first electronic commodity exchange. After that in 2003, the Multi-Commodity Exchange (MCX) and the National Multi-Commodity Derivatives Exchange (NCDEX) started, which are promoted by ICICI, NSE and other financial institutions. Presently, futures trading is permitted in all the commodities through 25 Exchanges/Associations.

Table 9: Leading Contracts on India's Major Multi-commodity Exchange
(Measured by dollar value of contract traded January-February 2005)

MCX		NCDEX		NMCE	
Silver	$1,526,718,464	Guar	$4,491,483,090	Raw-Jute	$31,631,627
Gold	$516,055,759	Soya	$603,603,748	Pepper	$25,690,128
Soya Oil	$438,660,878	Urad (Legume Black)	$490,847,806	Coffee	$25,281,079
Crude Oil	$290,182,815	Silver	$458,760,202	Rubber	$11,930,987
Guar Seed	$14,533,821	Chana (Chick Peas)	$355,207,952	Cardamum	$1,974,406

Note: Official sources do not provide information on the number of contracts traded. The data on the value of turnover was obtained from a report released every other week by the Forward Markets Commission. Local currency values were translated into dollars at Rs.43.76 per USD, the average exchange rate during the two-week period ending April 15.

Source: Forward Markets Commission Fortnightly.

Pricing Mechanism

Commodity future can serve as a pricing mechanism for price discovery either for the present or for expected predetermined future prices. It has been a major concern for the producers as well as the consumers in an agriculture dominated country like India. They are often referred to as efficient in price discovery process. It means the price quoted for a commodity on the futures market will be the best one for the actual price of the commodity it had. In general, people may think that commodity exchanges prices are established at which commodity futures are bought and sold. But the idea is not correct. In fact, it depends on the demand and supply conditions. Say for example, if the demand for buyers is more than suppliers then the price will rise and fall if sellers are more than buyers. The best way in identifying how the trade is made on the floor of commodity exchange is to think in terms of what happens at a public auction.

Table 10: Commodities Available in Different Mode or Categories

Precious Metals: Gold, Silver, Platinum etc.
Other Metals: Nickel, Aluminum, Copper etc.
Agro-based Commodities: Wheat, Corn, Cotton, Oil, Oilseeds etc.
Soft Commodities: Coffee, Cocoa, Sugar etc.
Live Stock: Live Cattle, Pork Bellies etc.
Energy: Crude Oil, Natural Gas, Gasoline etc.

Source: mcxindia.com

Settlement Procedure

The futures market in commodities offers both cash and delivery-based settlements where the investors have the choice of selection in between the two. Trading in contract month opens for every month on the twenty first day, three months prior to the contract month. If once the buyer opts to take the delivery of the commodity a transferable receipt from the warehouse where goods are stored is issued in favor of the buyer. On producing the receipt, the buyer can claim the commodity from the warehouse.

All the settlement functions are taken care of by clearing house or clearing corporation. The clearing house has number of members (mostly financial institutions) responsible for the clearing and settlement of commodities traded on the exchange. The margin accounts for the clearing house members are adjusted for gains and losses at the end of each day. Thus depending on a day's transactions and price movement, the members either need to add funds or can withdraw funds from their margin accounts at the end of the day.

National Securities Clearing Corporation Limited (NSCCL) undertakes clearing of trades executed on the NCDEX. The settlement guarantee fund is maintained and managed by NCDEX.

Difference between Commodity and Financial Derivatives

- In case of financial derivatives, most of the positions (contracts) are cash settled whereas in case of commodity derivatives, there is a possibility of physical settlement. This means that if the seller chooses to hand over the commodity instead of the difference in cash, the buyer must take physical delivery of the underlying asset.
- In case of physical settlement of contracts, financial assets are not bulky and hence do not need special facility for storage. Due to the bulky nature of the underlying assets, physical settlement in commodity derivatives creates the need for warehousing.
- The concept of 'varying quality of asset' does not actually exist in case of financial underlyings. However in case of commodities, the quality of the asset underlying a contract can vary largely.
- The process of taking physical delivery in commodities is quite different from the process of taking physical delivery in financial assets. The seller intending to make delivery has to take the commodities to the designated warehouse and the buyer intending to take delivery has to go to the designated warehouse and pick-up the commodity.
- In contrast to the case of equity futures, a seller of commodity futures has the option to give notice of delivery. This option is given during a period identified as 'delivery notice period'. The intention of this notice is to allow verification of delivery and to give adequate notice to the buyer of a possible requirement to take delivery. In all commodity exchanges, delivery notice is required to be supported by a warehouse receipt. In the commodities market, both positions (buyer and seller) can still be closed out before expiry of the contract.

Hedging Using Commodity Futures

Producers of agricultural commodities face price risk and production risk over time and within a marketing year. In case of agricultural commodities, price risk can occur for a number of reasons like drought, floods, uncertain rainfall, natural calamities, near record production, increase in demand, decrease in international prices, etc. One means of reducing this risk is through the commodity futures exchange markets. Agricultural producers can use commodity futures to hedge the potential costs of commodity price volatility.

Hedging in the futures market involves a two step process. Depending upon the cash market position, a hedger initially either will buy or sell futures. For example, a firm which owns or plans to purchase or produce a cash commodity will sell futures to hedge this cash position. A long hedge involves firm purchasing futures to protect itself against a price increase in a commodity prior to purchasing it in either the spot or forward market.

In the second stage, once the cash market transaction materializes, the futures position is no longer required and hence the hedger will close his futures position, i.e., if he has gone long on a contract, he will sell it.

Alternatively, if he has initially sold a futures contract, he will buy one. It should be noted that both the opening and closing positions must be for the same commodity, same number of contracts and delivery month.

SUMMARY

- Commodity futures contracts are agreements to buy or sell a standard quantity of specific commodity, at a predetermined future date and at a price agreed upon between the parties.
- Commodity futures can be for agricultural commodities, metallurgical commodities and energy commodities.
- Due to various lags between the policies, poor implementation process, the proper impact of various reforms brought in are not seen, but recent trends in the commodity market have come out with a ray of hope in the commodity derivative market.

Chapter X

Options

After reading this chapter, you will be conversant with:

- Concept of Options
- American and European Options
- Options Markets in India
- Option Pricing Models
- Exotic Options

Introduction

Options and Futures are the result of unrelenting search for better financial instruments. They belong to a class of instruments referred to as ‘Derivatives’ because they derive their value from an underlying commodity or a financial asset. The underlying commodities and financial assets can range from mundane products like wheat and cotton to precious items like gold, silver, petroleum and financial assets like stocks, bonds and currencies. Options on commodities have existed in different forms since 1860 for products as diverse as gold, wheat and tulip bulbs in the US. An active over-the-counter market in stock options has also existed there for nearly a century. However, large-scale manipulations by intermediaries and the absence of standardized contracts resulted in the investors incurring heavy losses due to which the commodity options disappeared from the listing of many exchanges by 1968. It was only in 1973 that organized exchanges began trading options on equities. In 1982, futures on equity and options on bonds made their appearance on stock exchanges.

An option means a choice. An option in a financial market is created through a financial contract. This financial contract gives a right to its holder to enter into a trade at or before a future specified date. The underlying assets on options include stocks, stock indices, foreign currencies and debt instruments, commodities and futures contracts. These are called stock options, index options, commodity options, currency options and futures options. An option is different from other derivatives in that it provides a downside protection against risk and also an upside benefit from favorable movements in the underlying asset prices.

CONCEPT OF OPTIONS

Meaning of Option

An Option is a contract in which the seller of the contract grants the buyer, the right to purchase from the seller a designated instrument or an asset at a specific price which is agreed upon at the time of entering into the contract. It is important to note that the option buyer has the right but not an obligation to buy or sell. But, if the buyer decides to exercise his right the seller of the option has an obligation to deliver or take delivery of the underlying asset at the price agreed upon. The seller of the option is also called the writer of the option.

Generic Terms Used in Options

Call Option

An option contract is called a ‘call option’, if the writer gives the buyer of the option the right to purchase from him the underlying asset.

Put Option

An option contract is said to be a ‘put option,’ if the writer gives the buyer of the option the right to sell the underlying asset.

Exercise Date

The date at which the contract matures.

Strike Price

At the time of entering into the contract, the parties agree upon a price at which the underlying asset may be bought or sold. This price is referred to as the exercise price or the striking price. At this price, the buyer of a call option can buy the asset from the seller and the buyer of a put option can sell the asset to the writer of the option. This is regardless of the market price of the asset at the time of exercising.

Expiration Period

At the time of introducing an option contract, the exchange specifies the period (not more than nine months from the date of introduction of the contract in the exchange) during which the option can be exercised or traded. This period is referred to as the Expiration Period. An option can be exercised even on the last day of the expiration period. Beyond this date the option contract expires.

Such options, which can be exercised on any day during the expiration period are called American options. There is another class of options called European options. European options can be exercised only on the last day of the expiration period. For these options the expiration date is always the last day of the expiration period.

Depending on the expiration period an option can be short-term or long-term in nature. Warrants and convertibles belong to the latter category and are often issued by companies to finance their activities. (In India, Reliance Petroleum Ltd. has recently converted its warrants issued as a part of triple optional convertible debentures into fully paid equity shares.)

Option Premium or Option Price

This is the amount which the buyer of the option (whether it be a call or put option) has to pay to the option writer to induce him to accept the risk associated with the contract. It can also be viewed as the price paid to buy the option.

Consider the data given below. This is regarding the options trading at Chicago Board Option Exchange.

Table 1

Expiry Date Strike Price	Sales	Open Int.	Week's ($)		Closing Price ($)	Net Change	N.Y. Close ($)
			High	Low			
IBM Jan. 40	1172	3459	7 1/2	6	7 1/8	+1 3/8	45 7/8
IBM Jan. 40 p	2030	6479	1 1/2	7/8	15/16	–9/16	45 7/8
IBM Jan 45	2410	10184	4 1/8	3	3 5/8	+11/16	45 7/8
IBM Jan. 45 p	1827	8452	3 1/2	2 3/8	2 9/16	–1 3/16	45 7/8
IBM Jan. 50	4964	11862	1 15/16	1 5/16	1 11/16	+7/16	45 7/8
IBM Apr. 45	238	173	5 1/8	4	4 3/4	+7/8	45 7/8
IBM Apr. 50	755	676	2 7/8	2 1/8	2 11/16	+9/16	45 7/8
John Jn. Sep. 35	317	439	6 3/8	5 1/4	5 3/8	+1/4	39 7/8
John Jn. Sep. 40	1146	2376	1 15/16	7/8	7/8	– 3/8	39 7/8
K Mart Oct. 25	222	327	3/16	1/8	1/8	– 3/6	22

Source: Barron's – Dow Jones & Company.

For explanation, we consider the first row of quotations (IBM Jan. 40).

In the first column, the company's name (IBM) on whose stock the option is being traded, the month in which that particular option is going to expire (January), the exercise price (40) and whether it is a put option is given. All options that are not indicated as put options are call options. The second column gives the number of contracts that were traded on that day. Since each contract represents 100 shares of the company, trading 1172 contracts on that day involved a total of 117200 shares of IBM. The figure in the third column (3459) gives the aggregate (cumulative) number of exercisable contracts that exist till date. It is referred to as Open Interest. An opening writing transaction will add to the existing positions and a closing writing transaction will reduce them.

The figures in the fourth column (7 1/2, 6), give the highest and the lowest prices in dollars at which the contracts were traded. The figures in the fifth column give the price of the last trade. The sixth column (1 3/8) gives the change between the closing (last) trade of 7 1/8 and the prior week's last trade of 6 6/8.

The last column gives the closing price of the underlying stock at the New York Stock Exchange. This facilitates the comparison of the prices of stocks and options.

Now, look at the following table regarding stock options of Satyam Computer trading at the National Stock Exchange (NSE) as on October 22, 2003.

Table 2

Instrument Type	Underlying	Expiry Date	Option Type	Strike Price	High Price	Low Price	Prey Close	Last Price	Number of contracts traded	Turnover in Rs. Lakh	Underlying Value
OPTSTIK	SATYAMCOMP	30OCT2003	CA	300.00	13.00	10.90	11.35	11.95	146	546.83	293.50
OPTSTIK	SATYAMCOMP	30OCT2003	CA	310.00	9.25	7.60	8.05	8.00	121	462.39	293.50
OPTSTIK	SATYAMCOMP	30OCT2003	CA	320.00	5.70	4.85	5.35	5.00	29	113.17	293.50
OPTSTIK	SATYAMCOMP	30OCT2003	CA	290.00	18.00	14.70	16.05	16.20	30	110.29	293.50
OPTSTIK	SATYAMCOMP	30OCT2003	PA	300.00	16.00	14.00	16.00	15.30	27	101.98	293.50
OPTSTIK	SATYAMCOMP	30OCT2003	PA	290.00	10.50	9.00	10.55	9.60	26	93.51	293.50
OPTSTIK	SATYAMCOMP	30OCT2003	PA	310.00	22.00	20.10	21.55	22.00	14	55.59	293.50
OPTSTIK	SATYAMCOMP	30OCT2003	PA	280.00	6.70	4.80	5.95	5.60	15	51.43	293.50
OPTSTIK	SATYAMCOMP	30OCT2003	PA	260.00	2.00	1.20	1.35	2.00	14	43.98	293.50
OPTSTIK	SATYAMCOMP	30OCT2003	CA	280.00	22.90	21.50	20.45	21.50	11	39.79	293.50
OPTSTIK	SATYAMCOMP	30OCT2003	PA	250.00	1.25	1.00	0.75	1.00	10	30.14	293.50

Source: www.nseindia. com

In the first column, the instrument type is mentioned as 'OPTSTK' representing a stock option. The second column gives the name of the stock on which the option is traded on the exchange and in this case, it is Satyam computers. Third column provides the date on which the option contract will be expired. The fourth column depicts the option type whether it is American or European where 'CA' and 'PA' represents the Call and Put American respectively. The fifth column represents the strike price at which the option can be exercised. Columns sixth, seventh and ninth column represents intra-day high, low and closing prices respectively. The eighth column gives the closing price on the last trading day. The tenth column gives the number of contracts traded. Satyam's contract size is 1200 shares. The eleventh column gives the turnover in rupees and the last column gives the current price of the underlying instrument, i.e., the stock of Satyam computers.

Expiration Cycle

The options listed in the stock exchanges and introduced in certain months expire in specific months of the year only. This is due to the fact that option contracts have to expire within nine months from the date of their introduction. Exchanges previously used to assign an issue to one of the three cycles. First is January, April, July and October; other is February, May, August and November; third is March, June, September and December. This has been modified now to include both the current month and the following month, plus the next two months in the expiration cycle so that the investors are always able to trade in the options. Therefore, now the first cycle will be January, February, April and July, the second cycle will be February, March, April and July and the final cycle will be March, April, July and October.

Pay-off from an Option

We will look at profit/loss made by an investor when he decides to exercise the option.

Position Limit: The maximum number of options contracts per investor.

Exercise Limit: The maximum number of contracts that can be exercised per investor.

Exercise Price Spacing: The usual exercise price spacing is:

Spacing	Stock Price
\$ 10.00	>\$200.00
\$ 5.00	\$25.00 – \$200.00
\$ 2.50	<\$25.00

At-the-money: An option whose exercise price is equal to the current spot price is said to be at-the-money.

In-the-money: A call option is in-the-money when the strike price is below the current spot price of the underlying asset; a put option is in-the-money when the strike price is above the current spot price of the underlying asset.

Out-of-the-money: A call option is said to be out-of-the-money when the strike price is above the spot price of the underlying asset or a put option is said to be out-of-the-money when the strike price is below the current spot price of the underlying asset. The buyer makes a loss if he exercises the option out-of-the-money.

	Put Options
Out-of-the-Money	Stock price > Exercise price
In-the-Money	Stock price < Exercise price
At-the-Money	Stock price = Exercise price

(An option is near the money if the current price of the underlying asset price is close to the strike price. A call is deep in-the-money if the price of the underlying asset is considerably above the strike price and a put is deep in-the-money if the stock price is considerably below the exercise price.)

Intrinsic Value

Intrinsic value of an option is the value of the profits that are likely from the option. It consists of the profit that will accrue, if the option is exercised today (in the case of an American) or the present value of the profit (in the case of an European option).

The Intrinsic Value is also the value of an option takes when it is in-the-money. For a call it is max (0, S – X) and for a put it is max (0, X – S) where S and X are spot price and strike price of the underlying asset respectively.

Time Value

The difference between the option premium and the intrinsic value.

Pay-off of an Option

The profit/loss that arise by way of exercise/non-exercise of the option.

Covered Call Writing

An option contract is said to be a Covered Call Option, when the option is covered or protected by the writer by depositing the shares of the company on which the option is written in an escrow account with the brokerage firm. Therefore, the writer of a call option does not have to deposit any cash as such and whenever an exercise notice is received from the OCC, the shares are delivered.

In case, the option expires or if the writer enters into an offsetting transaction he can withdraw the stocks deposited.

Naked Call Writing

If a trader writes a call option without owning the underlying stock, it is called as Naked Call Writing.

When the writer does not own the underlying stock, he has to deposit the necessary amount of margin with the brokerage firm who in turn deposits it with the exchange. Sometimes, the deposit required by the broker may be higher than the deposit required by the exchange.

Naked Put Writing

In this situation, the brokerage firm does not have either the cash or the stock of companies as security deposited by the writer of the put option.

- **Calculation of the Initial Margin for Naked Options:** The method of calculation of the margin differs from exchange to exchange.

We explain the method followed frequently with an example.

If the investor writes a naked call or put option which is 'Out-of-the-money', the margin is calculated in two ways and the higher of these two is deposited as the margin.

The First Method

i. Calculate the option premium for 100 shares (each option contract is on 100 shares).

ii. Then compute 0.20 (market value per share)(100).

iii. Then compute the amount by which the contract is 'Out-of-the-money'.

The margin amount is given by (i) + (ii) – (iii).

The Second Method

Margin = 100 x Option premium per share + 0.10 (Stock's market price)(100).

Illustration 1

An option trader writes a single naked call option. The option premium is Rs.2. The stock price and the exercise price are Rs.52 and Rs.55 respectively. Calculate the margin required.

Solution

The option is Rs.3 out-of-the-money. We calculate the margin by both the methods.

First Method

Option premium for 100 shares is Rs.200. Substituting, in the formula:

100 x Option premium per share + 0.20 (stock's market price) (100) – The amount by which the contract is 'Out-of-the-money'.

We have,

(2)(100) + 0.20(52)(100) – 100(55 – 52) = 940.00

Second Method

The formula is = 100 x Option premium + 0.10 (Stock's market price)(100)

= 200 + 0.10(52)(100)

= 720.00

The initial margin required is, therefore, the higher of two which is Rs.940.

Illustration 2

A trader writes a single put option at a premium of Rs.3.50. The stock's exercise price and market price are Rs.32.00 and Rs.35.00 respectively. Calculate the margin deposited by the trader at the brokerage firm.

Solution

Margin is calculated by two methods, and highest of the two is deposited.

First Method

Margin = Option Premium x 100 + 0.20 (Market value of the share) (100) – 100 (Stock's market price – Exercise price)

= 3.50 x 100 + 0.20(35.00) (100) – 100 (35 – 32)

= 350 + 700 – 300

= Rs.750.00

Second Method

Margin for single

Put option = 100 x Option premium + 0.10 (Stock's market price) 100

= 350 + 0.10 (35)(100)

= Rs.700.00

Therefore, margin to be deposited is the higher of these, which is Rs.700.

Calculation of Margin for Naked Put Option which is 'In-the-money'

For a naked put option, which is 'In-the-money', the margin is calculated as follows:

i. Calculate the option premium for 100 shares;

ii. Calculate 0.20 (Stock's market price) (100).

Then, the margin = (i) + (ii).

Illustration 3

An option trader writes a single naked put option. The option premium is Rs.2. The stock price and the exercise price are Rs.36 and Rs.38 respectively. Calculate the margin required.

Solution

We calculate the option premium which is 2 x 100	= Rs.200.
Then, we calculate 0.20(36)(100)	= Rs.720
Margin to be deposited = 200 + 720	= Rs.920.

Calculation of Margin for Naked Call Option which is 'In-the-money'

In this case, the margin is calculated as follows:

i. Compute the premium for 100 shares;

ii. Compute 0.20(Stock's market price)(100).

Then, the Margin = (i) + (ii).

We observe that, this method is similar to the method employed in calculation of margin for naked put option which is 'In-the-money'.

Illustration 4

An investor writes a naked call option at a premium of Rs.3. The current market price of the stock is Rs.64 and the exercise price is Rs.60. Calculate the initial margin.

Solution

In case of call option, Margin = Option premium + 0.20 (Stock's market price) (100)

= 100 x 3 + 0.20(64)(100)

= 300 + 1,280

= Rs.1,580.

Warrants

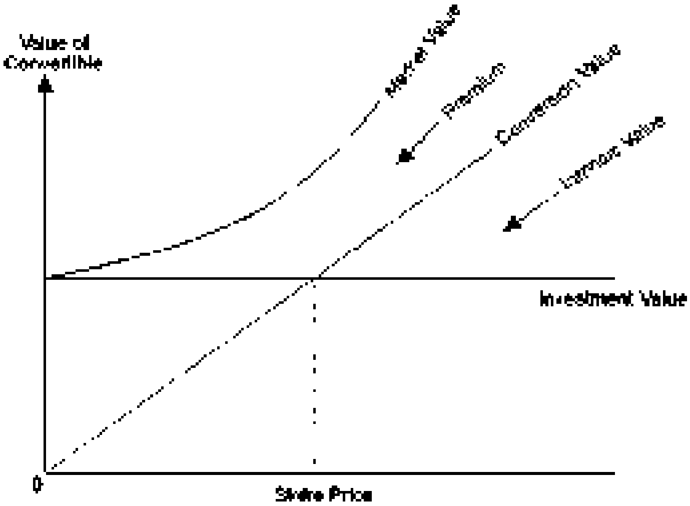
Warrants are long-term options with life of five years and above and are issued by companies and financial institutions. Some may be traded on the stock exchanges. Warrants are mostly issued in order to make debt stock more attractive to the investors by attaching options to subscribe to the equity capital of the company at a later date at a certain price. They can be issued either by the same company or by a third party in order to raise funds for the company. Warrants do not carry dividend payments and have no initial service costs.

Convertible Bonds

Convertible bonds are another type of options, under which bonds or unsecured loan holders are given a right to exchange their loan stock into equity shares at a future date, at a pre-decided exchange ratio. The market value of a convertible bond tends to be higher than the investment value and conversion value and the difference is called the premium, as depicted in the graph.

The difference between the conversion value and investment value is called the intrinsic value.

Figure 1



AMERICAN AND EUROPEAN OPTIONS

An American option can be exercised on any business day within the life of an option including the expiration date. European option can be exercised only at the expiration date.

Exchange Traded Options

Stock options trade on Chicago Board of Options Exchange (CBOE), Philadelphia Stock Exchange, American Exchange (AMEX), Pacific Exchange and New York Stock Exchange. Futures options trade on all the futures exchanges. All futures exchanges trade options on active futures contracts. Option trading on individual foreign currencies trade on Philadelphia Stock Exchange.

The table 3 below gives some of the leading option exchanges in the United States and the instruments on which options' contracts are traded.

Table 3

Exchange Name	Assets on which Options are Traded
Chicago Board Options Exchange	Individual stocks, Stock indices, Treasury securities
American Stock Exchange	Individual stocks, Stock indices
Philadelphia Stock Exchange	Individual stocks, Stock indices, Currencies
Pacific Stock Exchange	Individual stocks, Stock indices
New York Stock Exchange	Individual stocks, Stock indices
Chicago Mercantile Exchange	Futures (on agricultural goods, stock indices, debt instruments and currencies)
Chicago Board of Trade	Futures (on agricultural goods, precious metals, stock indices and debt instruments)

But the volumes traded differ from exchange to exchange. While CBOE leads in equity and index options, Philadelphia stock exchange leads in foreign currency options. In case of options on futures, Chicago Board of Trade and Chicago Mercantile Exchange are the leaders.

Factors Influencing Option Prices

The value of an option depends on six factors:

C_0 or $P_0 = f(S_0, E, , t, r_f, d)$

Where,

C_0 = Value of call option

P_0 = Value of put option

E = Exercise price

S_0 = Price of underlying stock

f = function of

σ^2 = Price volatility of underlying stock

t = Time to expiration

r_f = Risk-free interest rate

d = Cash dividend.

i. The spot price or current price of the underlying asset.

ii. The exercise price or strike price of the option.

iii. The time-to-maturity or time-to-expiration.

iv. Volatility of the underlying asset or volatility in the price of underlying asset.

v. The risk-free rate of interest.

vi. Dividends expected during the life of the option, in case of dividend paying stocks.

Zero Cost Options

Zero cost options are types of long option positions financed by the sale of other options. They can be divided into constituent options that have the same strike price. Hedging is also possible by buying out-of-the-money puts and simultaneously selling in-the-money calls. The main advantage of this type of options is that premium is not there.

Current Stock Price

When call option is to be exercised in future, the net flow from it will be the amount by which the stock price exceeds the strike price. Hence, the value of the call option increases with increase in the stock price while its value decreases whenever the stock price declines. For a put option, the net flow on exercise is the amount by which its strike price exceeds the stock price. Therefore, the value of a put option decreases with increase in the stock price while, its value increases whenever stock price declines.

Strike Price

The value of a call option increases with decline in strike price. On the other hand, value of the call option decreases when strike price increases. This happens because the value of call depends on the difference between stock price and strike price as stated earlier. Similarly, the difference between the strike price and the stock price determines value of a put option. Therefore, pay-off from a put increases with increase in the strike price, while the pay-off decreases with decline in the strike price.

Time to Expiration

The impact of "Time to expiration" on the stock prices varies depending on whether the option is American or European. In case of American option, whether call or put, the holder has a right to exercise any time during the life of the option. The longer the "Time to expiration", the greater the opportunity. Hence if the "Time to expiration" is longer, then the option price will be higher. However, this does not hold good for European options since the option holder can exercise only on maturity so no definitive relationship can be established between time to expiration and option price in case of European options.

Volatility

The volatility of a stock price represents the uncertainty attached to its future movement. As volatility increases, the chance that the stock will perform very well or very poorly increases. For the owner of a stock, these two possibilities neutralize each other. However, this is not true for a call or put option holder. The call option holder gains from price increase but has fixed downside risk in case of price decline. Again a put option owner benefits from the price decline but has limited risk in case of the upward movement in the stock price. Hence, the value of both call and put increase as volatility increases.

Risk-free Interest Rate

The impact of risk-free interest rate on the price of an option cannot be clearly defined. Whenever interest rates in the economy rise, the expected growth rate of the stock price increases but the present value of all the future cash flows to be received by the owner of the option declines. Because of these effects the value of a put option decreases as the risk-free interest rate increases. For the calls, the increase in the growth rate of the stock price enhances its value however, the present value effect tends to decrease it. Therefore, the first effect tends to push the price while the second effect tends to reduce it. It can be shown that the effect of the former always dominates that of the latter effect. Thus, the price of call always increases as the risk-free interest rate increases. It is quite important to mention here that the above effects had been considered with other variables remaining unchanged. Generally, whenever interest rates rise (fall), stock prices tend to fall (rise). The net effect of an interest rate change along with stock price change may differ from the results described above.

Dividends

The value of stock increases in anticipation of dividend declaration and the same declines after the record date. Hence, the price of European call option whose expiry date is beyond the record date tends to decline whereas that of put option tends to increase. In case of American options the impact on the price will be similar to the impact described earlier with reference to stock price.

The impact of dividend on the price of options is essentially a consequence of the impact of dividend on stock price.

Summary of the effect on the price of a stock option of increasing one variable while keeping other constant.

Table 4

Variable	European/ American Call	European/ American Put
Stock price	++	–
Strike price	–	++
Time to expiration	+ (only for American option)	+ (only for American option)
Volatility	++	+
Risk-free rate	+	–
Dividends	–	++

Option Market Quotes

The table 5 below shows a typical option price quotation in a US newspaper.

Table 5

Name of the Organization AAAAA	Strike Price	Calls Mar.			Puts Mar.		
		Feb.		Apr.	Feb.		Apr.
973/8	93	6 5/8	s	r	5/8	3 7/8	s
	88	3 5/8	2 1/2	1 3/8	r	4 3/4	r
	89	2	4 7/8	5/8	s	5 1/8	6

The first column in the above table provides the closing stock price of the firm AAAAA. The figures in the second column indicate the strike prices of the options available on the firm's stock. The row below "calls" and "puts" indicate the expiry months of the corresponding options. An "r" in a particular column indicates that the option was not traded on that day while an "s" shows that a specific option is not listed for trading.

Consider the call option with a strike price 88 that expires in February. This option's price is $3.625. The buyer of this option gets the right to buy a share of AAAAA at 88 until the option expires.

Maximum Profit/Loss Expectation on Options

As discussed before, the investor has the right but no obligation to exercise the option, so in case of call options, his maximum loss is limited to the premium paid, while the maximum profit is unlimited as there is no upper limit on the price a stock may reach.

Similarly, in a put option, there is an option of exercising or selling or allowing the same to expire. The option to exercise should be executed if the market price is lower than the strike price. In case of a reverse situation, the put option should be allowed to expire.

Option Traders

There are three different types of traders in the exchange floor. They are market makers, floor brokers and board brokers.

The commission charged by the brokers differs from investor to investor and from stock exchange to stock exchange and is generally based on a fixed figure plus a percentage of the amount of the trade.

Call Options

We know that in a call option if the investor decides to exercise his right, then he will buy the shares of the company at the exercise price. Should he do so irrespective of the current market price of the stock? No, he should not. The explanation for different market prices of the stock is given below.

For a contract assume that the option premium was Rs.3, the exercise price Rs.25 and the current market price of the stock is Rs.23. This data remains the same for all of the following three cases. Each contract stands for 100 shares.

Case 1

After three months assume that the market price of the stock rose to Rs.30. At this point, should the investor exercise the option? Yes, he should. The pay-offs are shown below.

Table 6

Premium	Exercise Price	Total Outgo	Worth of Stock at Current Price	Profit/(loss)
300	2500	2800	3000	200

In this case, the trader made a profit of Rs.200. The explanation is as follows: The trader by exercising the option has received the stock worth Rs.3,000 by paying only Rs.2,500. That is, a profit of Rs.500. This lowered by the premium will be Rs.200. Therefore, the trader will make a profit whenever the stock price exceeds the sum of option premium and the exercise price. It is beneficial for him to exercise the option as long as the stock price is greater than the exercise price.

Case 2

In this case, assume that the stock price has increased to Rs.28. Should he exercise the option? He should. The pay-offs are shown in the following table.

Table 7

Premium	Exercise Price	Total Outgo	Worth of Stock at Current Price	Profit/(loss)
300	2500	2800	2800	0

In this case, the trader by exercising the option has made a profit of Rs.300. However, this profit is negated by the option premium. Looking at it in another angle, if the investor buys the stock in the market, he would have to pay Rs.28, whereas he can get it for Rs.25 on exercising the option.

Case 3

Now assume that the current stock price is Rs.21. Should the investor now exercise his option and what would be the profit/loss if he exercises his option and if he does not? The pay-offs are shown in the following table.

Table 8

Premium	Exercise Price	Total Outgo	Worth of Stock at Current Price	Profit/(loss)
300	2500	2800	2100	(700)
300	–	300	–	(300)

We observe that if the trader exercises his option, he will incur a total loss of Rs.700 and even if he does not exercise the option the loss will be equivalent to premium. That is, if the stock price falls below the exercise price the investor loses and his maximum loss is equal to the premium he pays.

Put Options

In case of put options, a buyer will make a profit if he exercises his option when the stock's current price is lower than the exercise price. In this situation, the writer will take delivery of the stock whose worth is lower. We consider three cases as above. The option price (Rs.3) and the exercise price (Rs.25) remains the same for all the three cases.

Case 1

Assume that the current market price is Rs.21. Should the buyer of the option exercise it? Yes, he should. The pay-offs are shown in the table.

Table 9

Premium	Exercise Price	Total Inflow	Worth of Stock at Current Price	Profit/(loss)
300	2500	2200	2100	100

The explanation is as follows: On buying the option, the trader pays Rs.300. On exercising the option, the trader could manage to make a profit of Rs.400 as the price of the stock in the market is Rs.21. Therefore, Rs.400 reduced by Rs.300, he has a total profit of Rs.100. Thus, when the current price of the stock is lower than the exercise price less the premium, the trader makes a profit.

Case 2

Assume that the stock's current market price is Rs.22. Should the buyer exercise the option? Yes, he should. Pay-offs are shown in the table that follows:

Table 10

Premium	Exercise Price	Total Inflow	Worth of Stock at Current Price	Profit/(loss)
300	2500	2200	2200	0

In this case, the buyer paid Rs.300 as option premium. On exercising the option he made a profit of Rs.300 as the market price of the stock is Rs.22. Therefore, whatever profit was made on exercising the option was negated by the option premium paid. As a result, there was no profit for the trader. Therefore, we conclude that when the exercise price of the contract equals the sum of premium paid and the current price of the stock, the trader just manages to recover his investment.

Case 3

Assume that the stock's current market price is Rs.27. The pay-offs are shown in the table.

Table 11

Premium	Exercise Price	Total Inflow	Worth of Stock at Current Price	Profit/(loss)
300	2500	2200	2700	(500)
300	–	(300)	2700	(300)

In this case, the trader made loss. This is because the buyer already paid the premium of Rs.300. As the price of the stock increased, it will be a wise decision not to exercise the option. At least by selling the stock, in the exchange, the trader can recover the premium and make profits as a part of capital appreciation. Therefore, the trader makes a loss when the current market price of the stock is greater than the exercise price. His maximum loss is, again, limited to the premium paid as the option is allowed to lapse.

Note: In all these cases we have ignored the transaction costs.

Elementary Investment Strategies

The use of options enables an investor to achieve unique risk-return patterns which cannot be achieved by taking investment positions only in the underlying assets. This is in fact the economic rationale for the existence of options. We will elaborate on this theme by illustrating several investment strategies using options. To provide a balanced picture, we will also discuss the risks associated with indiscriminate use of options.

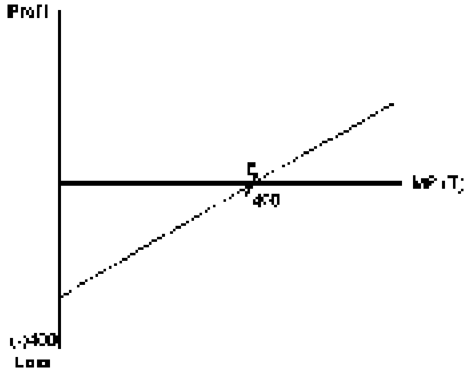
Let us begin our discussion with the two investment strategies familiar to us – the long position and the short position in the underlying asset.

Long Position

Consider an investor who is bullish about the equity stock of Reliance Industries. He believes that a price rise is imminent and takes a long position in the stock at say a price of Rs.400 per share. Assume an investment horizon of 3 months. The investor will make a profit at the end of this period if the stock appreciates in price. On the other hand, if the stock price remains unchanged or declines, the investor makes no profit or incurs a loss (ignoring transaction costs).

To determine the entire spectrum of profits and losses associated with the investor's strategy, we can use a 'profit diagram'. The profit diagram depicts the profits and losses associated with an investment strategy as a function of the price of the underlying asset at expiration. The possible range of prices on the expiration date are displayed along with X-axis and the profits and losses are on the Y-axis. The profit diagram associated with the long position is shown in figure 2.

Figure 2: Long Position



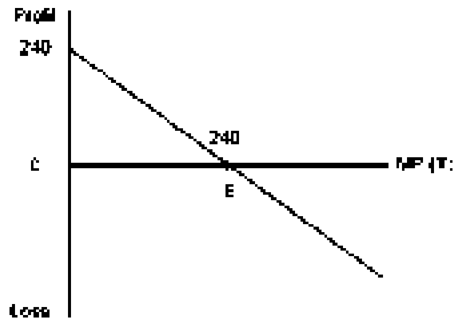
The profit diagram shows that the upside potential associated with the strategy is unlimited while the maximum loss is bounded at Rs.400, which occurs if MP(T) (expiration date price) falls to Rs.0. The point E where the line intersects the X-axis is the point where no profit or loss is made.

Short Position

A short position involves selling the asset first (without actually owning it) and buying it back later. The investor who short sells hopes that the price will decline during the time he is short in the asset.

Consider an investor who forecasts a decline in the stock price of Arvind Mills. He speculates on this forecast by short selling the stock at a price of Rs.240 per share. Let us assume a time-frame of three months within which he has to buy-back the asset. The profit diagram associated with this strategy is shown in figure 3.

Figure 3: Short Position



If the stock declines in price, the investor gains. The maximum gain to be made is Rs.240 which can occur, if MP(T) declines to Rs.0. On the other hand, if the stock price rises, the investor losses and the potential loss is unbounded. Thus, the strategy of short selling is characterized by bounded upside potential and unbounded downside risk.

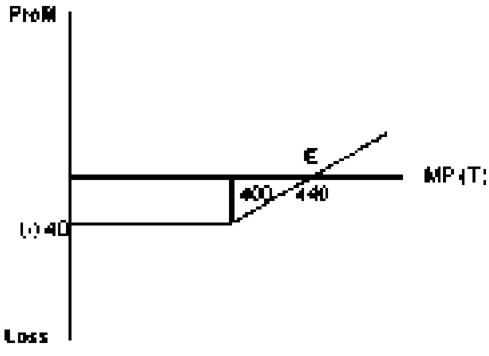
Having discussed the investment strategies associated with the underlying asset, let us now consider investment position in the options market. For expositional convenience, we will consider only European options and ignore transaction costs. There are four elementary investment strategies associated with options and they are:

- Long Call
- Short Call
- Long Put
- Short Put.

LONG CALL

Long call refers to the purchase of a call. Let us assume that our investor who was bullish on the stock of RIL decides to buy a 3-month call on the stock with an exercise price of Rs.400 by paying a premium of Rs.40 per share. The profit diagram associated with this strategy is shown in figure 4.

Figure 4: Long Call

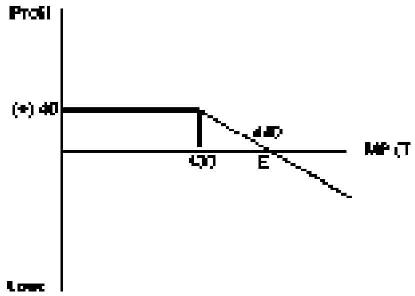


The similarity between the long position in the underlying asset and the long call position is that the investor concerned must be bullish on the underlying asset. There are, of course, differences between the two strategies in terms of the pay-off patterns. First, the option expires worthless if, at expiration the stock price is Rs.400 or less. Therefore, for the range of stock prices below Rs.400, the maximum loss is restricted to the option premium of Rs.40. The second difference is that the call buyer does not break even at a price of Rs.400. The break even point is equal to the exercise price plus the premium paid for the call which is equal to Rs.440 in this case. Put differently, the expiration date price must be Rs.440 for the call buyer to break even.

SHORT CALL

The strategy involves writing a call without owning the underlying asset. The call writer makes a profit if the option expires worthless on the expiration date and this can happen if the stock price at expiration is Rs.400 or less. If the expiration date price substantially exceeds Rs.400, the call buyer will exercise the call which in turn produces a loss to the writer because he has to buy the stock at a price higher Rs.400 and sell it at Rs.400. (We are assuming that the call writer does not own the stock on which the call has been written – a naked call writer). The call writer breaks even at a point equal to the exercise price plus the option premium. The profit diagram shows that the potential loss beyond the break even point is unlimited.

Figure 5: Short Call

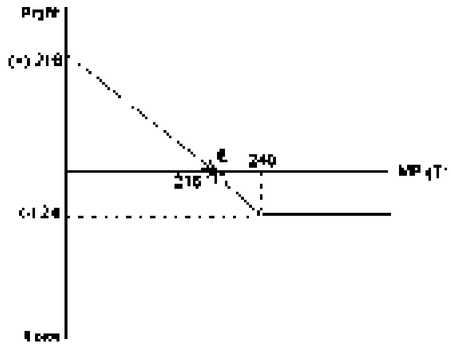


Obviously an investor who writes a naked call is bearish and wants to profit by speculating on his belief. If he is correct about the future price movement, he keeps the premium. If he is wrong, his losses can be substantial. To minimize the risk of being assigned an exercise, the writer can write an out-of-the-money call. Even though the out-of-the-money call premium is smaller than the premium of an in (at)-the-money call, there is a greater probability that he will keep the premium.

LONG PUT

This strategy involves buying a put – the right to sell the underlying asset at specified price. Obviously, the put buyer anticipates a decline in the price of the underlying asset. Let us assume that our investor who anticipates a decline in the stock price of Arvind Mills decides to buy a 3-month put with an exercise price of Rs.240 per share by paying a premium of Rs.24. The profit diagram associated with this strategy is shown in figure 6.

Figure 6: Long Put



If the stock price at expiration is less than the exercise price, the put has value. The maximum profit associated with this strategy is Rs.216 (= 240 – 24) which occurs, when MP(T) declines to zero. The put buyer breaks even at an expiration date price of Rs.216. If MP(T) is equal to or greater than Rs.240 on the expiration date, the put buyer will not exercise the option and stands to lose the premium of Rs.24.

Let us compare this strategy with the strategy of short selling the stock. The strategies are similar in the sense that they are bearish strategies. Comparing the profit diagrams of the two strategies (see figures 5 and 6) we find that maximum upside potential is bounded for both the strategies. But on the downside, the maximum loss is limited to the option premium for the long put position whereas it is unlimited for the short stock position.

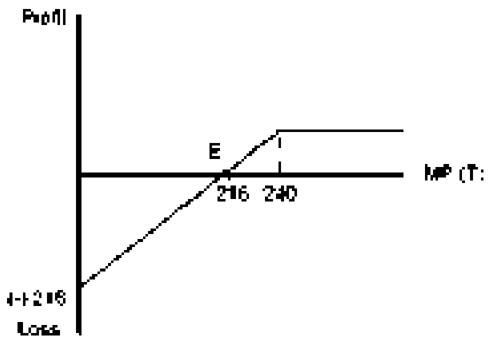
SHORT PUT

Short put is the strategy of writing a put. In contrast to the put buyer, the put writer is bullish on the underlying asset and earns an income (in the form of put premium) by speculating on his prediction. He is also prepared to accept ownership should the put owner decide to exercise.

For example, consider the investor who writes a 3-month put on the stock of Arvind Mills at an exercise price of Rs.240. The profit diagram associated with this strategy is shown in figure 7.

If the expiration date price is Rs.240 or higher, the put expires worthless and the put writer keeps the premium of Rs.24. On the other hand, if the expiration date price is less than Rs.240, his income of Rs.24 is eroded and at the price of Rs.216 he breaks even. At lower prices he starts losing and the maximum loss is bounded at Rs.216, when MP(T) = 0. Loss in this context refers to the difference between the price at which the put writer is forced to buy the stock and the market price at which he could have bought it otherwise.

Figure 7: Short Put



To sum up, we have examined the pay-off patterns associated with six elementary investment strategies.

- Long Stock
- Short Stock
- Long Call
- Short Call
- Long Put
- Short Put.

We have found that the pay-off patterns associated with stock-only positions – long and short positions – are completely linear whereas the pay-off patterns of option positions are truncated. It can be, therefore, concluded that option strategies can meet certain risk-return requirements which cannot be met by the two basic positions in the stock. For example, an investor who is bearish on a stock but wants to play it "safe" will find the long put strategy more appealing than shorting the stock.

Given these elementary positions and strategies, we can create more unique risk-return patterns by combining two or more of these elementary strategies. We will call these combinations as "Complex Strategies" and discuss some of these strategies in the following section.

Types of Positions

Options trade fall into one of the four categories:

i. Open a position with a purchase

ii. Open a position with a sale

iii. Close a position with a purchase

iv. Close a position with a sale.

i. **Open a Position with a Purchase**

An investor opens a position or establishes a position by buying an option. This action on the part of the investor increases the existing long positions by a single contract. An investor is said to be long when he buys an options' contract – it being either a call option or a put option.

ii. **Open a Position with a Sale**

An investor can also open or establish a position by writing an option. This increases the existing short positions by a single option. An investor is said to be short when he writes an option, whether it is a call or a put option.

iii. **Close a Position with a Purchase**

An investor who has a short position as a result of writing an option can cancel it by entering into a closing purchase transaction. This reduces the existing short positions by one contract.

iv. **Close a Position with a Sale**

An investor who has a long position as a result of buying an option can offset it by entering into a closing sale transaction. This reduces the existing long positions by one contract.

When a trader closes an existing position – either long or short, that order is called as an offsetting order. Thus, an investor who is long cancels his position by a sale of an option which belongs to the same series (this is a necessary condition) and an investor who is short can cancel his position by purchasing an option belonging to the same series.

In options trading also we have market order, limit order and stop limit order (along with the specified periods). These are similar to what we have in case of stocks.

Process of Trading

An investor, who wishes to deal in options, has to open an account with the broker. The broker may or may not be a member of a clearing house. First, we look at the process when the broker happens to be a member of a clearing house. After opening the account, the initial margin has to be deposited. One of the accounts executives notes down the contract specifications and transmits the same to the floor brokers. The floor broker executes the order and intimates the clearing house the details of the contract. After confirming these with the clearing house, he passes back to the accounts executive the trade details which are then conveyed to the investor.

When the broker does not happen to be a member of the clearing house: In this case, the broker has to contact a member of the clearing house and route his client's trades through him. The remaining procedure is the same.

Options Clearing Corporation (OCC)

The buyer of the call option has every right to purchase the shares of the company at the exercise price. If the writer of the option does not honor his part of the option contract, the buyer losses the benefit from buying the contract. Therefore, he looks for a mechanism which would assure him that the contract will be honored under all the circumstances. To overcome problems like these and to facilitate smooth trading in options, a clearing house ‘Options Clearing Corporation’ has been formed. In some instances this corporation is jointly owned by several exchanges (the clearing members) while in some other instances it exists as an autonomous body.

The Role of OCC

After the deal for an option contract is struck on the trading floor of the exchange, the OCC steps in acting as a writer as far as the buyer is concerned and the buyer as far as the seller is concerned. Thus, at this juncture, the link between the buyer and the seller is severed. At the end of every trading day, the OCC examines the contract notes submitted to it by its members. The paperwork submitted by both the parties should match. If they agree they are called as matched trade, if not out trade. The process of matching trades and tracking payments is called as clearing. In case of out trades, the exchange tries to reconcile the differences by contacting the related traders.

The OCC maintains all these data in a computer system. It also maintains a record of the outstanding position of all the investors involved in options trading. Thus, whenever it receives an exercise notice from its members it checks the uncanceled short position of other members in the same series and assigns it to one of them in a random fashion.

After receiving the short notice, the trader with the short position will:

i. Oblige the option holder, or

ii. Default.

When the Writer Obliges

This is quite a straight forward issue. The procedure is as follows. When the buyer of a call option decides to exercise his right, he informs his broker. The broker then delivers an exercise notice form to the OCC with necessary details. When the OCC receives the exercise notice form from the broker, it posts the same to one of the brokers whose account shows short uncanceled position in the same series. This is done on a random basis. The broker house then reassigns the notice to one of its clients, and delivers the share certificates already deposited with it.

When the Writer Defaults

In case the short trader fails to oblige, the OCC performs the writer’s part of the contract as usual and then initiates proceedings against the writer for default. We will also see, how the OCC takes precautions to avoid such situations.

In addition to the above, the OCC makes it possible for buyers and writers to close their positions at any time during the expiration period. When an option is sold, the clearing corporation makes the entry for sale of the option in the account of the holder maintained by it. At the same time, it enters a long position in the account of the writer of the option chosen randomly. The entry made will cancel out the existing entry and the offsetting position of the two is reduced. From this, we observe that whenever a buyer or a writer enters into an offsetting contract, he is relieved from his obligation to pay or to deliver the stock.

Margins

To relieve the OCC as well the broker of the legal complexities and the burden in case the writer defaults, margin requirements have been set in place by the exchanges where options are traded. This gives ample scope to brokers, to impose even stricter requirements on their clients, as in the final arrangement of things the brokers are responsible to the OCC for the actions of their clients. When a trader buys an option, he will pay the price of the option to the writer on the next day. Therefore, it can be said that in long positions, 100% margin is paid.

In case of option writers, margin requirements assume importance. When the option buyer decides to exercise the option, the writer has to deliver or buy the stock.

Margins are imposed on writers to make sure that there is no loss to the broker, buyer or the clearing house. The writer of, say a call option, is asked to deposit an amount calculated in accordance with the rules of the exchange. This amount is so calculated that generally, the price fluctuation in the underlying stock in a day is not more than the margin amount.

In case the price movement is adverse to the writer, the amount of loss is debited to the margin account. If the balance in the margin account falls below the maintenance margin amount, the writer is asked to make up the margin to the original level. The margin to be paid initially is called initial margin and the amount paid to make the margin up is called the variation margin.

If the option writer holds the stock on which he has written the option, he may deposit it with the exchange instead of paying margins. If the stock is so deposited, there is no risk of default by the writer. Therefore, he is exempted from margins.

Other Options

Currency Options

The largest portion of the currency option market is the interbank market. Some of the stock exchanges list currency options also. For instance, the Philadelphia Stock Exchange lists options on foreign currency. A currency call is similar to a call on a stock that gives the holder the right to buy a fixed amount of foreign currency at a fixed exchange rate on or before the option’s expiration date.

A currency put gives the holder the right to sell a fixed amount of foreign currency at a fixed exchange rate on or before the option’s expiration date.

Currency options are identified by the five parameters viz., time to expiration, currency pair, option type, strike and face value. The exchange rates are quoted as A/B when you buy a call option on currency A. It is also the same as a put option on currency B. Consider the following example. Assume that a dollar/mark quote is $0.6493/DM and you buy a call option with a face amount of DM1 million. This option gives you the right to buy $649,300 against DM 1 million. This is equivalent to a put option on dollar. Hence in effect the above transaction can be referred to as $ call/DM put.

Options in the interbank market are quoted in terms of *implied volatility*. *Implied volatility* is a measure of possible fluctuations in future exchange rates. The greater the volatility measure the greater will be the benefit from calls or puts.

Index Options

In the index options, underlying asset is stock index. The most popular index at which the options are traded are S&P 500 and S&P 100 which are traded on the Chicago Board of Options Exchange. One contract is to buy or sell 100 times the index at a specified strike price.

Box 1: Equity vs. Index Options

An equity index option is an option whose underlying instrument is intangible – an equity index. The market value of an index *put* and *call* tends to rise and fall in relation to the underlying index. The price of an index call will generally increase as the level of its underlying index increases, and its purchaser has unlimited profit potential tied to the strength of these increases. The price of an index put will generally increase as the level of its underlying index decreases, and its purchaser has substantial profit potential tied to the strength of these decreases.

Pricing Factors

Generally, the factors that affect the price of an index option are the same as those affecting the price of an equity option: value of the underlying instrument (an index in this case), strike price, volatility, time until expiration, interest rates and dividends paid by the component securities.

Underlying Instrument

The underlying instrument of an equity option is a number of shares of a specific stock, usually 100 shares. Cash-settled index options do not relate to a particular number of shares. Rather, the underlying instrument of an index option is usually the value of the underlying index of stocks times a multiplier, which is generally US $100.

Volatility

Indexes, by their nature, are less volatile than their individual component stocks. The up and down movements of component stock prices tend to cancel one another out, lessening the volatility of the index as a whole. However, the volatility of an index can be influenced by factors more general than those which affect individual equities. These can range from investors' expectations of changes in inflation, unemployment, interest rates or other economic indicators issued by the government and political or military situations.

Risk

As with an equity option, an index option buyer's risk is limited to the amount of the premium paid for the option. The premium received and kept by the index option writer is the maximum profit a writer can realize from the sale of the option. However, the loss potential from writing an uncovered index option is generally unlimited. Any investor considering writing index options should recognize that there are significant risks involved.

Cash Settlement

The differences between equity and index options occur primarily in the underlying instrument and the method of settlement. Generally, when an index option is exercised by its holder, and when an index option writer is assigned, cash changes hands. Only a representative amount of cash changes hands from the investor who is assigned a written contract to the investor who exercises his purchased contract. This is known as cash settlement.

Purchasing Rights

Purchasing an index option does not give the investor the right to purchase or sell all of the stocks that are contained in the underlying index. Because an index is simply an intangible, representative number, you might view the purchase of an index option as buying a value that changes over time as market sentiment and prices fluctuate. An investor purchasing an index option obtains certain rights as per the terms of the contract. In general, this includes the right to demand and receive a specified amount of cash from the writer of a contract with the same terms.

Option Classes

Available strike prices, expiration months and the last trading day can vary with each index option class, a term for all option contracts of the same type (call or put) and style (American, European or Capped) that cover the same underlying index.

Strike Price

The strike price, or exercise price, of a cash-settled option is the basis for determining the amount of cash, if any, that the option holder is entitled to receive upon exercise.

In-the-money, At-the-money, Out-of-the-money Call Options

An index call option is in-the-money when its strike price is less than the reported level of the underlying index. It is at-the-money when its strike price is the same as the level of that index and out-of-the-money when its strike price is greater than that level. An index put option is in-the-money when its strike price is greater than the reported level of the underlying index. It is at-the-money when its strike price is the same as the level of that index and out-of-the-money when its strike price is less than that level.

Premium

Premiums for index options are quoted like those for equity options, in dollars and decimal amounts. An index option buyer will generally pay a total of the quoted premium amount multiplied by $100 for the contract. The writer, on the other hand, will receive and keep this amount.

The amount by which an index option is in-the-money is called its intrinsic value. Any amount of premium in excess of intrinsic value is called an option's time value. As with equity options, time value is affected by changes in volatility, time until expiration, interest rates and dividend amounts paid by the component securities of the underlying index.

Exercise & Assignment

The exercise settlement value is an index value used to calculate how much money will change hands, the exercise settlement amount, when a given index option is exercised, either before or at expiration. The value of every index underlying an option, including the exercise settlement value, is the value of the index as determined by the reporting authority designated by the market where the option is traded.

AM & PM Settlement

The exercise settlement values of equity index options are determined by their reporting authorities in a variety of ways. The two most common are:

PM settlement – Exercise settlement values are based on the reported level of the index calculated with the last reported price of the index's component stocks at the close of market hours on the day of exercise.

AM settlement – Exercise settlement values are based on the reported level of the index calculated with the opening prices of the index's component stocks on the day of exercise.

If a particular component security does not open for trading on the day the exercise settlement value is determined, the last reported price of that security is used.

Closing Transactions

As with equity options, an index option writer wishing to close out his position buys a contract with the same terms in the marketplace. In order to avoid assignment and its inherent obligations, the option writer must buy this contract before the close of the market on any given day to avoid notification of assignment on the next business day. To close out a long position, the purchaser of an index option can either sell the contract in the marketplace or exercise it if profitable to do so.

Source: *www.888options.com*

Futures Options

In futures options, the underlying asset of an option is a futures contract. These futures may be index futures, currency futures or interest rate futures. In the United States, options on futures trade only on futures exchanges. Each futures exchange trades options on its active futures contracts. Financial instruments account for the majority of futures options. Options on foreign currency constitute the next largest category. Options on energy and wood product futures and other agricultural commodities are traded relatively in less quantities. Futures options tend to be more popular than options on the underlying assets, due to the cost advantage of delivering the futures options instead of the asset as the contracts are exercised usually before the expiry date. Also the transaction charges on future options are generally lower than on the current options.

Interest Rate Options

An interest rate option holder gets the right to buy or sell the underlying cash instrument or the financial futures contract. The treasurer may use these options to protect his position from rising interest rates or falling interest rates by buying put options or call options respectively.

Borrowers options and lenders options are over the counter call and put options on short-term loans and deposits respectively. These are called interest rate guarantee. It is a guarantee because it helps one to fix the maximum borrowing rate or the minimum lending rate.

Borrowers Options

Assume that your view is that interest rates will rise and you are contemplating to invest in a big project for which you plan to raise resources at an interest rate not greater than 6%. Now you have the following information. There is an option to cover a 6-month loan on a principal of $10 million at a strike 5.5%. If rates are 5.25% on the expiry date you need not exercise the option and you save the cost of funding by 0.75%. If rates are 6.25% then you can exercise the option because the cost works out to be less than the maximum rate acceptable.

Lenders Options

Assume that you have surplus funds for a short period of time and wish to invest them profitably, and at the same time wish to protect your position from falling interest rates. But you may not be willing to lock-in the funds at a specific rate due to high level of uncertainty in the movement of interest rates in the future. The lenders options can be made use of in such a situation. It is nothing but a put option that gives the right and not the obligation to deposit a fixed amount of funds at an agreed rate for a specific time period.

Over-the-counter Options

A very popular type of options, where companies or financial institutions trade with each other, rather than on the stock exchanges, is called Over-The-Counter options. Tailor-made to the requirement, these options seldom match the features of exchange traded options. Bermudan and Asian options are types of Over-The-Counter options. The popularity of this type of options has resulted on many exchanges offering Flex options, in which the terms agreed are different from the usual ones in the exchange, in an effort to compete with the Over-The-Counter options business.

Zero Cost Options

Zero cost options are types of long option positions financed by the sale of other options. They can be divided into constituent options that have the same strike price. Hedging is also possible by buying out-of-money puts and simultaneously selling in-the-money calls. The main advantage of this type of options is that it entails premium.

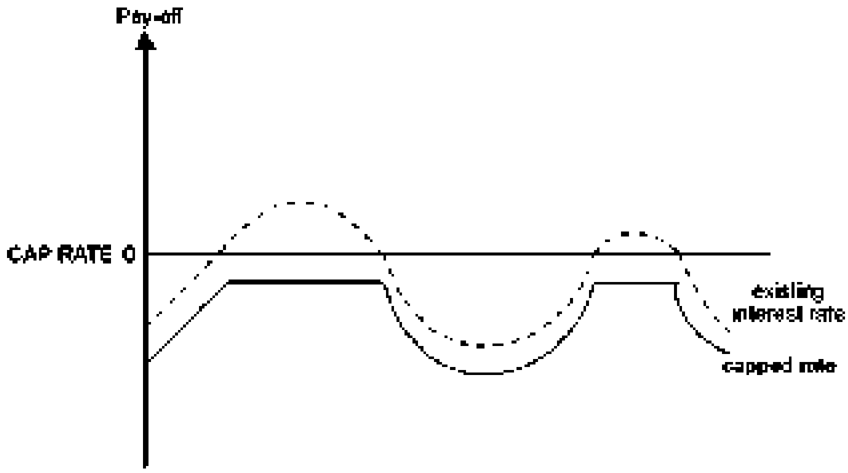
Caps, Floors and Collars

An interest rate cap and floor are special types of borrowings and lending options, which are meant for long-term hedging.

Caps (Interest Rate Caps)

A cap is a series of interest rate options, which guarantees a fixed rate payable on a borrowing over a specific time period at specific future dates. If interest rates rise above the agreed cap rate then the seller pays the difference between the cap rate and the interest rate to the purchaser. A cap is usually bought to hedge against a rise in interest rates and yet is not a part of the loan agreement and may be bought from a completely different bank/writer. In a cap, usually an upfront fee is to be paid to the bank/writer. The cap guarantees that the rate charged on a loan at any given time will never exceed the current existing rates or the cap rate. The cap working is depicted in the following graph:

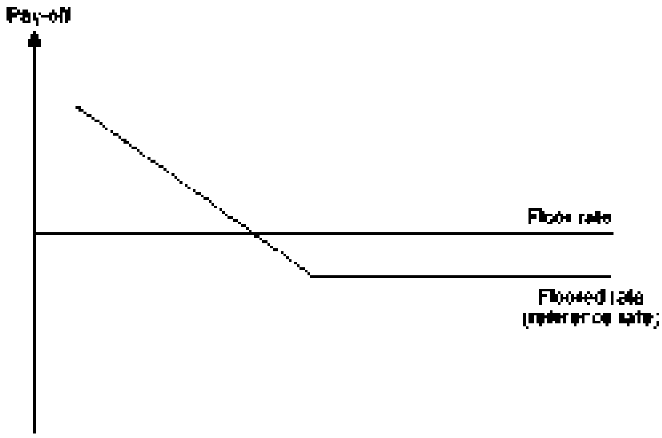
Figure 8: Interest Rate Clap



Floors (Interest Rate Floors)

A floor is an agreement where the seller agrees to compensate the buyer if interest rates fall below the agreed upon floor rate. It is similar to a cap, but ensures that if the interest rate falls below a certain agreed floor limit, the floor limit interest rate will be paid.

Figure 9: Interest Rate Floor



Collars

A collar is a combination of a cap and a floor where you sell a floor at a lower strike rate and buy a cap at a higher strike rate. Thus, they provide protection against a rise in interest rates and some benefit from a fall in interest rates.

The pay-off profile of a cap and a collar are given below.

Figure 10(a): Interest Rate Cap

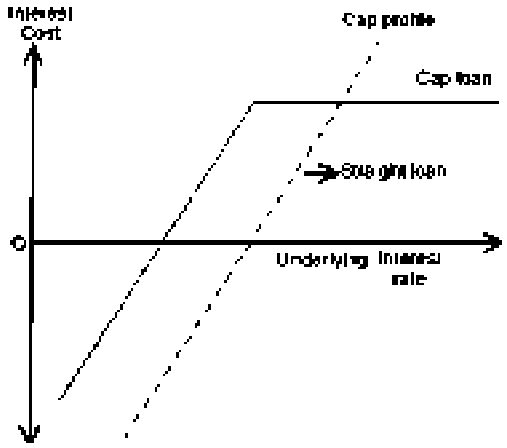
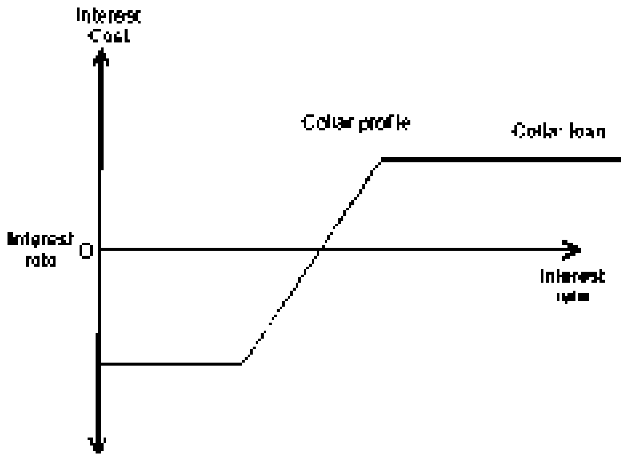


Figure 10(b): Interest Rate Collar



OPTIONS MARKETS IN INDIA

Options have been introduced in the Indian stock exchanges since July, 2001. But the investors and the traders are still skeptical as these instruments are new to the Indian market and the derivatives market in the world is very dull after a few scams in the derivatives dealing in the late nineties. From July 2002, stock options were also introduced in December 2002, there is a proposal to introduce rupee options in India.

Index options were already traded in the market. On July 2nd the trading of stock options started. An index option and a stock option are quoted as follows.

Details about the index and stock options traded at the NSE are given below.

Instrument Type	:	OPTIDX for index option and OPTSTK for stock option
Symbol	:	NIFTY (in the case of index)/stock symbol in the case of stock say, XYZ
Option Type	:	CE (to denote the option is a call of European type)

CA indicates the option is a call option and the style of the option is American. Similarly we have put options denoted as PE and PA respectively.

Strike Prices: Generally there are five strike prices, two in-the-money, one at-the-money and two out-of-the-money prices. In the case of stock options, the strike price intervals are determined based on the price of the underlying security. The strike-intervals are as follows:

Table 12

Price of Underlying	Strike Price Interval
Less than or equal to Rs.50	2.50
> Rs.50 to < Rs.150	5
> Rs.150 to < Rs.250	10
> Rs.250 to < Rs.500	20
> Rs.500 to < Rs.1,000	30
> Rs.1,000 to < Rs.2,500	50
> Rs.2,500	100

Base price of the options contracts when introduced will be the theoretical value of the option contract calculated as per the Black-Scholes model. The base price on subsequent trading days will be the daily close price of the options contract. For those options, whose orders could not be placed because of application of price ranges, the base prices are modified at the discretion of the exchange and intimated to its members. There is no day minimum or maximum price ranges applicable to the options. The operating ranges and day minimum or maximum ranges of options are kept at 99% of the base price. Hence, the members will not be able to place orders at prices which are beyond 99% of the base price. Trading members can enter into an index options contract (buy/sell) on NIFTY. Lot size in the case of stock options will be Rs.2,00,000.

Expiry Period of the Contracts

The contracts in general expire on the last Thursday of the expiry month. If the last Thursday is a holiday, then the previous working day will be considered as the expiry date.

Liquidation of Options Contracts

Liquidation of options can be done in three ways. On the expiry date one can sell or buy, abandon or exercise it. But buying and selling are most commonly practised in the options market. When the premium is less than the transaction costs of liquidating the options, the option is usually abandoned.

Pricing of Options Contracts

Options are generally priced by the negotiations between buyers and sellers. Prices are influenced by the expectations of the future prices of the buyers and sellers and the relationship between the option price and the price of the instrument. The price step in respect of S&P CNX Nifty options contracts is Rs.0.05.

Users of Options Markets

The choice of options for investment purposes will depend on financial goals and investment objectives of the investors. The following types of investors may trade in options.

i. Those who want to trade in the market without holding a strong portfolio.

ii. Those who want to protect the value of their diversified portfolio of equities.

iii. Those who have strong views on the market and its future movement and would like to take advantage of the same.

iv. Those who observe the equities market so closely.

Eligibility of Stocks for Options Trading

To be eligible for trading for options, the stocks should meet the following criteria:

i. The stock should be one among the top 200 scrips on the basis of average market capitalization during the last six months and the average free float market capitalization should not be less than Rs.750 crore. The free float market capitalization means the non-promoter holding in the stock.

ii. The stock should be amongst the top 200 scrips on the basis of average daily volume (in value terms), during the last six months. Further the average daily volume should not be less than Rs.5 crore in the underlying cash market.

iii. The stock should be traded in at least 90% of the trading days in the last months, with the exception of cases in which a stock is unable to trade due to corporate actions like demergers, etc.

iv. The non-promoter holding in the company should be at least 30%.

v. The ratio of the daily volatility of the stock vis-à-vis the daily volatility of the index (either BSE Sensex or S&P CNX Nifty) should not be more than 4, at any time during the previous six months.

Options on Individual Securities

Option on individual stock available on 53 stocks stipulated by Securities and Exchange Board of India (SEBI). For which index future and future on individual stock available presently.

Settlement of the Index Options Contract

In the index options contract, the premium to be paid or to be received is calculated for each CM after netting the positions at the end of each day. The CMs who have to pay the premium pay them to NSCCL and this is adjusted with those who have to receive the premium. This is known as daily premium settlement CMs are responsible for collecting and settling the premium amounts from the TMs and their clients. The premium to be paid or received is directly debited or credited to the CM’s clearing bank account.

On the expiry day of the options contract, NSCCL will determine the outstanding in-the-money contracts based on the final settlement price and the resulting profit or loss will be settled in cash. The final settlement price is the closing value of the underlying index price on the expiration day of the contract. The final settlement profit or loss will be the difference between the stock price and the final settlement price of the relevant index option contract. Final settlement profit or loss amount is credited or debited to the relevant CM’s clearing bank account on the day following the expiry day.

Settlement of Options Contracts on Individual Securities

The premium to be paid or received is netted across all option contracts on individual securities at the client level to determine the net premium payable or receivable at the end of each day. The settlement procedure is similar to that of the index option contracts. Interim exercise settlement is effected for exercised option positions at in-the-money strike prices, at the close of trading hours on the exercise day. The interim exercise settlement price is the clearing price of the underlying security on the exercise day. The settlement value is the difference between the strike price and the exercise settlement price of the option contract. The exercise settlement value is debited or credited to the CM’s clearing bank account on the third day of the exercise day.

Final settlement is effected at in-the-money prices.

Options quotations in the Indian exchanges are given below.

Table 13

Contract (Strike Price)	Prev. Close	Close Price	No. of Contracts	No. of Trades	Value in lakh	Open Interest
BSXCFEB03300	414.09	406.33	100	1	374900	0
BSXPJAN03300	3311.03	3311.03	0	0	0	0

Source: www.bseindia.com.

Table 14: Index Options on Nifty at NSE as on October 22, 2003

Instrument Type	Underlying	Expiry Date	Option Type	Strike Price	High Price	Low Price	Prev Close	Last Price	Number of contracts traded	Turnover in Rs. Lakh	Underlying Value
OPTIDX	NIFTY	30OCT2003	PE	1500.00	27.00	17.25	24.15	22.10	262	797.19	1513.85
OPTIDX	NIFTY	30OCT2003	CE	1500.00	40.00	33.00	34.50	38.00	110	338.14	1513.85
OPTIDX	NIFTY	30OCT2003	CE	1540.00	19.90	15.00	16.55	19.00	105	327.08	1513.85
OPTIDX	NIFTY	30OCT2003	PE	1520.00	36.00	27.00	34.10	32.00	77	239.15	1513.85
OPTIDX	NIFTY	30OCT2003	CE	1520.00	32.00	23.05	26.55	29.00	75	231.87	1513.85
OPTIDX	NIFTY	30OCT2003	CE	1550.00	15.25	11.50	14.00	15.25	59	184.55	1513.85
OPTIDX	NIFTY	30OCT2003	PE	1540.00	47.05	35.00	45.15	41.50	56	177.17	1513.85
OPTIDX	NIFTY	30OCT2003	CE	1530.00	26.00	18.00	21.75	22.50	48	148.94	1513.85
OPTIDX	NIFTY	30OCT2003	CE	1400.00	116.00	105.50	113.00	116.00	38	115.06	1513.85
OPTIDX	NIFTY	30OCT2003	CE	1560.00	14.00	10.00	11.15	12.85	32	100.56	1513.85

Source: www.nseindia.com

Table 15: Stock Options on Maruti at NSE as on October 22, 2003

OPTSTK	MARUTI	30OCT2003	CA	280.00	5.50	4.25	4.85	5.50	19	86.66
OPTSTK	MARUTI	30OCT2003	CA	270.00	9.30	8.25	7.80	8.25	12	53.50
OPTSTK	MARUTI	30OCT2003	CA	300.00	1.65	1.45	1.90	1.50	6	28.95
OPTSTK	MARUTI	30OCT2003	CA	250.00	20.00	19.60	17.40	19.60	4	17.27
OPTSTK	MARUTI	30OCT2003	CA	260.00	14.90	12.00	11.50	14.90	3	13.13
OPTSTK	MARUTI	30OCT2003	PA	250.00	2.50	2.20	2.85	2.50	3	12.11
OPTSTK	MARUTI	30OCT2003	PA	270.00	10.10	10.10	15.00	10.10	1	4.48
OPTSTK	MARUTI	30OCT2003	CA	190.00	2.50	2.50	28.55	2.50	1	3.08

Source: www.nseindia.com

Box 2: Index Options

In view of strengthening the derivative markets SEBI allowed introduction of options on indices. An option confers a right and does not constitute an obligation. In India index options are introduced based on two underlying indices – S&P CNX Nifty in case of NSE options and BSE Sensex for BSE options. The multipliers for NSE and BSE are 200 and 100 respectively. Every contract has a life cycle of three months.

Therefore, if the NSE is at 1,000, the smallest possible contract on the NSE will be of the size of Rs.0.2 m. If the BSE is at 3,000 then the smallest size of the contract will be Rs.0.3 mn.

At any point of time, three contracts will be available. One that will expire in the current month, the second will expire in the near month and the third will expire in the far month. For example, in June the contracts available are those expiring in June (near month), July (next month) and August (far month). When the June contract expires the September series will come into existence. Therefore, a contract will have a life cycle of three months. The reasons for having contracts expiring in three different months are to provide the time intervals for which the trader might take a view on the markets.

Underlying Index	S&P CNX Nifty
Contract size	Permitted lot size shall be 200 or multiples thereof
Price steps	Rs.0.05
Price bands	Not applicable
Style	European/American
Trading cycle	The options contracts will have a maximum tenure of three months – the near month (one), the next month (two) and the far month (three). New contracts will be introduced on the next trading day following the expiry of near month contract.
Expiry day	The last Thursday of the expiry month or the previous trading day if the last Thursday is a trading holiday.
Settlement basis	Cash settlement on a T + 1 basis.
Settlement prices	Based on expiration price as may be decided by the Exchange.

Source:www.nseindia.com

Box 3: Currency Options in India

Trading in rupee option has started from 7th July 2003 after the RBI allowed options in rupee. On the first day of trading transaction volume was $200-$250. Options help corporate to hedge their forex risks. An option is a derivative contract that gives one the right, but not the obligation, to buy or sell something on a stated date at a stated price in the future. In forward contracts, there is an obligation to buy or to sell, depending on the commitment made.

Leading foreign banks such as Standard Chartered, HSBC, ABN Amro were among the first to report on major transactions. Indian banks such as SBI, IDBI, ICICI Bank and IndusInd were also active in the market.

Motives behind introducing Currency Options and Cross Currency Options

All Indian clients are permitted to purchase cross currency options to hedge their trade exposures. Authorized forex dealers in India who offer these products are required to cover these products back to back in international markets and not carry the risk in their own books. With increased awareness of the balance sheet mismatches by the banks and financial institutions and the associated risks, a need for appropriate risk management product is felt and the required steps were taken in that direction. As this awareness increases further, there will be a continuous demand for more innovative products and sophisticated solutions to optimize the financing and treasury management functions. A major amendment of Securities Contracts Regulation Act (SCRA) would be required to legally permit OTC traded derivatives. This is because most non-standardized derivatives world over are OTC traded. Another step that has to be taken for a more rapid and orderly development of derivatives market is an establishment of internationally accepted guidelines and their recognition by tax authorities in the Indian scenario.

Rationale behind FC-INR Currency Options

- To allow hedging currency exposures to protect the downside by way of premium paid upfront. Currency options would help Indian industry and businesses to compete better in international markets by hedging currency risk.
- The pay-off profile of the currency options helps in hedging different types of exposures. For instance, if an Indian company is buying a good/service from abroad, where the bid quote is in foreign currency but the local costs of production are in rupees, then the company faces a risk till the buying contract is allotted. When forwards of currency swaps are used to cover this risk, if the company is not allotted the contract, then, these derivatives would create reverse positions. This reverse position may result in cash loss. But the use of an option contract would limit the liability to the extent of the option premium paid.
- The nature of the instrument allows it to be used as a hedge against uncertainty of the cash flows.
- It helps in attracting further forex investment due to the availability of another mechanism for hedging forex risk.
- Keeping in mind the requirement of Indian markets, the following product structure is recommended at the introduction stage.
- Options can be introduced as over-the-counter contracts
- Specifications of the contract would include,
  - Currency pair FC-INR where FC is the foreign currency as desired by the client
  - European exercise
  - Notional amount can be customized to meet counterparties' requirements and no minimum amount is suggested
  - Premium payable on spot basis
  - Settlement can be either through delivery on spot basis or through net cash in rupees on spot basis based on the FC-INR spot rate on maturity date
  - Strike price is also customized as per counterparties' needs
  - The maturity of the options is tailored to the requirements of the transacting parties. Some of the typical maturities observed in international markets are 1 week, 2 weeks, 1 Month, 3 months, 6 months, etc.

Market Participants

In the options market authorized dealers may be allowed by the RBI to enter into FC-INR option contracts with their clients. Any person residing in India would be allowed to use foreign currency-rupee options to hedge his exposure arising out of trade, foreign currency liabilities, etc. Foreign institutional investors can also hedge their exposures in India provided that the value of the hedge does not exceed 15% of the market value to the equity at initiation of the hedge.

Permitted Hedges with FC-INR Options

Contingent exposures are those where the exposures arise only when a contract involving foreign currency payment of receivable is agreed between the parties involved in a transaction.

Derived foreign exchange exposures are exposures that are generated out of swaps and other permitted transactions. For example, if a country has a foreign currency exposure of its swap agreement with another party for its rupee liability, then it may be allowed to book rupee options on interest payment due on the foreign currency.

Only one hedge transaction may be booked against a particular exposure for a given time period. At maturity, the change of hedge instrument is left to the client's discretion. For example, if an exporter has some USD receivables after 6 months then he can sell a forward for 3 months and at maturity net settle the contract and buy a put option for 3 months. As the options and forwards essentially hedge the same risk, the clients can exercise choice between them at maturity of the original contract.

All the authorized dealers are allowed to offer all FX derivative products with approval required from RBI exchange control department for offering cross currency options on covered basis. Banks may use this product for the purpose of hedging trading books and balance sheet exposures or offering to their clients on covered basis.

Interbank participation will be allowed in option contracts due to following reasons:

– This would help Authorized Dealers (ADs) in foreign exchange to effectively manage their options positions within the limits prescribed.

– Options being non-linear products, the risks of open positions can be completely hedged only by entering into other option contracts.

– It will help in providing liquidity and narrow bid-offer quotes.

– Current regulatory framework for cross currency options allows residents to use various cost reduction strategies provided there is no net inflow of premium to the client. Since the risks arising from a naked option are almost similar to that from a zero cost structure there is a need for allowing clients to write naked options and be net receivers of premium in case of structures.

The current rationale regarding cancellations and rebooking for forward contracts may be continued with the FC/INR options market in India. Hedging options positions tend to be dynamic in nature and hedges are required to be rebalanced frequently static-one time hedging of an option position is possible only by entering into an offsetting option transaction.

Pricing and Quotation Systems

The premium of FC-INR options is dependent upon the spot rate, interest rates in both currencies and the estimate of future volatility in spot rate. The international practice is to quote the premium as percentage of the national amount and can be settled in any of the currencies involved.

Standard Black-Scholes model is used for computing option premiums required for mentioning the quotes. The volatility that results in required premium is called implied volatility which is also quoted in the market. Authorized dealers could quote the option premium in rupees or as a percentage of the rupee notional amount. The premium could be paid in rupee terms.

The authorized dealers would be required to report to RBI on a weekly basis the following information regarding option transactions undertaken and the option portfolio.

Authorized dealers are also required to report the change in delta expected for the portfolio if spot changes by a certain value. (Say 0.5%, 1%, etc.)

Source: ICFAI Research Center.

Captions, Floortions and Swaptions

These are compound options on caps and floors which give the investor the option to buy and sell caps/floors. The buyer can usually specify the strike price, expiry and type of option he needs. A swaption is a compound option on interest rate swaps, currency swaps, commodity swaps and other types of swaps and is similar to a cap. It is discussed in more detail in the 'Financial Swaps' chapter.

Participating Caps

In a cap, an upfront premium is payable. A participating cap is one such cap, where there is no upfront premium but where the purchaser must pay the seller the difference between the reference rate and ceiling rate if the former is lower than the latter and the seller will pay the difference between the reference rate and the ceiling rate to the buyer if the reverse condition occurs. This type of cap is beneficial for those companies which do not wish to invest a large sum as an upfront premium.

Taxation of Options

Gains and losses on stock options are taxed as capital gains, which can be used as a tool for tax planning. Gains or losses happen when:

i. The option is sold.

ii. The option expires without exercising.

iii. The option is exercised.

Box 4: Intuitively Understanding the Way Options are Priced
The Nobel Prize in Economics was awarded to Robert Merton, Fischer Black and Myron Scholes for their pioneering work in establishing the foundation for the financial engineering that has revolutionized contemporary finance. They developed an intellectually elegant model that enables traders to take a set of observable prices and to calculate mathematically a price for an option. While some may criticize it for the assumptions that it makes, the model has been instrumental in allowing traders to understand intuitively the behavioral characteristics of the product and it has facilitated the exponential growth of derivatives worldwide. Indeed, one could argue that because of its assumptions the model has forced traders to understand every aspect of options pricing. This article will explain intuitively the way in which the options pricing model was derived and it will illustrate the assumptions implicit in the model. Let's take a look at an investor who wants to buy IBM stock. The buyer of an IBM call option has the right but not the obligation to buy IBM stock at the maturity date at a pre-set strike price. He will exercise this option if the option is in-the-money. That is to say, the buyer will exercise his right to purchase IBM stock if the strike price is less than the prevailing cash price for IBM stock at the time the option expires. The question the modeler has to answer is: How to ascertain what the stock price is going to be at maturity, an event that could take place months from now? The first assumption has to do with the way in which we model the process that characterizes the movement of the underlying price of IBM. We know that the price of the IBM stock fluctuates. Perhaps it follows a trend. We have observed the volatility of the stock price. If we have a way of describing the statistical process underlying the IBM price, then we have taken the first critical step towards pricing the option. Let us assume that the stock price follows a Markov process. This is simply a process in which only the current value of a variable is useful in forecasting what the future value of the variable could be.

Assumption 1: The underlying price is lognormally distributed.

In fact, let us assume that the logarithm of the price is normally distributed such that it has a trend and a volatility that we can specify. This enables us to predict what the expected value of the stock price will be and it also makes the model mathematically tractable. Use of normal distribution makes it easier to find a closed-form solution to the problem. A closed-form solution is simply an equation that we can use to determine the price of the option. Note that this means that volatility for the underlying price is constant and the same for all maturities. As we shall see in subsequent articles, there is usually a term structure to volatility in which different maturities have different volatilities. Remember that an option is not an option on the spot price but an option on the forward price. Different maturities will trade with different volatility, in practice, because of cash flow events, expectations of political instability, political events, management changes, etc.

Assumption 2: The short selling of securities with the full use of proceeds is permitted.

When we talked about delta hedging in "Derivatives Explained," we assumed that we could buy and sell stock against our options position in order to capture the effects of a volatile underlying price, thereby paying for the option premium over the life of the instrument. In order to sell stock, there can be no restriction on short sales.

Assumption 3: There are no transaction costs or taxes. All securities are perfectly desirable.

Transaction costs, such as brokerage, and taxes would distort the simple problem of trying to understand how to price an option. In practice, the investor or the options professional accounts for these factors in the course of doing business. Transaction costs and taxes will distort the delta hedging decision, providing a disincentive for delta hedging and altering the way in which we determine the option's value.

Assumption 4: There are no dividends during the life of derivative security.

Again, we ignore dividends in the derivation of the Black-Scholes model because of the distortionary effects they can have on our delta hedging decision. If we buy a call option and need to delta hedge it by short selling securities, we may be hesitant to short sell securities that pay a dividend.

Assumption 5: There are no riskless arbitrage opportunities.

This is an assumption of efficient markets theory. An arbitrage opportunity exists when one can buy and sell the same instrument (or virtually the same instrument) simultaneously for different prices, thereby locking in a price. Because the transaction is instantaneous, there is no risk to the individual. A market may be said to be efficient if there are no such opportunities. Put another way, as soon as such opportunities arise, they are immediately realized by some astute investor. You would not expect them to last for long, as markets will correct themselves rationally. Or, so says the theory. Long Term Capital Management claimed to have engaged in arbitrage by buying and selling similar (but not identical) instruments with holding periods in excess of a few weeks. This is ironic because some of the leaders in financial research were part of this firm. It turned out that the similarity between those instruments was not as solid or as durable as the rocket scientists originally thought it to be.

Assumption 6: Security trading is continuous.

Prices of stocks on North American exchanges move in discrete increments, such as 1/32. By assuming that prices can trade in a mathematically continuous fashion, the model is more mathematically tractable. For example, if IBM's stock traded at 189.8975, there would be no reason why the next price could not be infinitesimally higher, say 189.8975001.

Assumption 7: The risk-free rate of interest, r, is constant and the same for all maturities.

This is a big assumption. It states that the government yield curve is flat. We know that is not true, just from common sense. But, in order to solve the model for a wasting asset, it is important to model rates as constant.

Intuition

Having made all of these assumptions, how did Black, Scholes and Merton apply them to the pricing of options? They modeled a portfolio that consisted of one unit of the option and a fraction (the delta) of shares in the underlying instrument of the option, choosing the delta so that the portfolio did not change in value for small movements in the price of the underlying price. By doing so, they mathematically removed the uncertain element of the Wiener process. There was no longer any risk in the portfolio. Therefore, they reasoned, the test portfolio must have the same return as a riskless portfolio, r.

Solving this differential equation using boundary conditions fixed by whether or not the derivative was a call or a put resulted in the closed-form solution for the options price. Now, when you want to price an option, you input the following parameters into your Black-Scholes calculator and you have the price:

1. Stock’s current price
2. Strike price
3. Today’s date
4. Maturity Date
5. Delivery Date
6. Risk-free interest rate
7. Stock price implied volatility
8. Call or a Put.

Note that one of the items here is “implied volatility.” Let’s say you’re the IBM investor and you observe everything in the market, including the price of the call option you want to buy, except for the volatility. You can use the Black-Scholes calculator to “back-out” the volatility that the market is using. Doing so gives you the so-called “implied volatility.” Subsequent articles will discuss the ways in which options pricing has evolved, in addressing the shortcomings of the Black-Scholes assumptions and in extending the Black-Scholes approach to other markets, including currencies, dividend-paying equities, futures, etc.

Source: Article by Chand Sooran, Principal, Victory Risk Management Consulting, Inc.

Trading Strategies of Options

Option traders often trade options in combination to benefit from unpredictable behavior in the prices of the underlying assets. Option prices are determined as a function of the price of the underlying asset, the time until expiration, risk-free interest rate, volatility of the underlying asset, the exercise price. We will denote the variables determining the option prices by following the standard symbols given below.

S = Price of the underlying asset at time t.

X = The exercise or the strike price of the option on the underlying asset.

T = The expiration date of the option.

c_t = The price of an European call at time ‘t’.

C_t = The price of an American call at time ‘t’.

p_t = The price of an European put at time ‘t’.

P_t = The price of an American put at time ‘t’.

We will discuss the following strategies in this section:

- Covered Call Writing
- Protective Put
- Straddles and Strangles
- Strips and Straps
- Spreads.

Our discussion on each of these strategies will be organized in terms of:

- Identifying the Elementary Strategies.
- Defining the Expiration Day Cash Flows and Profit/Loss associated with the strategy.
- Constructing the Profit Diagram.
- Evaluating the Strategy.

We will assume that the options are of the European type and will use the date provided in table 16 for illustrating the different strategies.

Table 16: Hypothetical Price Data for Stock Options

BSE (Bombay Stock Exchange)	Strike Price	Calls-Last			Puts-Last		
		March	June	October	March	June	October
Arvind Mills (310)	270	50	58	71	2	s	s
	310	21	30	r	42	50	65
	350	3	8	12	70	r	91

COVERED CALL WRITING

This strategy involves buying the underlying asset and writing a call on that asset.

Illustration 5

Buy 100 Shares of Arvind Mills	@ (–) Rs.310 per share
Write a June 350 Call	(+) Rs. 8 per share
Initial Cash flow [CF(0)]	(–) Rs.302 per share

Assuming that the investor's time horizon is 6 months and the call is an European call, the expiration day cash flows and the net cash flows are defined in the following table for a range of expiration date prices. The reader is required to note that the expiration day cash flows are obtained by reversing the initial positions.

Expiration Day Cash Flows for a Covered Call

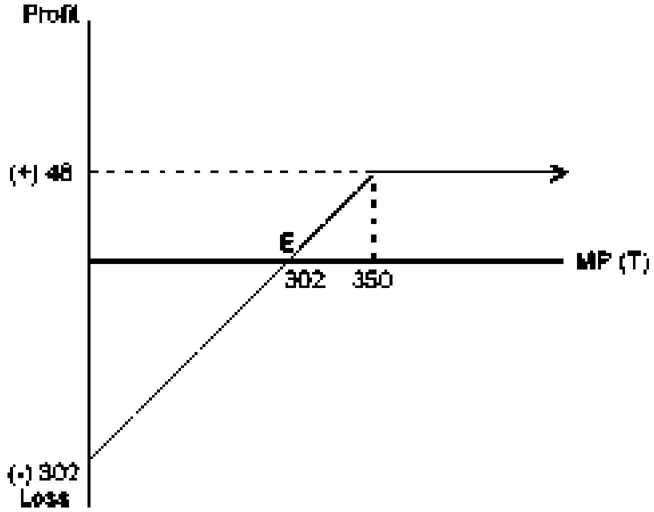
MP(T)	At Time T			Net Cash Flow
	Sell Stock	Buy Call	CF(T)	= CF(0) + CF(T)
270	270	0	270	(–) 32
290	290	0	290	(–) 12
310	310	0	310	8
330	330	0	330	28
350	350	0	350	48
370	370	(–)20	350	48

The total and the associated profit diagram reveal the following:

The call expires worthless for a price at or below Rs.350. The investor sells the shares at the expiration date price and makes a loss if the expiration date price is below Rs.302. At a price of Rs.302 (which is equal to the initial cash outflow) the investor breaks even. The maximum loss is bounded at Rs.302 which will be incurred when MP(T) = 0.

If the expiration date price exceeds Rs.350, the call closes in-the-money which implies that the writer has to repurchase the option at a premium equal to the expiration date price less the exercise price. The result is that for every rupee increase in the stock's price beyond Rs.350, the investor's profit increases by Re.1 from the long position in the stock and decreases by Re.1 because the call was written. Therefore, the net profit stabilizes at Rs.48 for MP(T) $\geq$ 350.

Covered Call Writing



When will an investor use a covered call writing strategy? Given an understanding of the pay offs associated with this strategy, we find that the strategy will make sense to an investor who believes that a stock offers scope for a small price appreciation. This investor will, therefore, buy the stock at the prevailing market price and write an out-of-the-money call. If the price rises, the covered call writer will capture the price increase up to the exercise price and keep the call premium as well.

Obviously the covered call writer will not enjoy and price appreciation beyond the exercise price of the call and will regret if the stock price rises sharply. Likewise, if the stock price falls sharply, the covered call writer will regret for having bought the stock.

PROTECTIVE PUT

This strategy involves buying the underlying asset and buying a put on that asset.

Illustration 6

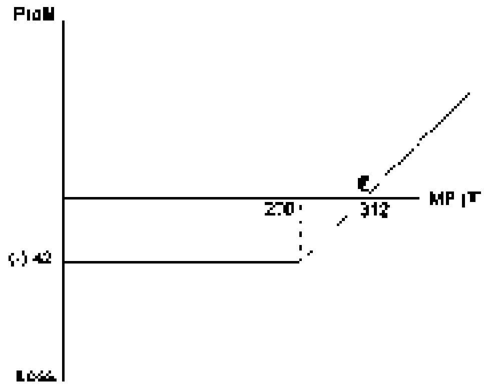
Buy 100 Shares of Arvind Mills	@	(–) Rs.310 per share
Buy a March 270 put		(–) Rs. 2 per share
Initial Investment [CF (0)]		(–) Rs.312 per share

The expiration date cash flow and the profit diagram are as follows:

Expiration Day Cash Flows for a Protective Put

MP(T)	At Time T			Net Cash Flow
	Sell Stock	Sell Put	CF(T)	= CF(0) + CF(T)
240	240	30	270	(–) 42
260	260	10	270	(–) 42
280	280	0	280	(–) 32
300	300	0	300	(–) 12
320	320	0	320	8
340	340	0	340	28

Protective Put



From the expiration day cash flow statement and the profit diagram, we find that – the put expires worthless for prices at or above Rs.270. The investor sells the shares at the expiration date price and incurs a capital loss on such sale for prices below Rs.310. The investor breaks even at a price of Rs.312. For prices above Rs.312, the investor's net profit (measured in terms of the net cash flow) increases by Re.1 for every rupee increase in the stock price.

For prices below Rs.270, the put closes in-the-money which implies that the investor gains by selling the put. The capital loss on sale of shares is partly offset by the premium receive and for all prices below Rs.270, the net loss (measured in terms of net cash flow) remains constant at Rs.42. Put differently, the loss is bounded at Rs.42 for MP(T) ® 270.

This strategy appeals to those investors who are particularly concerned with protection against downside fluctuations in stock prices. This protection, of course, has a cost in terms of the premium paid for buying the put. This cost can be reduced by buying an out-of-the-money put.

Options Combinations

There are a variety of option combinations which traders can adopt to suit their risk-return profile. These option strategies would help the trader to profit from the unexpected movement of prices of the underlying asset in either directions.

STRADDLE

A straddle involves a call and a put option with the same exercise price and the same expiration date. A straddle buyer buys a call and a put option and the seller sells a call and a put option at the same exercise price and the same expiration date. The maximum loss associated with the long straddle position is the cost of the two options (the premium paid for buying the options). Profit potential is unlimited when the prices of the underlying asset rise significantly and limited when it falls significantly. The pay-off of a straddle buyer is given below:

Figure 11: Pay-off of Straddle

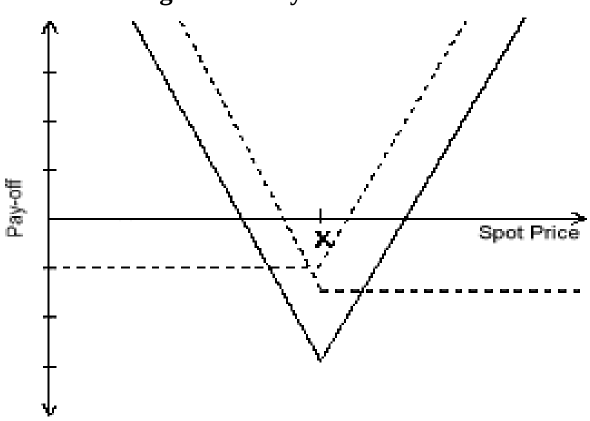


Table 17: Expiration Day Cash Flows for a Long Straddle

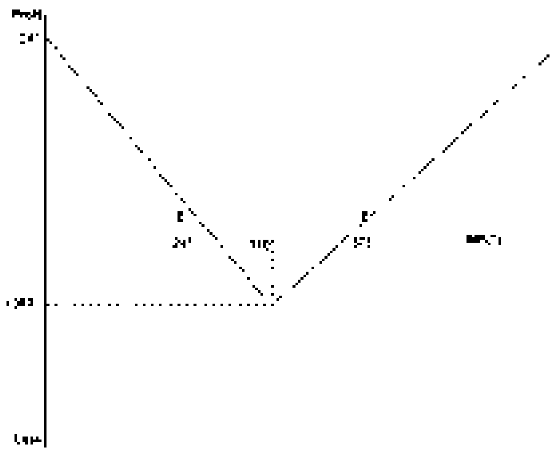
Buy a March 310 call	(–) Rs.21 per share
Buy a March 310 put	(–) Rs.42 per share
Initial Investment [CF (0)]	(–) Rs.63 per share

The expiration date cash flows are as follows:

MP(T)	At Time T			Net Cash Flow
	Sell Call	Sell Put	CF(T)	= CF(0) + CF(T))
220	0	90	90	27
240	0	70	70	7
260	0	50	50	(–) 13
280	0	30	30	(–) 33
300	0	10	10	(–) 53
310	0	0	0	(–) 63
320	10	0	10	(–) 53
340	30	0	30	(–) 33
360	50	0	50	(–) 13
380	70	0	70	7
400	90	0	90	27

The associated profit diagram is shown in figure 12.

Figure 12: Long Straddle Strategy

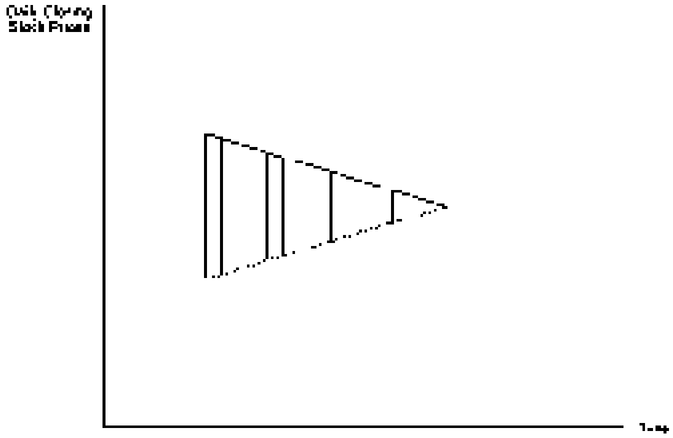


The table and the profit diagram reveal that the investor purchasing a straddle makes profits at prices which are significantly lower or higher than the prevailing market price. This strategy will appeal to an investor who wants to take a position in an underlying asset that is volatile but does not have a clue whether it will rise or fall in the short run. The investor however, only anticipates a sharp movement in the price of the asset.

For example, consider a stock whose price movements are as shown in figure 12. The graph has been drawn connecting the daily high-low prices. The triangular formation reveals that there has to be a break out either upwards or downwards.

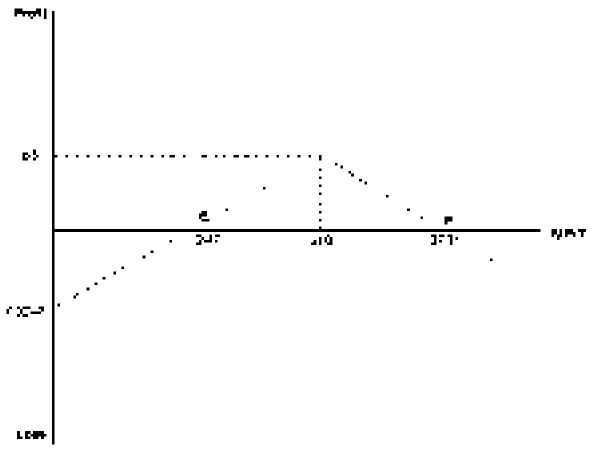
It is difficult to predict the direction in which the stock will move (because the successive tops are lower than the preceding tops which is a bearish signal, but the successive lows are higher than the preceding lows which is a bullish signal). If the investor knows that the stock is a volatile stock, he can profit from this scenario by buying a straddle on the stock.

Figure 13: Triangular Formation of Stock Prices



Obviously, the writer of a straddle anticipates no major fluctuation in the price of the underlying asset. In other words, the writer will profit if the price of the underlying asset remains more or less stable up to the expiration date. Constructing the pay-off table and the profit diagram for this strategy is relatively straight forward once we have understood the pay-off patterns for a long straddle strategy. The writer of the straddle presented in example below will face a profit diagram as shown in figure 14 below.

Figure 14: Short Straddle Strategy



From the profit diagram it can be seen that the writer faces the risk of significant losses if the price of the underlying asset was to rise or fall sharply. While the maximum loss with decline in price is limited to Rs.247 (= – 310 + 63), the potential loss associated with a steep rise in price is theoretically unlimited.

STRANGLE

It is a combination of a call and a put with the same expiration date and different strike prices. If the strike prices of the call and the put options are X_1 and X_2, then a strangle is chosen in such a way that $X_1 > X_2$.

Assume that you buy a call and a put option on a particular stock with strike prices $35 and $30 respectively. Let the cost of the call and the put be $3 and $5 respectively. Then your initial outflow is $8. If you have to benefit from your strategy, the total pay-off should exceed $8. You will exercise your call option only when the price of the stock at expiration goes above $38. Similarly you will exercise your put option only when the price of the stock at expiration goes below $25. To break even, (to reach a position of no loss and no profit) the stock's price at expiration should be below $22 or above $43. If the price at expiration falls some where between $22 and $43 then you do not benefit from your strategy. In fact within this range you are exposed to loss. Outside this range you have a profit potential. You would have guessed by now that the profits and loss on a short position in a strangle would be the reverse of that of the long position. The pay-off of a strangle buyer and seller are given below.

For example, if an investor believes that the probability of Arvind Mills stock moving up sharply is higher than the probability of the price plummeting, he will buy an at-the-money (or in-the-money) call and an out-of-the-money put as shown below:

Figure 15: Pay-off of Strangle

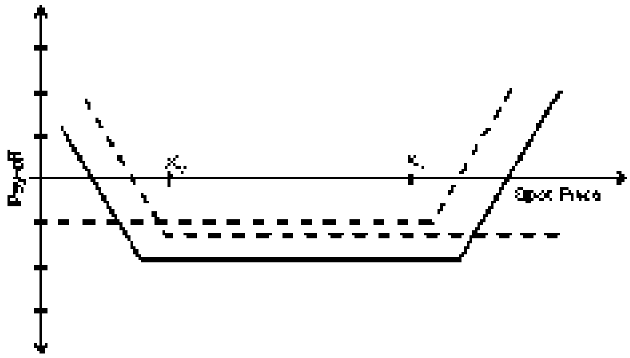


Illustration 7

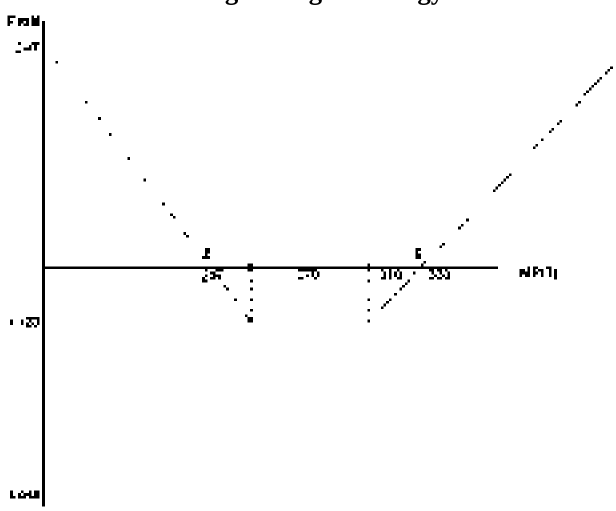
Buy a March 310 call	(–) Rs. 21 per share
Buy a March 270 put	(–) Rs. 2 per share
Initial Investment [CF (0)]	(–) Rs. 23 per share

The expiration day cash flows and the corresponding profit diagram will be as follows:

Expiration Day Cash Flows for a Strangle

MP(T)	At Time T			Net Cash Flow
	Sell Call	Sell Put	CF(T)	= CF(0) + CF(T)
220	0	50	50	27
240	0	30	30	7
260	0	10	10	(–) 13
270	0	0	0	(–) 23
300	0	0	0	(–) 23
310	0	0	0	(–) 23
320	10	0	0	(–) 13
340	30	0	30	7
360	50	0	50	27

Long Strangle Strategy



Comparing the profit diagrams of the long straddle strategy and the long strangle strategy, we find that the profit associated with a sharp potential price appreciation is higher under the long strangle strategy. We also find that the initial investment cost of the long strangle strategy is less than the initial investment cost of the (at-the-money) long straddle strategy.

The strangle writer stands to gain only if there are no pronounced changes in the price of the underlying asset. The profit diagram for this strategy is left as an exercise to the reader.

STRIPS AND STRAPS

Strips

A strip consists of a long position in one call and two puts with the same exercise price and expiration date. The buyer of a strip believes that there will be a big stock price move but the stock price is more likely to fall than it is to rise.

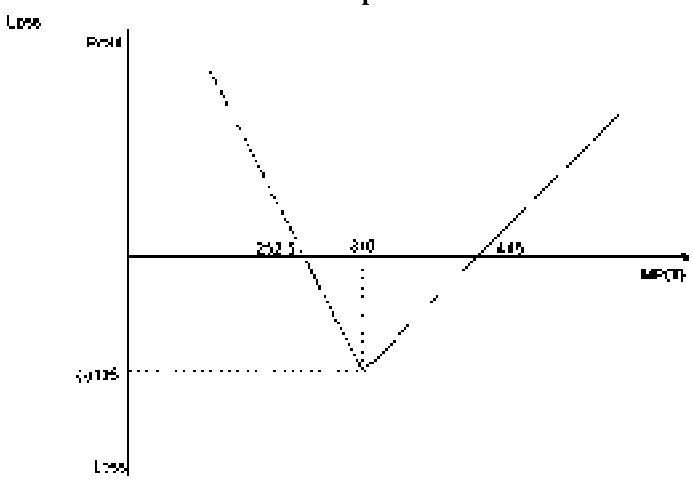
Illustration 8

Buy one March 310 call	(–)21
Buy two March 310 put	(–)84
Initial Investment [CF(0)]	(–)105

The expiration date cash flow is as follows:

MP(T)	At-Time T			Net Cash Flow = CF(0) + CF(T)
	Sell Calls	Sell Puts	CF(T)	
220	0	+180	180	75
240	0	140	140	35
260	0	100	100	(–)5
270	0	80	80	(–)25
300	0	20	20	(–)85
310	0	0	0	–105
320	10	0	10	(–)95
340	30	0	0	(–)75
360	50	0	50	(–)55
400	90	0	90	–15

Strip



The table and the profit diagram that the strip buyer can make profit in both rise and fall in the stock prices. But the amount of profit will be greater when the underlying stock declines sharply. This strategy will appeal to investors who want to take a position in an underlying asset that is volatile but will be likely to decline steeply.

Straps

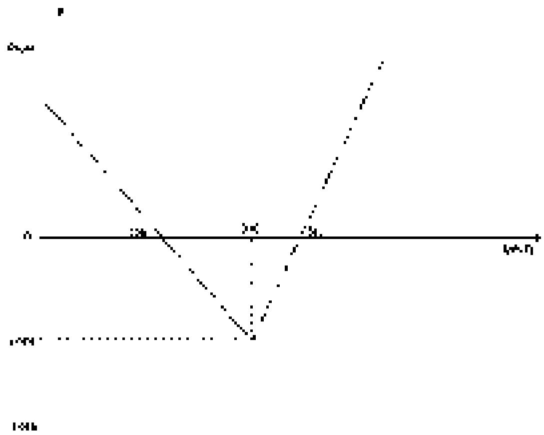
A strap consists of a long position in two calls and one put with the same strike price and expiration date. A strap is like a strip that is skewed in the opposite direction. The buyer of a strap expects bullish and bearish possibilities for the optioned security with a price rise being more likely.

Illustration 9

Buy two March 310 calls	(–) 42
Buy one March 310 put	(–) 42
Initial Investment [CF(0)]	(–) 84

MP(T)	At-time T			Net Cash Flow = CF(0) + CF(T)
	Sell Calls	Sell Puts	CF(T)	
220	0	90	90	6
240	0	70	70	(–)14
260	0	50	50	(–)34
270	0	40	40	(–)44
300	0	10	10	(–)74
310	0	0	0	–84
320	20	0	20	–64
340	60	0	60	–24
360	100	0	100	+16
400	180	0	180	+96

Strap



The table and the profit diagram illustrate that the investor purchasing a strap makes profits at prices which are significantly lower or higher than the prevailing market price. However, profit will be higher in the bullish market condition. This strategy will attract an investor who expects market to be volatile but thinks that it will rise in future. As evident from the table, the profit will be higher whenever the rise in price of stock is huge.

SPREAD STRATEGIES

Spread strategies are employed for exploiting moderately bullish or bearish beliefs about the market. Spread strategies involve only the use of options. There are three types of spreads:

- Vertical Spreads or price spread
- Horizontal Spreads or time spread
- Diagonal Spreads.

Vertical Spread involves buying an option and selling another option of the same type and time to expiration, but with a different exercise price.

Buy March 270 Call	@ Rs.50
Sell March 350 Call	@ Rs.3

Horizontal Spread involves buying an option and selling another option of the same type with the same exercise price, but with a different time of expiration.

Buy March	310 Call	@ Rs.21
Sell June	310 Call	@ Rs.30

Diagonal Spread involves buying an option and selling another option of the same type with a different exercise price and a different time to expiration.

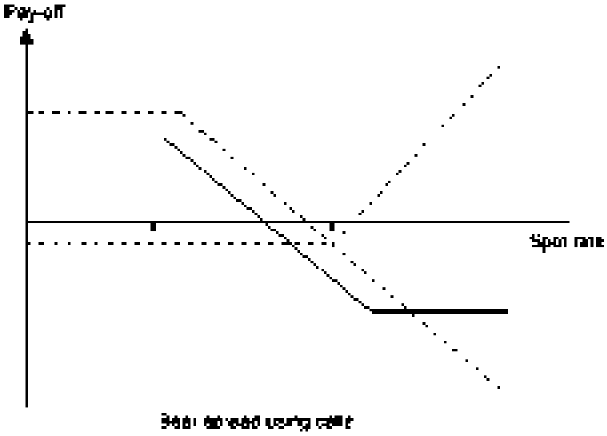
Buy March	270 Put	@ Rs.2
Sell June	310 Put	@ Rs.50

Bull and Bear Spreads (Vertical Spreads)

A bull spread is a combination of options created to profit from a rise in prices of the underlying asset. A bear spread is a combination of options created to profit from a fall in prices of the underlying asset. If you wish to buy a bull spread using calls, then you buy a call with a lower strike price and sell a call with a higher strike price. This strategy is called a spread because it involves buying an option and selling a related option to limit the risk. This strategy also limits the profit potential. The cost of a bull spread would be the cost of the option bought less the cost of the option sold. Assume a stock currently trading at $45. You expect a rise in the prices of the stock in the near future. You have limited funds for investment now so that you are not able to invest in stock at present and benefit from your forecast. You wish to limit your risk exposure and at the same time you like to benefit from your forecast. You can use options to achieve this. Assume that the following options are available on the stock. Two call options with the exercise prices $40 and $52 costing $5 and $3 respectively. If you want to limit your downside risk you use a bull spread by buying the call with exercise price $40 and selling one with $52. The total cost associated with this strategy is $2 ($5 – $3). If the stock price at expiration turns out to be $55 you exercise the call at $40 and the call buyer would also exercise his/her call. This will give you a profit of $8. Thus, the long position would give you a profit if the stock price exceeds $45 and the short position would give a profit when the stock price lies below $55. But when the stock price at expiration exceeds $52, each dollar gained by you on the short call will be offset by that lost on the long call. So, the maximum gain will be achieved at $52 viz. $8. This is same as you get when the stock price at expiration is $55. The break even price of a bull spread is the sum of the lower strike price and the initial cash flow. In a bull spread you have limited downside risk and also limited profit potential.

If you expect a fall in the prices of a particular asset and if you wish to hedge the risk arising from diverse movements in the prices of that particular asset you can adopt a bear spread strategy to limit your loss and profit potential. Here, you sell a call with a lower strike price and buy a call with a higher strike price. It is equivalent to adopting a short position in bull spread using calls. The pay offs associated with bull and bear spreads are given below.

Figure 16: Vertical Bear Spread using Calls



a. **Bullish Vertical Spreads:** As the name suggests, this strategy is employed to exploit a moderately bullish belief about the market or about a stock.

The strategy can be executed either using calls or using puts. A bullish vertical spread with calls will involve buying an in-the-money call and selling an out-of-the-money call of the same term to expiration.

The use of this strategy lowers the initial cash outlay than what would have been incurred in the event of purchasing only an in-the-money call.

Illusration 10

(Bullish Vertical Spread using Calls)

Buy June 270 Call	Rs. 58
Sell June 350 Call	Rs. 8
Initial Investment [CF(0)]	(–) Rs.50

The expiration day cash flows and the associated profit diagram are as follows:

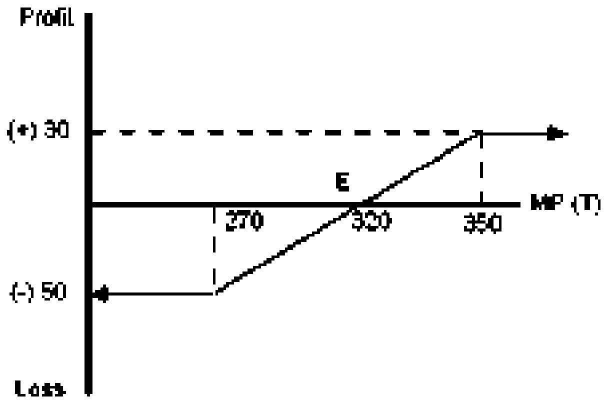
Expiration Day Cash Flows for a Bullish Vertical Spread using Calls

MP(T)	At Time T			Net Cash Flow = CF(0) + CF(T)
	Buy June 270 Call	Sell June 350 Call	CF(T)	
240	0	0	0	(–) 50
260	0	0	0	(–) 50
270	0	0	0	(–) 50
280	10	0	10	(–) 40
300	30	0	30	(–) 20
320	50	0	50	0
340	70	0	70	20
350	80	0	80	30
360	90	(–) 10	80	30

As we said earlier, this strategy will appeal to an investor who is moderately bullish on the underlying asset. The investor makes the maximum profit at the strike price at which he has sold the call. Obviously, an investor who is very bullish must just buy the (in-the-money) call in order to fully exploit the upside potential which is theoretically unlimited.

An investor who is moderately bullish can also construct a bullish spread using puts. As you would have guessed, this strategy will involve buying an out-of-the-money put and selling an in-the-money put.

Bullish Vertical Spread Strategy using Calls



Illusration 11

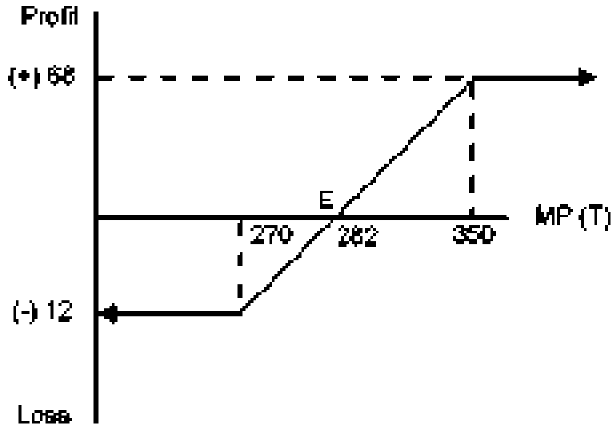
(Bullish Vertical Spread using Puts)

Buy March 270 put	(–) Rs. 2
Sell March 350 put	(+) Rs.70
Initial Cash Flow	(+) Rs.68

The construction of the expiration day cash flow table is left as an exercise to the reader. You can verify that the profit diagram associated with this table is as follows:

We find that if the investor's expectations turn out to be correct, both puts will expire worthless and the investor, in general, makes a higher profit than what can be made using the bullish spread with calls.

Bullish Vertical Spread Strategy using Puts



b. **Bearish Vertical Spreads:** Spread strategies of this type are employed to exploit moderately bearish beliefs about the underlying asset and can be executed using either calls or puts. The following examples illustrate the pay-off patterns associated with this strategy.

Illusration 12

(Bearish Vertical Spread using Calls)

Sell October 270 Call	(+) Rs.71
Buy October 350 Call	(–) Rs.12
Initial Cash Flow [CF(0)]	(+) Rs.59

The profit diagram associated with this strategy will be as follows:

Bearish Vertical Spread Strategy using Calls

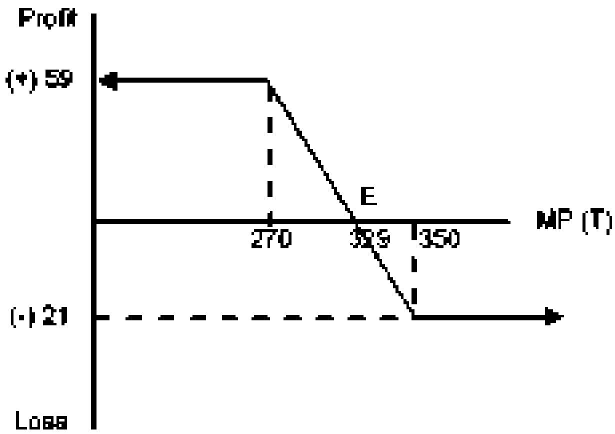


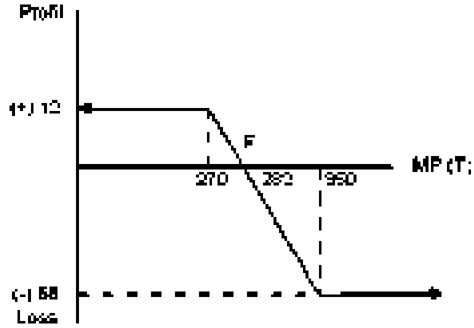
Illustration 13

(Bearish Vertical Spread using Puts)

Buy March 350 put	(–) Rs.70
Sell March 270 put	(+) Rs. 2
Initial Cash Flow [CF(0)]	(–) Rs.68

The profit diagram associated with this strategy will be as follows:

Bearish Vertical Spread Strategy using Puts



From our discussion on vertical spread strategies, we find that these strategies can be profitably employed when an investor believes that the stock price will move only to the strike price that generates the maximum profit. Put differently, the investor employing any of these strategies does not anticipate a major change in the price of the underlying asset.

Spread strategies can also be used to limit the maximum loss of a naked option writer. For example, an investor who believes that the stock price of Arvind Mills will fall below Rs.310 might write a March 310 call. This short call strategy *per se* produces a pay-off pattern with an unbounded downside risk. The writer can limit the downside risk by buying a March 350 call. The combination of the two positions is nothing, but a bearish vertical spread strategy using calls.

Horizontal Spread (Time Spread)

Time value of option should be borne in mind when an option trade is primarily concerned with movements in intrinsic value. Consider a trader who buys an at-the-money call option and expects to profit in case of rise in the stock price. The holder can still face loss if the rise in the price of the underlying instrument is modest and takes a long time to come about, as the profit from the increase in intrinsic value could be more than offset by a fall in time value. This is more likely in the case of an option that is close to the expiry date.

The point is even more apparent in the case of an out-of-the-money call. Such a call might fail to become in the money as a result of a rise in the price of the underlying instrument occurring quickly and well before expiry. The profit would depend upon the price rise of the underlying instrument out weighing the loss of time value caused by the passage of time.

“If all options in a spread expire at the same time, the value of the spread is simply the function of the underlying price at expiration. If, however, the spread consists of options which expire at different times, the value of the spread cannot be determined until both the options expire. The spread’s value depends not only on where the underlying market is when the option expires, but also on what will happen between that time when the short-term option expires and the time when the long-term option expires. Horizontal spreads, sometimes referred to as time spread or calendar spread, consist of opposing positions which expire in different months.”

The most common type of time spread consists of opposing position in two options of the same kind (either both call or puts) where both options have the same strike price. A long time spread is created when when a long-term option is purchased and the short-term option is sold, while a short time spread is created when a short-term option is purchased and the long-term option is sold. We know that the longer the maturity of the option, the more expensive it is. Therefore, a long-term option will have higher price than that of a short-term option, this is consistent with the practice of referring to any spreads which are executed at a debit (credit) as a long (short) spread position.

The commonly executed time spreads are one-to-one that is, one contract is purchased for each sold contract, but a trader may use a time spread to reject a bullish, bearish or neutral market sentiment. In general, a calendar spread is created by buying an option with long-term expiration while selling the same option with near-term expiration. Most important, the time value of the near-term option declines more rapidly than the time value of the long-term option, and the profit is provided by this difference in the rates at which the time value declines. The premium of the long-term option is not necessarily proportionately higher than the premium of the near-term option. The price of the long-term option can be somewhat less sensitive to changes in the underlying spot price than the price of the near-term option.

This kind of calendar spread option demands an initial investment. Assuming that the longer-maturity option is sold when the short maturity option expires, the investor makes a profit if the stock price at the expiration of the short maturity option is close to the strike price at the expiration of the short maturity option. However, a loss is incurred when the stock price is significantly above or significantly below this strike price. The profit pattern of the calendar spread constructed by buying long-term option and selling a short-term option can be understood by assuming high and low stock price, when the short-term maturity option completes its term. First consider that the stock price is very low when the short-term option expires, the value of short-term option will be nil, while the value of the long-term option is very small and close to zero. Hence the investor incurs loss that is only little less than the initial investment (premium paid on long-term option – premium received on short-term option) because the calendar spread buyer will gain a little return from the long-term option. Now consider the situation, where the stock price, ST is very high when the short-term option expires. The cost of writing short-term option will be ST – X (X is the strike price) and long-term option (assuming that early exercise is not feasible) is worth little more than ST – X.

Again in this situation the calendar spread buyer loses an amount little less than his initial investment. When the stock price (ST) is close to the strike price (X) at the time of the expiration of the short-term option, the short-term option costs either little or nothing at all. However, the long-term maturity option will still have value and therefore, a substantial profit can be made by the calendar spread holder.

"A time spread has different characteristics from the other spreads we have discussed earlier, because its value depends not only on movement in the underlying market, but also on the other trader's expectations about the futures market movements reflected in the volatility. If we assume that the options making up a time spread"[1] are approximately at-the-money, time spread will have following two essential characteristics:

i. A long time spread always likes the underlying market to sit still.

ii. A long time option spread always benefits from an increase in implied volatility.

1 Theta has been discussed on detail in the chapter "Sensitivity of Option Premiums".

We know that the rate of decline of an option premium per unit of time is called as the theta of the option. An important property of an at-the-money options's theta (time decay) is its propensity to become increasingly large as the expiry date comes nearer. As time passes, a short-term at-the-money option having less time to expiration will lose its value at a faster rate than a long-term at-the-money option. This principle has an important impact on the value of the time spread.

Example

Assume two at-the-money calls, one with three months to expiration and another with six month time to maturity, have values of 5 and 8.5 respectively. The value of the spread is therefore, 3.5. If one month passes and the underlying market remains unchanged, both options will lose value. But the short-term option, with its higher theta, will lose greater amount value. Suppose if long-term option loses 2.5 points, the short-term option may lose a full point. Therefore, the options are worth 4 and 8.25 and the spread is worth 4.25. If another month passes and the market remains unchanged, both option will lose their value but at different speed and again, the short-term option, with less time to expiration, will lose value at much faster rate. Again assume that if the long-term option loses 0.50 value, the short-term option may lose 2 points. Now, the value of the options are 7.75 and 2 and the spread has increased in value to 5.75. Finally, if at the expiration the market is still unchanged, the short-term option will be at-the-money and lose all its remaining value of 2 points. The long-term option will also lose value but will do so at lower speed. If the long-term option loses value of 0.75, it will be worth 7 points, and the spread will be worth 6 points.

The Effect of Time Passage on Time Spread:

Time to Expiration

Long-term option	6 months	5 months	4 months	3 months
Short-term option	3 months	2 months	1 month	0 month
Option Value				
Long-term option	8.5	8.25	7.75	7
Short-term option	5.0	4.00	2.00	0
Spread value	3.5	4.25	5.75	7

Now, consider the situation when the underlying asset market fluctuates dramatically, assume that both options described above are at-the-money and have values of 8.5 and 5 respectively. When the underlying asset market moves up and options have moved deeply into-the-money, they begin to lose their time value. If the rise in the asset price is quite large, the remaining three months of long-term option will not have any value and both options will eventually lose their time value. For example, if the strike price of both the calls is 100 and the underlying market moves from 100 to 150, both options might trade at their intrinsic value, or 50 points. Thus the calendar spread will not have any value. If longer term option may retain value as much as 0.50 points, the spread value will be equal to 0.50 points. What will happen if the underlying market makes a large downward move? This situation is similar to an upward move, because here both options move further out-of-the-money and their time value also begins to shrink. In this case, both options will not have any intrinsic value, so that if the market moves down far enough, the time spread will be worthless. If as in previous case, the long-term option retains 0.5 point value, the spread will still collapse to 0.50 point. As we know that a short-term at-the-money option always decays faster than a long-term at-the-money option, regardless whether the options are calls or puts. Both a long time call spread and long time put spread want the underlying market to stand still to produce any material gain to the spread holder. The best situation for both kinds of options will require the short-term option to expire right at-the-money so that the long-term option will retain as much time value as possible while the short-term option expires worthless. Similarly, we can construct a short time spread (reverse time spread) by buying a short-term option and selling a long-term option. If a long-term time spread wants the market to sit still, logically a short time spread likes the market to move so the major consideration in deciding whether to create a long or short time spread is the likelihood of movement in the underlying market.

Time spreads are also sensitive to change in implied volatility and as we outlined, a long time spread always benefits from an increase in implied volatility. The relationship between option's vega[2] (sensitivity to a change in volatility) and the time remaining to expiration states that as time to expiration increases the vega of the option increases which indicates that a long-term option is always more sensitive to a change in volatility than a short-term option with the same strike price. For example, assume again that a 100 call time spread is worth 1.5 (long-term option with value 7.5 and short-term option with value 6). Assume also that the value of the option calculated by considering the volatility of 20%. What will happen to the value of the spread if volatility of the underlying stock rises to 25%? Both long- and short-term options will increase in the value but the long-term option has more time to expiration and therefore, with higher vega will add more value compared to the short-term option. If the short-term option adds 50 points, the long-term option may gain a full point. Now the options will be worth 8.5 and 6.5 and the spread will have widened from 1.5 to 2. On the other hand, if we decrease the volatility of the option both options will shed their value but the long-term option with more remaining time to expiration will be more sensitive to the change in volatility and will lose a greater amount. The new option can take values of 6.5 (long-term) and 5.5 (short-term) causing the spread to move down to 1 point. Thus an option trader who is long in a time spread expects to lose money, if the underlying market is smooth and moves gently in either direction. Trader knows that the benefits of time spreads begin to collapse as the option move into or out-of-the-money. However, if this movement is accompanied by substantial increase in implied volatility, the increase in the spread's price due to the increase in implied volatility may actually be greater than the loss due to market movement. Conversely, if the market remains calm, the trader expects the spread to widen because of the short-term option's greater time decay. But if, at the same time, there is a collapse in implied volatility, the decline in the spreads' price due to the decline in volatility may more than offset any gain from the passage of the time. If this occurs, the trader may lose due to shrinkage in the spread. Conversely, in the case of a short time spread, with a passage of time and with an increase in the implied volatility value, the spread loses value. The two opposing forces discussed now are the decay in an option's value due to the passage of the time and the change in an option's value due to the change in volatility, puts time spread in a special category with its unique characteristic. A trader dealing in time spread is not only attempting to forecast movement in the underlying market but he is also willing to predict changes in implied volatility.

A long time spread using calls will allow the investor to purchase a call with several months until expiration and write a call with only several weeks until expiration. Both calls will be having the same exercise price. Assume that the investor purchases a call with an exercise price of 60 with six months until expiration for an option premium 3.5 with the underlying stock trading at 57. At the same exercise price, the investor writes a call with one month until expiration for an option premium of 1 point. This spreads requires investment of 2.5 points which will be debited in the investors account.

2 Vega has been discussed in detail in the chapter "Sensitivity of Option Premiums".

Let us take an hypothetical example to understand this:

Time-Value Loss for an Option (S&P 500)

	December 20x1 Call		March 20x2 Call	
Strike price $	Premium (points)	Theta (points)	Premium (points)	Theta (points)
200	12.25	0.1193	26.60	0.0581
205	11.10	0.1256	24.20	0.0611
210	9.05	0.1221	22.15	0.0689
215	3.00	0.1197	19.18	0.0701
220	6.85	0.1117	15.13	0.0695

Time Maturity 48 days 139days

Volatility (25%) (25%)

Let us assume that the investor sells the December 20x1 Call of Strike Price $205 and purchases simultaneously the March 20x2 call of the same strike price. He will gain 0.1256 index points on the sale, which amounts to a $500 x 0.1256 = $ 62.80 gain (as each S&P index point is worth $500) and also there will also be a loss of $500 x 0.0611 = $30.55 on the March 20x2 Call. As he has sold the December call and purchased the March 20x2 call, he makes a net profit of $62.80 – $30.55 = $32.25.

The maximum risk in the time spread is the debit cost (excluding commissions and transaction charges) plus the possibility of any dividends paid should the stock be prematurely called just before ex-date. If the stock is called the investor may either exercise the long call option or sit with a position known as synthetic put. Synthetic put involves selling the underlying stock short and purchase a long call with an exercise price and expiration date which are the same as the call would have been purchased. The break even point for the time spread using calls is when the stock trading at the exercise price plus the debit paid to initiate the spread. As long as the stock is not trading below this value, the investor will lose money. It is most beneficial that the stock does not rise above the exercise price until after the short call expires. The difference between the exercise price and break even point represents the maximum trading loss. If the stock is called and the investor is forced to exercise the long call, a loss might be realized in this area. While the loss is limited to a maximum of the debit paid for the spread, the possibility of a loss does exist. The ideal situation as discussed earlier, for the investor using this strategy is that the stock remains below the exercise price until the written call expires, allowing the investor to capture 100 percent of the premium written. After the expiration of the written call, the investor would hope for the underlying stock to make a bullish move making the purchased call even more valuable. In this situation, the investor would profit in both calls. The possibility of this situation happening all the time is small, but it does exist. If the stock remains virtually unchanged till the expiration of the short call position, the investor may select at that time to sell the long call position. Even if, the time premium on the long call has deteriorated, the loss will not equal that of the gain in the short call position, allowing the investor to realize a profit. Some investors will write another call option, which has shorter life than the call which was purchased. This allows the investor the opportunity to duplicate the results of the previous month without any additional cost for the purchase of another call. If successful, the investor may duplicate the scenario for several months. While it is highly unlikely that the stock will remain unchanged or little moved during this period, substantial profits might be realized with little risk to the investor.

The time spread might also be used for an investor with a slightly bearish bias toward the underlying stock. In such a situation, the investor would purchase a put option with several months until expiration and write a put option with the same exercise price with a shorter period till expiration. The long put (the option which was purchased) will protect the investor against any assignment which would force the purchase of the underlying stock from the obligation of the short put contract. Unlike the call time spread, the put time spread is not subject to the payment of a dividend since the investor is only obligated to purchase the stock and not sell the issue short. The maximum risk in utilizing this strategy is the debit amount (initial investment). The investor utilizing the time spread using puts will benefit most, if the stock remains above the exercise price until the short put position expires. If the stock price declines after the expiration of the short put, the investor would utilize maximum return from the written put plus appreciation of the purchased puts as the stock moves lower. This is a two-fold benefit, should the timing be correct. It is very difficult to enact a strategy which requires such precise timing for an exact movement. This should not be expected. The break even point for the use of the time spread using puts is realized if the stock is at a price equivalent to the exercise price minus the initial debit amount. If the stock is between the break even point and the exercise price, a loss might be realized at the expiration of the short. If the stock is put to the writer, the writer might choose to hold the position resulting in a protective put stock position or the spreader might exercise the long stock position and sell the stock which was purchased.

Illustration 14

A trader purchased a call option with strike price 100 and time to maturity 6 months and simultaneously he sold another call option with the same strike price 100 but with 3 months time to expiration. Assume that the volatility of the underlying asset is 30% (Standard deviation) and the risk-free return in the market is 8%. Show the value of the long time spread using the Black and Scholes model for option pricing.

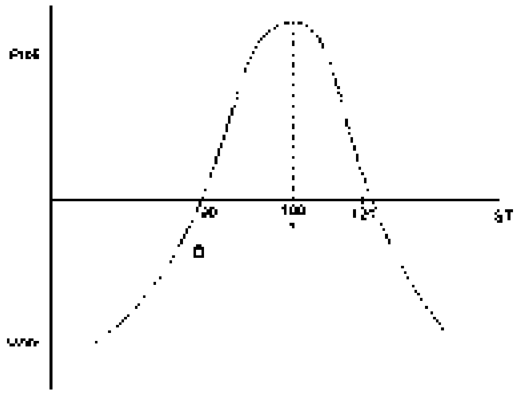
Using the Black and Scholes model, we have to first calculate the value of the option with differing stock price. Assuming that these values provide a good approximation for the call option we calculate the profit and loss of this time spread strategy using calls as follows:

Stock Price	Value of the Call Purchased	Value of the Call Sold	Value of the Time Spread
80	1.99	1.15	0.84
90	4.88	2.51	2.37
100	10.30	6.06	4.24
110	17.37	13.95	3.42
120	23.80	23.04	0.76

Horizontal Reverse Time Spread

Reverse time spreads using calls involve the purchase of a call which expires in a short period of time and the writing of another call with the same exercise price but which has a longer time period until expiration. This time spread strategy is just the opposite strategy to the long time spread. This reverse time spread using calls is for the investors who believe that the price of the underlying stock will decline before the expiration of the written call. The purchase of the short-term call is to protect the investor in case the stock moves in the wrong direction in the short-term. Some investors believe that if a stock does not move against them in a short period of time, then their assumption is correct. Consider that an investor purchases a February 15 call and writes a April 15 call. The strike price for both calls is the same and the premium of the short call is Rs.3 while premium on the long call is Rs.5, thereby giving credit of Rs.2 to the investors. If the stock prices rise dramatically during the holding period of the long call, the investor can exercise the call position and turn a bearish position into a covered write. If the investor decides not to exercise the call, the spread position could be closed out for a debit which would probably make him incur a small loss. After the expiration of the long call, the break even point for the investor would be the exercise price plus the original credit received. The investor should pay attention to the naked call position as the risk to the investor is unlimited. If the stock suddenly rises, the investor could face serious financial risk. If the stock remains unchanged for sometime, the investor should consider the premature closure of the naked option position.

Figure 17: Time Spread



"Similar to the call spread, in this spread, the investor buys a put option with a shorter period for expiration and writes a put option with a longer time-to-maturity. Both the put options have the same exercise price. This strategy would be suitable for an investor who is bullish on the underlying stock and at the same time willing to take some risk. If the stock price is below the difference between the exercise price of the put option and the difference in premiums then the investor will gain on the long put and lose on the short put. This is the break even point for this strategy. If the stock price falls below this level, after the expiry of the long put, then the maximum possible loss will be incurred by the investor when the stock price goes to zero. If the stock price rises as per his expectations, the investor would realize a maximum profit which is the difference between the premiums till the expiration of the long put. But after the expiration of the long put, he will continue to gain on the short put and the profit potential is restricted to the premium received in that case. But if the stock price ceases to rise after the expiry of the long put, then the investor has to assume the risk of losing on the short put. But if the stock price stops to rise before the expiry of the long put he might choose one of the following two strategies. He might exercise the long put and go short on the underlying stock. This would leave him with a short stock position and a short put. If the investor is assigned the put which was written, the stock position will be balanced."[3]

To understand the concept of the reverse time spread, we can use our earlier example by reversing the initial position; that is selling 6-month call and buying

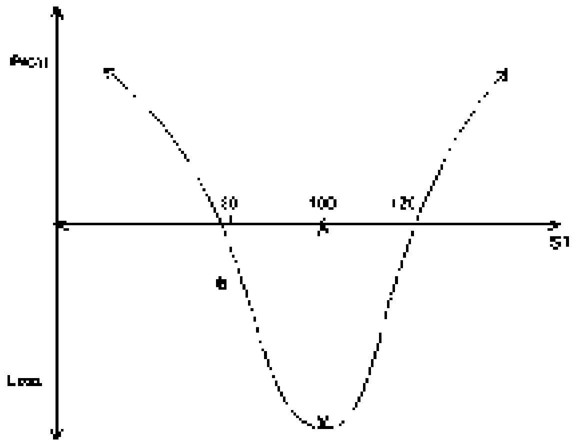
3 Fullman, Scott H., Options: A Personal Seminar, New York Institute of Finance, 1982.

3-month call. The profit pattern of this reverse time spread using call will be just opposite to what given in our earlier example.

Stock Price	Value of the Call Sold	Value of the Call Purchased	Value of the Time Spread
80	1.99	1.15	0.84
90	4.88	2.51	2.37
100	10.30	6.06	4.24
110	17.37	13.95	3.42
120	23.80	23.04	0.76

The reverse time spreads are similar to the writing of the naked options but use the purchase of a shorter term contract to hedge the naked position. It is important to realize that once the short-term option position (which was purchased) expires, the investor will have a naked short option position. This position can subject the investor to unlimited risk.

Figure 18: Time Spread



Diagonal Spread

A diagonal spread is similar to a time spread, except that the options have different exercise prices. While many diagonal spreads are executed one-to-one (one long-term option for each short-term option), diagonal spreads can also be ratioed, with unequal numbers for long and short market contracts.

With the large number of variations in diagonal spreads it is impossible to generalize about their characteristics as we can do with long and short time spreads. Each diagonal spread must be analyzed separately, often using computers, to determine the risks and rewards associated with the spread. For example, we can create a diagonal spread by buying a call with a lower exercise price in a further into the future month and writing a call with a higher exercise price in a near-term month. Should the stock begin to move higher immediately, the investor would still realize a profit should the position have to be closed by the time the first call (near term) expires. Diagonal spread can also be very favorable to an investor with a bearish opinion of a stock. This is known as a diagonal spread using puts. Similar to the diagonal spread using calls, the investor purchases a put contract with several months till expiration and an exercise price near the current stock price (higher exercise price) and writes another put contract with an exercise price which is out-of-the-money (lower than the put which was purchased and is expiring in a short period of time. Should the underlying stock depreciate in price before the expiration of the put which was written, the investor should still realize some profit. While this profit might not be such as if the move happened post the first expiration, the investor should still realize a profit. For example, an investor purchased an April 17.5 put for premium 3 and wrote a March 12.5 put at premium

1.25. The maximum risk to the investor of 1.75 points would only be realized, if the stock price closed above 15.75 until expiration of the March contract. The investor realized a maximum profit till expiration of the first put since the stock dropped below the 12.5 exercise price of the put which was written. The maximum profit of 3.75 per spread was realized by the investor for a return of 185% till expiration. While this result may have not been the goal of the investor, the result was more than pleasing. "Once the short position expires, the investor should consider the writing of another out-of-the-money option. Option may be written right until the month in which the long position expires. The ultimate position might be a bull spread using calls or a bear spread using puts. If the options are written for several months". (Options A Personal Seminar by NYIF).

Now we will draw diagrams showing the profit pattern of the diagonal spreads using calls. Assume that a diagonal spread is created by buying a call with strike price X_2 and exercise date T_2 and selling a call with strike price X_1 and exercise date T_1 ($T_2 > T_1$).

The profit pattern, when $X_2 > X_1$ will be as follows:

Figure 19: Profit Pattern when $X_2 > X_1$

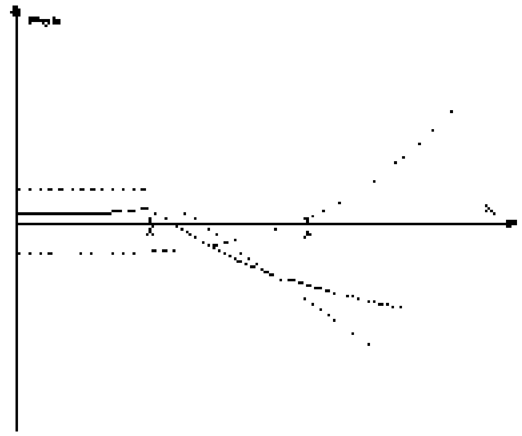
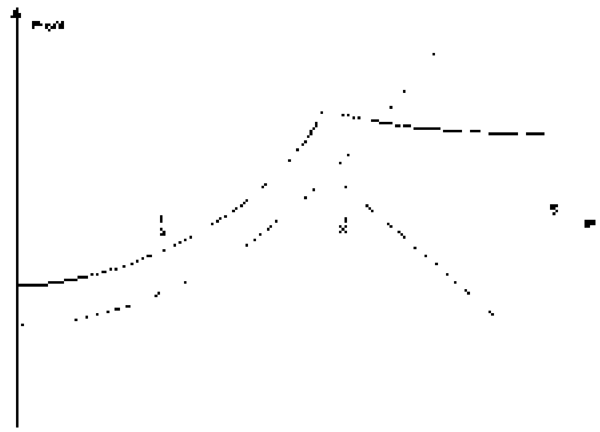


Figure 20: Profit Pattern when $X_2 < X_1$



There is, however, one type of diagonal spread about which we can generalize. If a diagonal spread is done one to one, and both options are of the same type and have approximately the same delta, the diagonal spread will act very much like a conventional time spread. A diagonal bull spread involves the purchase of a relatively short-term option and the sale of a longer term option with higher strike price. Conversely a diagonal bear spread involves the purchase of relatively a long-term option contract and the sale of a short-term contract with lower strike price. The value of the diagonal bull spread increases with the rise in the underlying asset price whereas the value of the bear spread rises with the decline in the underlying stock price.

Reverse diagonal time spreads are used by some traders and investors to take opportunity in anticipation of sudden changes in the stock activity, also known as trend changes. The reverse diagonal call spread can be accomplished in two different ways. First the trader might purchase a call option which expires before the call which is written with differing exercise price. The purchased call may give extra protection and possibly even profit if the call utilizes an exercise price which is lower than that of the call which is written. If the stock rises short-term, the purchased call could be sold for a quick profit, leaving the investor or trader with a naked call position. If the trader or investor believes that the stock will have a quick short-term rise, and then begins to decline in price, this strategy could be most beneficial. If the stock drops in price first, the purchased call will probably drop and might expire worthless. This loss should be partially offset as the value of the written call should also decline, allowing for the call to be purchased at a profit. The investor/trader should not wait for the written call to drop to zero before buying the call back. At this time, the investor might wish to write another calling in the same month, but with an exercise price which is lower. A second method of using the reverse diagonal call spread involves the purchase of a call which expires before the call which is written, with the purchased call utilizing a higher exercise price. If the price of the underlying stock rises dramatically before the expiration of the purchased call, the trader/investor has liability which is limited to the difference between the two exercise prices. The maximum loss before the expiration of the purchased call is the difference between the two exercise prices less the credit received, if the purchased call is exercised.

Box Spread

A box spread is a combination of bull and bear spreads with calls and puts respectively with the same set of exercise prices. If X_1 and X_2 are strike prices available with calls and puts respectively then a box spread involves buying and selling calls with strike prices X_1 and X_2 and buying and selling a put with strike prices X_2 and X_1 respectively. If you are a risk-averse investor then you can adopt this strategy since this always gives a pay-off of the difference between the higher and the lower strike prices. Here it is $X_2 - X_1$.

Butterfly Spread

A butterfly spread can be executed by using four identical options with the same expiration date and on the same underlying stock but different exercise prices. A trader, who is long on the butterfly spread, buys one call with a low exercise price, buys one call with a high exercise price and sells two calls with an intermediate exercise price.

A trader who is short on the butterfly spread takes exactly the opposite position by selling one call with a low exercise price, selling one call with a high exercise price and buying two calls with an intermediate exercise price.

Let us assume that,

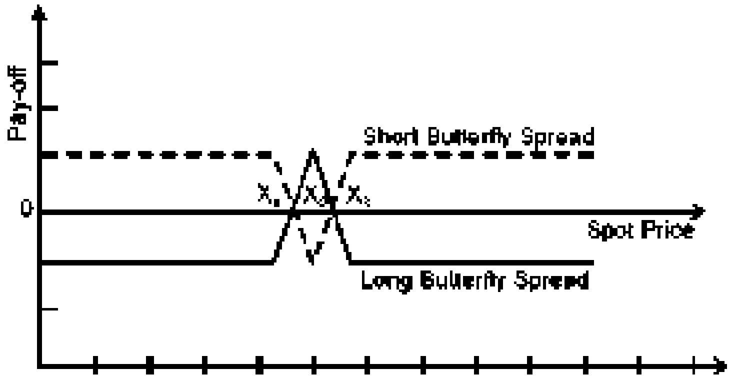
X_1 is the low strike price

X_2 is the intermediate strike price and,

X_3 is the high strike price.

So, a long trader on butterfly spread would buy one call option each at strike prices X_1 and X_3 and sell two options at the intermediate strike price of X_2. These strike prices are chosen such that $X_1 < X_2 < X_3$. The butterfly spread gives a pay-off similar to that of a straddle but the former is less risky compared to the latter while at the same time you have only limited profit potential. The pay-off of a butterfly spread using calls is given below.

Figure 21: Butterfly Spread



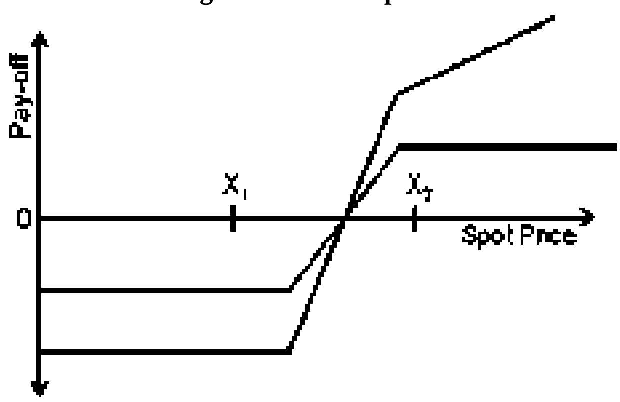
Ratio Spread

In a ratio spread two or more related options are traded in a specified proportion. As the ratio can be varied without any limit, there are infinite numbers of possibilities of designing a ratio spread. In a ratio spread the number of options bought differs from the number sold to form a spread. If this ratio is 1, then the ratio spread becomes identical to a bull or bear spread depending on the strategy adopted. Buying two options and selling one option gives a 2:1 ratio spread. Since there are a number of possibilities of forming a ratio spread we will take up an example of a 2:1 ratio spread.

Assume that you buy 2 call options on a particular stock at a lower strike price and sell one call option on the same stock at a higher strike price. This is different from the bull spread where you buy and sell one at a time. Assume that the call prices are $85 and $90 with prices $5 and $3 respectively, and when the stock price is below $85, then you do not benefit from either of the calls and you lose the initial outlay $7. If the stock price is below $90 but above $85 you gain on the options bought. If the stock price is $90 you get a gain of $3. If the stock price increases further to $95, you will gain $20 on the options bought and you will lose $5 on the option sold. The gain will be $15. With the initial outlay of $3 the net gain is $12. Thus in a ratio spread, you have unlimited profit potential if the prices move in accordance with your expectation and your loss is limited. A risk loving investor will go in for a ratio spread and he will choose the ratio depending on the magnitude of risk acceptable to him.

The pay-off profile of a 2:1 ratio spread is given below.

Figure 22: Ratio Spread

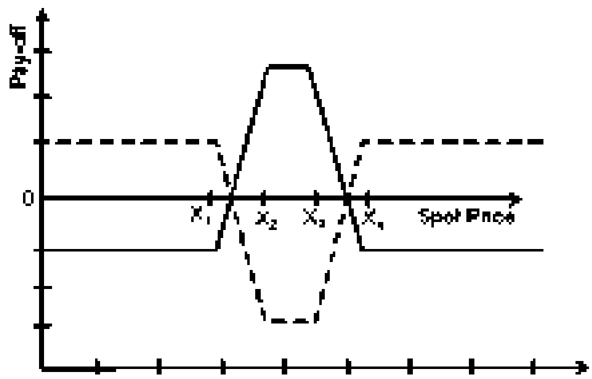


Condor Spread

A condor-spread strategy is similar to a butterfly spread involving 4 options of the same type but with a small difference. In a butterfly spread, three different strike prices are involved; but in a condor, four different strike prices are involved. In a condor spread, two options are bought at the extreme strike prices and two are sold at two intermediate strike prices. Let us see the example of a condor spread with calls.

Assume that there are 4 call options on a stock with strike prices $45, $50, $57 and $62 priced at $9, $6 $2 and $1 respectively. In a condor spread, you buy those at $45 and $62 and you sell those at $50 and $57. If the stock price at expiration turns out to be $45 or below, no call option will be exercised and the loss is limited to the cost of the spread, i.e. $2. If the stock price at expiration is $50, the long call with strike price $45 will be exercised and the pay-off will be $3. The short call with strike price $50 will be exercised against you when the stock price at expiration is above $50. If the stock price at expiration is above $62 the profit on the long calls will be offset against the loss on the short calls. Thus, the condor spread has limited loss and a limited profit. The pay-off of a condor spread is given below. It can be easily shown that the pay-off of a short position is the mirror image of the long position.

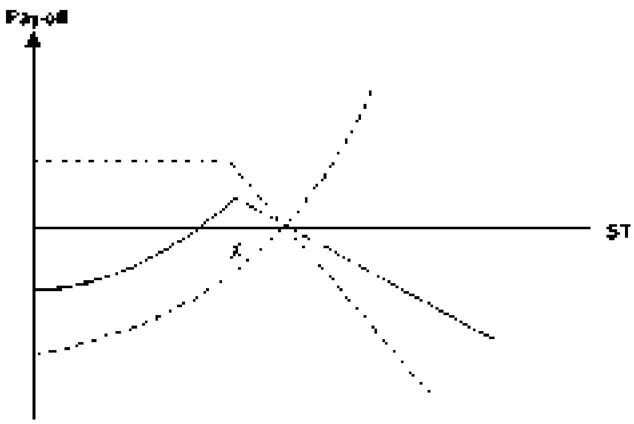
Figure 23



Calendar Spread

A calendar spread is almost similar to a butterfly spread. It is created by selling a call option with a certain strike price and purchasing another call option with longer maturity but the same strike price. Despite the initial investment, the long maturity option can be sold when the short maturity option expires, thus resulting in a profit.

Figure 24: Calendar Spread using Two Call Options



Arbitrage with Options

Arbitrage means making riskless profits by identifying mispriced stocks and without investing one's own funds.

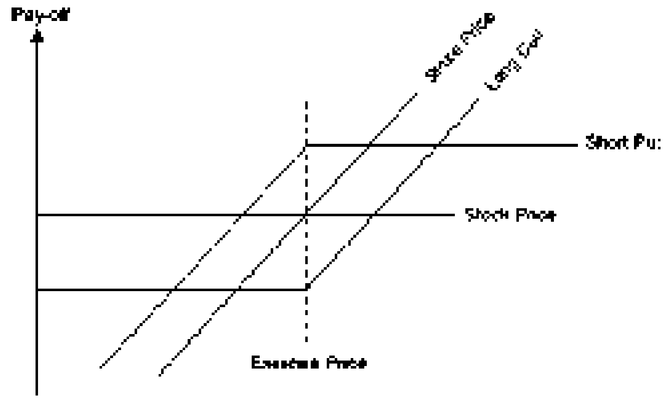
In the case of options it involves buying calls and selling puts of the same stock, with the same strike price and expiry date. Quasi arbitrage happens when the investor's funds are used in the dealing.

Synthetics

Synthetics involve the purchase of call options and writing of put options at exactly the same exercise price. If the prices go below the exercise price, there is a possibility of windfall gains. If the prices go above the exercise price, the stock can be purchased at the exercise price.

The following graph explains the operation of synthetics:

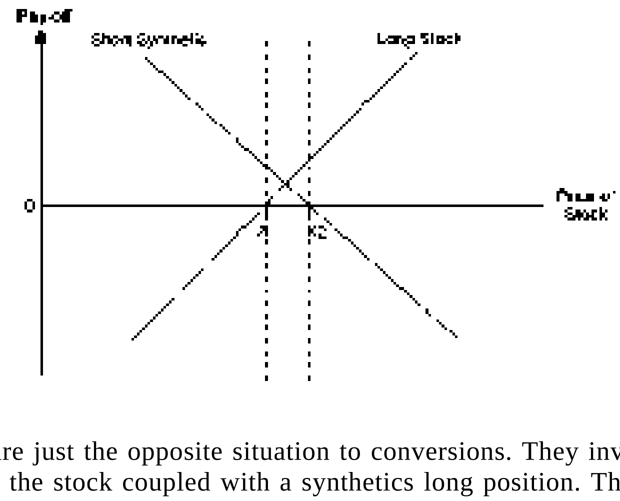
Figure 25: Synthetics



Conversions

Conversions means holding a long position stock while creating a synthetics short provision, in order to get the possibility of arbitrage profits.

Figure 26: Conversion



Reversals

Reversals are just the opposite situation to conversions. They involve a short position on the stock coupled with a synthetics long position. This gives rise to arbitrage opportunities in case of mispriced stocks.

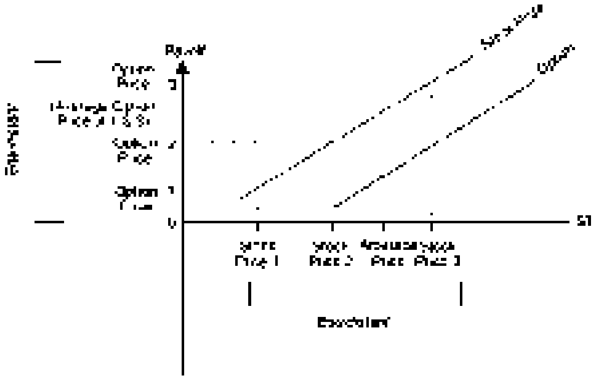
Option Price Convexity

Under normal conditions, in case there are three options with equally spread apart strike prices, the premium on the middle strike price should be lower than the average of the first and the third strike prices.

Now, if the middle one has a premium higher than the average of the other two, an arbitrage opportunity is created.

The same is explained in the following graph:

Figure 27: Option Price Convexity



OPTION PRICING MODELS

Bounds on Option Prices

The value of a call option cannot be greater than the difference between the price of the underlying asset and the exercise price at expiration. Similarly, the value of a put option cannot be greater than the difference between the strike price and the price of the underlying asset at expiration. In this chapter we will see what values the options take before expiration. We will see the option values as a function of the price of the underlying asset, the strike price and the time until expiration.

The range of prices, which the option can take during a particular period, is called as the boundary space for an option. The pricing of an option should include no arbitrage possibility also. There are more realistic options pricing models to determine the options prices uniquely without any arbitrage possibility. The models are binomial option pricing model and Black Scholes pricing model.

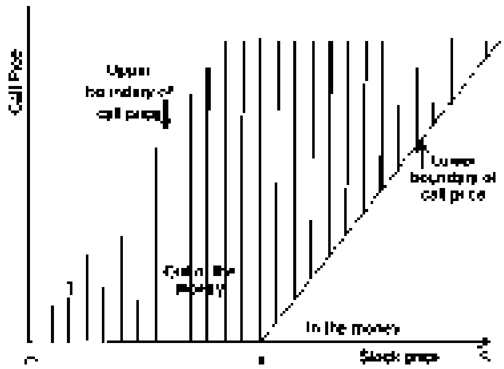
The Boundary Space for a Call Option

As we have seen earlier, we know that the value of the call option is directly proportional to the price of the underlying asset, and the time to expiration and inversely proportional to the exercise price. Therefore, the value of an option will be the highest for an option with zero exercise prices and an infinite time to expiration. The value of such a call would be equal to the price of the underlying asset. Similarly, the value of the option will be the lowest for an option with higher exercise price and the shortest time to expiration. A call that is about to expire, with t = T, will be the call with the lowest price for a given price of the underlying asset and a given exercise price. Hence we see that the lower bound for any call option will be its value at expiration and the upper bound will be the stock price.

Where, t is remaining time to expire

T = Expiration date.

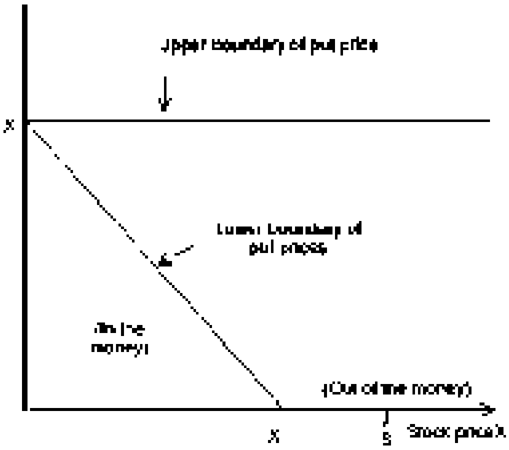
Figure 28: Boundaries of Call Price



The Boundary Space for a Put Option

The value of a put option at expiration should be max (0, X – ST) where X is the strike price of the put option, and ST is the underlying asset's price at expiration. This specifies the lower bound for the put option and now let us find the upper bound for a put option. When you have sold a put option at a certain exercise price, on the exercise date you have to buy the underlying asset and surrender it to the buyer and get the exercise price from the buyer. So, you will benefit if the asset price is less than the exercise price. Therefore, the lower the asset price the more valuable the put must be. Since an American option can be exercised at any time before expiration the maximum value an American put can take is the exercise price. For an European put before expiration the maximum value will be the present value of the exercise price.

Figure 29: Boundaries of a Put Price



Early Exercise

For non-dividend paying stocks, the calls on an American option should be exercised on expiration, while the puts should be exercised immediately. In case the investor feels that the stock price may fall in future, he should try to sell the call to another investor, rather than exercise it.

Assume that the stock split of ABC Ltd. is $110 and the American call option has an exercise price of $90. The investor will make only $20 if he exercises the call, and anything above $20 if he sells the option to another investor who may be bullish about the future of the said stock and would like to hold it till the expiration day.

While in the case of a put, if the investor exercises his option immediately, he will earn $20, which is the maximum he can make since the stock prices can never be negative. If he waits, the gain from exercising may be lower than $20 (anything between 0 to $20) as the stock prices may reduce.

Effect of Dividends

In most of this chapter, we assumed that American options are on non-dividend paying stocks. In case of dividend paying stocks, where the dividend can be estimated with some level of accuracy, the investor is better-off exercising the call option immediately (before the dividend declaration date) rather than waiting, as the stock price is bound to go down on declaration of dividends. This will make the option less attractive in future.

Put-call Parity

Considering the fact that different variables have varying impact on the prices of call and put options, it is quite likely that the prices of call and put options on the same stock are interrelated.

We can understand this relationship between the call price and the put price by considering two portfolios as follows. Consider portfolio A consisting of an European call option and a cash equal to and another portfolio B consisting of an European put option and a share. (The underlying asset for the options is the same share which is part of portfolio B).

The value of both the portfolios at the expiration of the options will be the same viz. max (S_T, X).

Table 18: Value at Expiration Date T

	$S_T > X$	$S_T < X$
Call + Cash	$(S_T - X) + X = S_T$	$0 + X = X$
Put + Stock	$0 + S_T = S_T$	$(X - S_T) + S_T = X$

The present values of these two portfolios which have equal future values will also be equal.

That is, c + Xe – r(T – t) = p + S ...... Eq. 1

This relationship is called *put-call parity.*

If this relationship does not hold, then there will be arbitrage opportunities. It is known from the above relationship that the value of an European call with a certain exercise price and a certain exercise date can be deduced from the value of the put option with the same exercise price and date, and vice versa.

Though the above relationship holds good only for European options, we can also derive a similar relationship for the American option on non-dividend paying stock.

Since P > p where P is the price of the American put option,

P > c + Xe–r(T – t) – S

It can be easily proved that an American call option on a non-dividend paying stock should never be exercised prior to expiration date. Therefore, an American call option on a non-dividend paying stock is worth of corresponding call option on the same stock.

Thus C = c, where C is the price of the American calls option,

P > C + Xe–r(T – t)– S

C – P < S – Xe–r(T – t)

This is an equivalent put-call parity relationship between American call and put options.

Binomial Option Pricing Model

One of the popular models for option pricing is binomial model proposed by Cox, Ross and Rubinstein in 1979. This model is based on the construction of a 'binomial tree' which represents the possible paths followed by the underlying asset's price over the life of the option.

An option has a definite time period (in days). If it is assumed that an option life is for a single time period, i.e., one day, it is called as single period binomial model whereas if the option has another day, we go for two-step binomial model, which is explained later. This model is called a binomial model as price of stocks can move either way; the binomial probability distribution is used in case of two outcomes though we have a range of possible outcomes. This can be used for the single period binomial model for the sake of simplicity, brevity in presenting. The concept of option pricing model that can be used in understanding the Black Scholes model discussed later.

The binomial option pricing model can be used to estimate the fair value of call or put option. It can be understood easily through an example in which it is assumed the options are European. It is also assumed that the underlying stock does not pay any dividend during the life of the option. This model can be modified to price American options also.

The Single-period Binomial Model

Let us assume that current price of a stock is Rs.100 and will either increase to Rs.110 or decrease to Rs.90, by the end of one year from now. Assuming the riskless interest rate to be 8%, let us now try to calculate the value of a call option on this stock, if its exercise price is Rs.100. To value this call option, the following portfolio is constructed and this portfolio ensures that the owner of portfolio receives the same return (zero after one year) whether the stock sells at Rs.90, or Rs.110. Let us denote the value (premium) of a call as c and the stock price after one year as S_1.

Table 19

Portfolio	Flows at t = 0	Flows at t = 1 year	
		S_1 = 90	S_1 = 110
Write 2 calls	+2c	0	–20
Buy 1 stock	–100	+90	+110
Borrow Rs.83.34 at 8%	–83.34	–90	–90
		0	0
Borrrow an amount equal to PV of Exercise Price discounted at the risk-free rate, that is, 83.34.			

The above portfolio is constructed in such a way that the portfolio investor receives nothing at the end of year one, whether the stock price moves up or down, therefore, the investment required for this portfolio should also be zero, which

$\rightarrow$ 2C – 100 + 83.34 = 0 or C = Rs.8.33

To confirm the value of this call cannot be more or less than Rs.8.33, let us consider two different values of C: C = Rs.5 and Rs.15. If the call price is Rs.5, then the call is underpriced. In such a situation, arbitrage profits can be made by buying the call, shorting stock and lending an amount equal to the present value of the exercise price (Rs.83.34).

In contrast to the above situation, if call price is Rs.15, then it is overpriced and selling the call, buy the stock and borrowing will lead to an arbitrage profit. Both the situations have been depicted in the following tables.

If Call Price is Rs.5

Table 20

Portfolio	Cash flow at t = 0	Cash flows at t = 1 year	
		S_1 = 90	S_1 = 110
Buy 2 calls	– 10	0	+ 20
Short 1 stock	+ 100	– 90	– 110
Lend Rs.83.34 at 8%	– 83.34	+ 90	+ 90
	6.66	**0**	**0**

If Call Price is Rs.15

Table 21

	Cash flow at t = 0	Cash flows at t = 1 year	
		S1 = 90	S1 = 110
Write 2 calls	+ 30	0	– 20
Buy 1 stock	– 100	+ 90	+ 110
Borrow Rs.83.34 at 8%	83.34	– 90	– 90
	+ 13.34	0	0

It is important to note here that in both the above situations, the net cash flow after one year is zero. However, there is a net cash inflow at time t = 0 giving arbitrage profit. This illustration states that an arbitrage profit is assured at the beginning if the call price is not equal to Rs.8.34. Although we have used strike price equal to the current stock prices here, the results will remain the same even if we use a different strike price.

Let us generalize this concept of a no payment portfolio to derive the binomial option pricing formula.

Let us use the following notations to derive the formula:

S_0	=	The stock price at time 0
E	=	The exercise price of the option
u	=	1 + percentage increase in stock price from time 0 to time 1 year
d	=	1 + percentage decrease in stock price from time 0 to time 1 year
C	=	The call price
C_u	=	The value of the call if the stock price increases
C_d	=	The value of call if the stock price decreases
r	=	Risk-free rate of return.

To replicate the zero pay-off portfolio concept, let us say, we buy n stocks and sell calls in such a way the pay-off from the portfolio of call and stock will be the same irrespective of the value of stock price after 1 year.

First, we will have to find the number of stocks to be bought per call, to make the pay-off from portfolio equal to zero and independent of the stock price. The number of calls required to achieve this is called the hedge ratio.

Table 22

	Cash flow at t = 0	Cash flows at t = 1 year	
		$S_1 = u\,S_0$	$S_1 = d\,S_0$
Sell call	C	$-C_u$	$-C_d$
Buy n stocks	$-nS_0$	nuS_0	ndS_0

If the value of this portfolio is independent of the value of stock,

$$-C_u + nuS_0 = -C_d + ndS_0$$

$$n(uS_0 - dS_0) = C_u - C_d$$

$$n = \frac{C_u - C_d}{S_0(u-d)}$$

In the case of situation discussed earlier

$C_d = 0$, $C_u = 10$

u = 1.10 and d = 0.90 S = 100

$$n = \frac{10-0}{100(1.1-0.90)} = \frac{10}{100 \times 0.20} = \frac{10}{20}$$

$$n = 0.5$$

Therefore, to have the call plus the stock of the same pay offs, no matter what happens to stock price at the end of year 1, we have to write 2 calls for each stock bought. This combination of call and stock is in agreement with our previous discussion.

If we use n as hedge ratio, the cash flows after one year will be the same for above mentioned portfolio. That is, $-C_u + nuS_0 = -C_d + ndS_0$

Now, to make the portfolios cash flows after one year equal to zero, we have to borrow an amount at t = 0 so that we owe (C_d – ndS_0) or (C_u – nuS_0) at time t = 1 year. If r is the borrowing rate, we should borrow $\frac{C_d - ndS_0}{1+r}$

Table 23

	Cash flow at t = 0	Cash flows at t = 1	
		$S_1 = uS_0$	$S_1 = dS_0$
Write call	C	$-C_u$	$-C_d$
Buy n stocks	$-n S_0$	nuS_0	ndS_0
Borrow	$\frac{-C_d + nd S_0}{1+r}$	$C_u - nuS0$	$C_d - ndS0$
Total	$C - n S_0 - \frac{C_d + ndS_0}{1+r}$	0	0

As you may have guessed already, if the cash flow from the portfolio after 1 year is zero, the initial investment required for setting up that portfolio must also be equal to zero.

Therefore,

$$C - nS_0 - \frac{C_d + ndS_0}{(1+r)} = 0$$

If we put 1 + r = R in the above equation

$$C = \frac{nS_0R + C_d - ndS_0}{R}$$

The above equation can be rewritten as

$$C \quad \frac{C_u\,p + C_d\,(1-p)}{R}$$

Where, $p = \left(\frac{R-d}{u-d}\right)$

Derivation of the above is available in the footnote.[4]

---

4 Substituting the value of n in the equation,

$$C = \frac{nS_0R + C_d - ndS_0}{R}$$

we get

$$C = \frac{\left(\frac{C_u - C_d}{S_0\,(u-d)}\right)RS_0 + C_d - \left(\frac{(C_u - C_d)}{S_0\,(u-d)}\right)dS_0}{R}$$

$$= \frac{\frac{(C_u - C_d) + C_d\,(u-d) - d(C_u - C_d)}{(u-d)}}{R} = \frac{\frac{C_u\,(R-d)}{u-d} + \frac{C_d\,(u-R)}{u-d}}{R}$$

This formula can be used for valuing the call option with one period remaining until it expires. The above derived formula can be simplified by putting

$p = \left(\frac{R-d}{u-d}\right)$ which implies that 1 – p = $\left(\frac{u-r}{u-d}\right)$ putting the value of p and 1 Ä p in the above equation, the formula can be written as follows:

$$C = \frac{C_u p + C_0\,(1-p)}{R} \qquad \text{where, } p = \left(\frac{R-d}{u-d}\right)$$

The Role of Probabilities: While discussing the single-period binomial option model, we have not considered the probability of up or down movement of the stock price. Although we have not used any concept of probability in the single-period binomial model which we discussed just now, we can assign certain probability to stock price by assuming a risk neutral economy. Risk neutral economy refers to an economy where everyone is risk neutral. All the investors in such an economy require no compensation for risk and the expected return on all securities will be equal to risk-free interest rate. By assuming a risk neutral economy, we are also assuming that the return on the stock is equal to risk-free rate. This can be proved, if we assume that probability of up movement in stock is equal to p (recall that $\frac{R-d}{u-d}$ = p) and the stock prices after increase and decrease are SL that is (S x d) and S_H that is (S x u) respectively. Now, the expected price after time t, S_t can be calculated as follows:

$$\begin{aligned} S_t &= p\,S_H + (1-p)\,S_L \\ &= p\,(S \times u) + (1-p)\,(S \times d) \\ &= pS\,(u-d) + Sd \\ &= \frac{(R-d)}{(u-d)} \times S(u-d) + Sd \\ &= RS \\ &= (1+r)S \end{aligned}$$

Where r is risk-free rate.

Thus, we can see that in a risk neutral economy, returns on stocks are also equal to risk-free rate of interest. The above derivation also proves that in a risk neutral economy the probabilities of up and down movements are p and 1 – p.

We already know the risk-free interest rate and up and down percentage movements. Let us recall the equation for call price:

$$C = \frac{C_u p + C_d (1-p)}{R}$$

$$\text{Where, } p = \left(\frac{R-d}{u-d}\right)$$

In this equation, the call value equals the present value of the future pay offs from owning the calls. The stock price goes up, the call pays C_u at expiration. If the stock goes down, the call pays C_d. The numerator of this equation gives the expected value of the call's pay offs at expiration. Therefore, the probability that a stock price increases is also the probability that the call is worth C_u. Clearly the probability that stock price will increase is $\left(\frac{R-d}{u-d}\right)$ = p and the probability of a stock price decrease is $\left(\frac{u-R}{u-d}\right)$

Illustration 15

The current price of one stock is Rs.50 and it is expected that stock price after one year will be either Rs.60 or Rs.40. Calculate the value of call option on this stock, if its exercise price is 50. Find the probability of the stocks price increase and decrease also. (Assume lending and borrowing rate = 10%)

Here, C_u = 10
C_d = 0
Stock price = 50
R = 1 + 0.10 = 1.10

Probability of price increase

$$= \left(\frac{R-d}{u-d}\right) = \left(\frac{1.10-0.8}{1.2-0.8}\right) = \frac{0.3}{0.4} = 0.75$$

Probability of price decrease

$$= 1 - p = 1 - 0.75 = 0.25$$

Value of call option

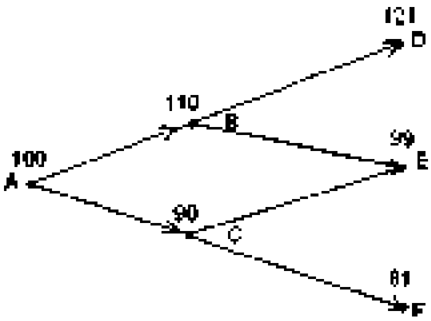
$$= \frac{C_u p + C_d (1-p)}{R}$$

$$= \frac{10 \text{ x } 0.75 + 0}{1.10} = 6.82.$$

Two-step Binomial Model

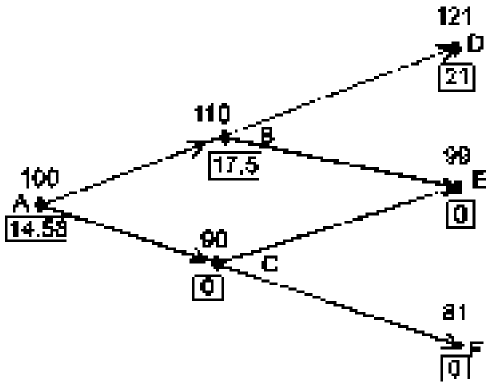
We can extend the one period binomial model to two or more periods. The price of a stock is Rs.100 and in two time periods may go up 10% or down by 10% in each period. We can represent this situation in the following way.

Figure 30: Stock Prices in Two-step Binomial Tree



Let us now calculate the value of call at different nodes in two steps binomial tree. Let us assume that each time step is one year and risk-free interest rate is 8% and as before, we consider a call option with a strike price of Rs.100.

Figure 31: The Two-step Binomial Tree Showing Prices and Pay-offs at Each Node



The main goal of our analysis here is to calculate the option price at the initial node A of the above tree. This can be achieved by using over one period binomial model repeatedly. The option prices at the final nodes of the tree can be easily calculated using the same one-step model. Let us start with the right hand end of the tree, at the top. At node D, the stock price is Rs.121. Therefore, options price is 121 – 100 = 21, at nodes E and F, the option is out-of-the-money and its value is zero.

At node C also the option is out of the money and its value is zero. We can calculate the option price at node B by concentrating our attention, on upper part of two-step tree. The value of the options at nodes D and E is what is relevant for this calculation.

$u = 1.1$; $d = 0.9$; $r = 0.08 \Rightarrow R = 1.08$

$$p = \frac{R-d}{u-d} = \frac{1+0.08-0.9}{1.1-0.9}$$

$$= \frac{0.18}{0.20} = 0.90$$

The value of the option at node B is

$$C = (p\,C_u + (1-p)\,C_d)/R$$

$$= (0.9 \times 21 + (1-0.9) \times 0)/1.08$$

$$C = 17.5$$

Now we can find out the value of call option at the initial node A. This can be calculated by focusing on the nodes B and C of the tree. The value of the option at node B is 17.5 and at C it is zero.Therefore, we can calculate the value of call option at node A using the one-step binomial mode once again.

$$\text{Value of option at node A} = (18.9(0.9) + (1-0.9) \times 0)/R$$

$$= (\text{Rs.}17.01)/1.08 = 15.75$$

In the single-period binomial model, there are only two possible outcomes whereas in the two-period model, there are four possible stock price patterns. We can extend this and say that there will be 2^i possible stock prices if i is the number of period until expiration. As the number of periods increases, the branches in binomial tree will increase. But we can always calculate the value of call option at the last node to the right directly and subsequently moving backwards and treating each node separately, we can calculate the value of call option at the starting point or the first and only node to the extreme left.

American Options

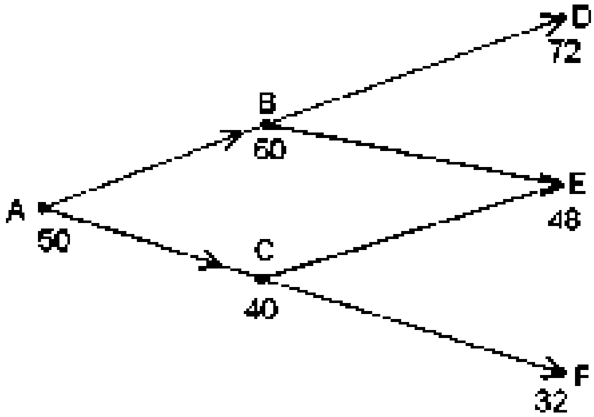
Until now, we have considered only European options, we are now ready to value the American options using binomial option model. The procedure to value American option is quite similar to the method described earlier. Here again we will work back from the final node to the starting node. However, we also test at each node to see whether early exercise is advantageous. The value of the American option at the final node will be equal to the value of European option at that node. To value the American option at nodes prior to the final node, we should take the higher of the following two values:

i. The value given by one-period binomial option model.

ii. The pay-off received from early exercise of option.

To understand this, let us take an example. Consider a two year American call option with a strike price of Rs.50 on a stock whose current price is also 50. Assume that there are two time periods of one year and in each year the stock price can move up or down by an equal percentage of 20%. We also suppose that risk-free interest rate is 6%.

Figure 32: Stock Prices in Two-step Binomial Tree



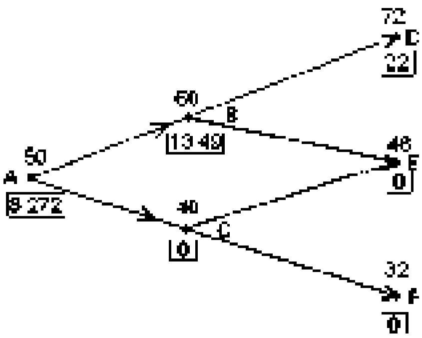
Using single-period model, the probability of price increase is

$$p = \frac{R-d}{u-d} = \frac{1.06-0.80}{1.20-0.80} = \frac{0.26}{0.4}$$

$$= 0.65$$

Therefore, probability of price decreases = 1 – 0.65 = 0.35

Figure 33: The Two-step Binomial Tree Showing Prices and Pay-offs at Each Node



The value of American call option at node D, E and F will be equal to the value of European call option on these nodes and accordingly call values at node D, E and F are 22, 0 and 0. Using the single-period binomial model, the value of call option at node B is

$$C = \frac{C_u p + C_d (1-p)}{R}$$

$$= \frac{22 \text{ x } 0.65 + 0 \text{ x } 0.35}{1.06}$$

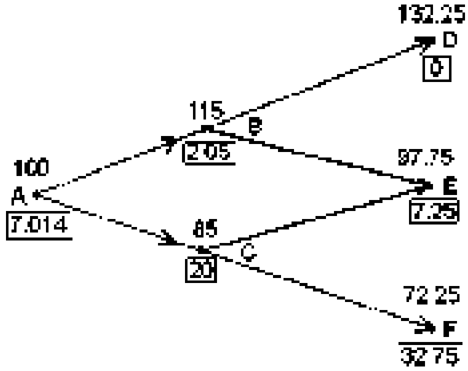
$$= \text{Rs.}13.49.$$

At node B, the pay-off from early exercise will pay Rs.10, which is less than the value calculated using the single-period binomial model. Hence at node B, early exercise is not preferable and the value of American option at this node will be Rs.13.49. If the value on early exercise had been higher, the value of early exercise would have been taken as the value of the option, as shown in the following example.

Illustration 16

Consider a two year American put option with a strike price of 105 on a stock whose current market price is 100. We assume that there are two time steps of one year and in each year the stock price either moves up or down by 15%. The value of risk-free interest rate is 6%.

Figure 34: The Two-step Binomial Tree showing Prices and Pay-offs at Each Node



Using single-period model, probability of price increase is

$$p = \frac{R-d}{u-d} = \frac{1.06-0.85}{1.15-0.85}$$

$$= \frac{0.21}{0.30} = 0.70$$

Probability of price decreases = 1 – 0.70 = 0.30

As shown above in the two-step binomial tree, the value of American put option at final nodes D, E and F will be equal to the value of European call option on these nodes and, therefore, put values at node D, E and F are 0, 7.25 and 32.75.

Now, the value of put option at node C can be calculated using single-period model

$$\text{Put} = \frac{P_u p + P_d\,(1-p)}{R}$$

$$= \frac{7.25 \text{ x } 0.70 + 32.75 \text{ x } 0.30}{1.06}$$

$$= \text{Rs.}14.06$$

Early exercise at node B will give Rs.20, which is higher than the above calculated value. Hence early exercise at this node is preferable and value of American put option on this node is Rs.20. In contrast to the above case, at node B early exercise will pay nothing and hence not preferable. At node B, the value of American put option is

$$= \frac{0 \text{ x } 0,70 + 7.25 \text{ x } 0.30}{1.06} = \text{Rs.}2.05$$

Again proceeding backward and comparing the value of early exercise pay-off with the value given by single period model, we get the value of American put option of node A as Rs.7.014.

Black-Scholes Model

From the moment of its publication in the Journal of Political Economy in 1973, the Black and Scholes option pricing model has earned a prominent position among the most widely accepted of all financial models. Black-Scholes model is proposed by Fischer Black and Myron Scholes by deriving a differential equation that must be satisfied by the price of any option on a non-dividend paying stock.

Though one may not agree with the model, it is vital to have an understanding of this model in case one has to know about option markets. This model is a mathematical extension of the binomial model though it did not evolve from the binomial model. The basis for the Black Scholes model was that an option could be priced by forming a risk less hedge portfolio comprising stocks as well as options.

The concept underlying Black-Scholes model is to establish no-arbitrage portfolio to value option, when stock prices are binomial. A risk-free portfolio consisting of a position in this option and position in the underlying stock is constructed. The return from this portfolio will be equal to risk-free interest rate in the absence of any arbitrage opportunity. The main reason behind creation of a riskless portfolio is that both stock price and option price are influenced by the same underlying source of uncertainty of stock price movement. In any short span of time, the price of a call option is perfectly positively correlated with the price of the underlying stock, the price of the put option is perfectly negatively correlated with the price of the underlying stock. For both put and call, a suitable portfolio of the stock and the option can be constructed so that the gain and loss from the stock option always offsets the gain or loss from the option position and providing a certain total value of the portfolio at the end of the short period of time.

For example, consider that at any particular time the relationship between a small change in the stock price and the corresponding change in the price of a European call option, c follows:

$$\delta c = 0.5 \times \delta S$$

This relationship indicates that the slope of the line representing the relationship between c and S is 0.5. The riskless portfolio would consist of a long position in 0.5 share and a short position in one call option. Here it is essential to point out an important difference between the Black-Scholes model and binomial model that the constructed riskless portfolio is risk-free for small time period in Black-Scholes model. In theory it remains riskless only for an instantaneously short span of time. To remain riskless the portfolio must be adjusted or rebalanced continuously. The relationship between δc and δS might change from $\delta c = 0.5 \times \delta S$ today to $\delta c = 0.6 \times \delta S$ next week. Therefore, to make the portfolio risk-free, 0.6 stock instead of 0.5 shares must be purchased against each call sold. If this rebalancing continues the return from the riskless portfolio in any short period of time must be equal to risk-free interest rate. It is, however, true that the return from the riskless portfolio in any short span of time ought to equal to risk-free interest rate. This is the essence of the Black-Scholes model which leads to their famous model for option pricing.

The assumptions underlying the Black-Scholes model are:

i. Short selling of securities is permitted.

ii. Absence of transaction costs and taxes.

iii. No dividend payments during the life of the option.

iv. No arbitrage opportunity.

v. Security trading is continuous.

vi. The risk-free rate is ‘r’ and is constant for all maturities.

vii. European exercise terms are used.

Based on the above assumptions, Black-Scholes formula is derived as below.

$$C = SN(d_1) - Xe^{-r(T-t)}N(d_2) \qquad \text{….. (2)}$$

$$P = Xe^{-r(T-t)}N(-d_2) - SN(-d_1) \qquad \text{….. (3)}$$

Where,

$$d_1 = \frac{\ln(S/X + (r + \frac{\sigma^2}{2})(T-t)}{\sigma\sqrt{(T-t)}} \qquad \text{….. (4)}$$

$$d_2 = \frac{\ln(S/X + (r - \frac{\sigma^2}{2})(T-t)}{\sigma\sqrt{(T-t)}} \qquad \text{….. (5)}$$

$$d_2 = d_1 - \sigma\sqrt{T-t}$$

C   is the call option price

P   is the put option price

S   is the spot price of the underlying asset

X   is the strike price of the option

r   is the risk-free rate

T – t   is the time to expiration expressed in years

σ is the analyzed standard deviation of returns on the underlying asset, i.e., the volatility measure

N(d)   is cumulative standard normal distribution

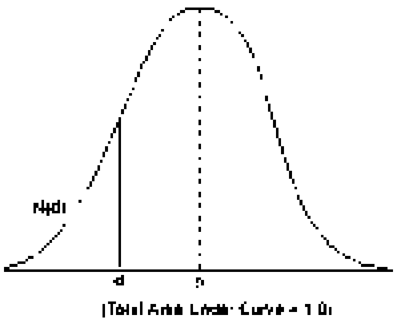
e   is exponential function (2.7183)

ln   is natural logarithm.

The values of d_1 and d_2 are in units of volatility because of division by $\sigma\sqrt{(T-t)}$ and these are points on the horizontal axis of the standardized normal distribution.

N(x) is the cumulative probability distribution function for a variable that is normally distributed with a mean of 0 and a standard deviation of 1. Again, while calculating the values you should remember that N(d) = 1 – N(–d). $N(d_1)$ can be interpreted as the probability of the call option being in-the-money at expiry.

Figure 35: Standard Normal Curve



The above given Black-Schole's model can be divided into two parts. The first part, $SN(d_1)$, derives the expected benefit from acquiring a stock outright. This is found by multiplying stock price (S) by the change in the call premium with respect to a change in the underlying stock price $N(d_1)$. The second part of the model, $Xe^{-r(T-t)}N(d_2)$, gives the present value of paying the exercise price on the expiration day. The fair market value of the call option is then calculated by taking the difference between these two parts.

From (equation 2) we can see that it is in the general form of the equation for call price viz.

$$C \geq S - Xe^{-r(T-t)}$$

This equation is applicable in a risk neutral world. Taking into account the risk factors, Black's formula was derived. The equation (2) can be rewritten as follows.

C = S x risk factor 1 – $Xe^{-r(T-t)}$ x risk factor 2.

The risk factors are $N(d_1)$ and $N(d_2)$.

A numerical example will illustrate the model more clearly.

Illustration 17

Suppose you buy an European call option on a stock which currently trades at Rs.50 with strike price 55. The option will expire in the next 3 months. The stock's volatility is 25%. The risk-free rate is 7% per annum. What will be the price of the option bought by you using Black-Schole's model?

Here, S = 50; X = 55;   = 25%; T – t = 3/12 = 0.25 r = 0.07

Applying these values in (6.2)

$$d_1 = \frac{\text{In}\,(50/55) + (0.07 + 0.252/^2)\,x\,0.25}{0.25\sqrt{0.25}}$$

$= -0.5599 = -0.56$ (approx.)

$d_2 = d_1 - \sigma\ \sqrt{T-1}$

$= -0.56 - 0.25\ \sqrt{0.25}$

$= -0.56 - 0.125 = -0.685 = -0.69$ (approx.)

$= -0.56 - 0.125 = -0.685 = -0.69$ (approx.)

$N(d_1) = 0.2877$

$N(d_2) = 0.2451$

$C = S.N(d_1) - Xe^{-r(T-t)}.\ N(d_2)$

$= 50 \text{ x } 0.2877 - 55.\ e^{-0.07 \text{ x } 0.25}\ .\ 0.2451$

$= 14.39 - 13.25 = 1.14$

For the estimation of the put option premium,

$N(-d_1) = N(0.56) = 0.7123$

$N(-d_2) = N(0.69) = 0.7549$

$P = Xe^{-r(T-t)}\ N(-d_2) - S.N(d_1)$

$= 55^{-0.07 \text{ x } 0.25}\ 0.7549 - 50 \text{ x } 0.7123$

$= 40.80 - 35.62 = 5.18$

Hence, the call option price is Rs.1.14 and the put option price is Rs.5.18

(**Note:** The students are suggested to approximate the values of d_1 and d_2 up to two decimals only, as the normal distribution tables that are generally available provide $N(d_1)$ and $N(d_2)$ values on the basis of the values of d_1 and d_2 up to two decimal points.)

Assumptions of Black and Scholes Model

It is necessary to understand the implication of the assumptions made by the Black and Scholes model.

i. **The stock pays no dividends during the option's life**

Most companies pay dividends to their shareholders, so this might seem a serious limitation to the model considering the observation that higher dividend yield elicit lower call premiums. A common way of adjusting the model for this situation is to subtract the discounted value of a future dividend from the stock price.

ii. **Markets are efficient**

This assumption suggests that people cannot consistently predict the direction of the market or of an individual stock. The market operates continuously with share prices following a continuous   process. To understand what a continuous   process is, you must first know that a Markov process is one where the observations in time period t depend only on the preceding observations. An   process is simply a Markov process in continuous time. If you were to draw a continuous process, you would do so without picking the pen up from the piece of the paper.

iii. **There are no transaction costs or taxes**

Usually market participants do have to pay a commission to buy or sell options. Even floor traders pay some kind of fee, but it is usually very small. The fees that individual investors pay is more substantial and can often distort the output of the model.

iv. **Interest rates remain constant and known**

The Black and Scholes model uses the risk-free rate to be constant and known rate. In reality there is no such thing as the risk-free rate, but the discount rate on the US Government Treasury Bills with 30 days left until maturity is used to present it. During period of rapidly changing interest rates these 30 days rates are often subject to change, thereby violating one of the assumptions of the model.

v. **Returns are lognormally distributed**

The assumption underlying the Black and Scholes model is that stock prices follow random walk which means that proportional changes in the stock price in a short period of time are normally distributed. This in turn implies that the stock price at any future has what is known as a lognormal distribution. Whereas a variable on a normal distribution curve can be either positive or negative, with the lognormal distribution it can only be positive (see figure 36). A variable with a lognormal distribution has the property that its natural logarithm is normally distributed.

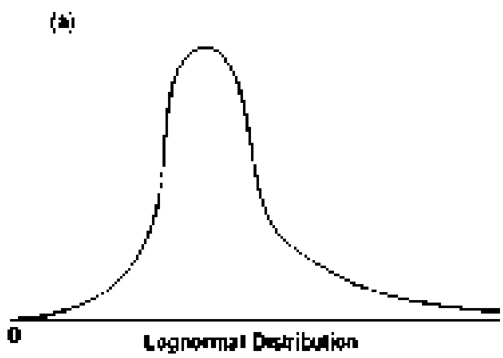
vi. Eu**ropean exercise terms are used**

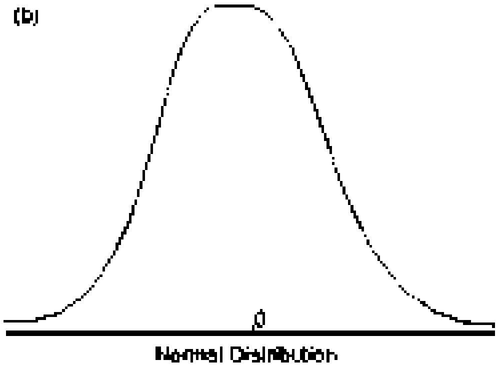
European exercise terms say that the option can only be exercised on the expiration date. American exercise terms allow the option to be exercised at any time during the life of the option, making American options more valuable due to their greater flexibility. This limitation is not a major concern because very few calls are ever exercised before the last few days of their life. This is true because when you exercise a call early, you forfeit the remaining time value on the call and collects the intrinsic value. Towards the end of the call, the remaining time value is very small, but the intrinsic value is the same.

Advantages of Black and Schole's Model

The Black and Schole's option model presents a number of advantages. The most prevalent advantage is its ease of use. It tells the user what is important. In other words, it includes the very factors that market analysts look for. Secondly, it does not promise to produce the exact prices that show up in the market, but it does a remarkable job of pricing options that meet all of the assumptions of the model. In fact, it is safe to say that virtually all option pricing models, even the extremely complex ones, have much in common with the Black and Scholes model.

Figure 36





Source: www.bradly, eda

Disadvantages of Black and Scholes Model

The most visible flaw of the model is its inability to compute complex derivative products. The model's lack of functionality in this aspect leads many analysts to the use of the Binomial and Monte Carlo models for more complex derivatives products. Another shortcoming of the model is the fact that all data resulting from the use of the model is based on past data. The model does not prepare for future events which can be crucial in the fast pace world of finance.

Since 1973, the original Black and Scholes option pricing model has been the subject of much attention. Many financial scholars have expanded upon the original work. In 1973, Robert Merton relaxed the assumption of no dividends. In 1976, Jonathan Ingerson went one step further and relaxed the assumption of no taxes or transaction costs. In 1976, Merton responded by removing the restriction of constant interest rates. All these developments helped in a great way to construct more accurate valuation models for stock options.

Evaluation of Option Based

Investment Strategies

Having discussed the various investment strategies using options and/or positions in the underlying assets, we are now convinced that the use of these investment strategies can produce risk-return patterns suited to the unique requirements of investors. At this stage, it is worth while to remember that we have not accounted for the following while calculating the pay offs associated with these strategies.

i. **Transaction Costs:** In fact, most of the strategies result in substantial brokerage commissions because brokerage has to be paid on multiple legs. For example, while executing a long straddle strategy commissions have to be paid on buying a call and buying a put. In fact, many clients do complain that the brokerage houses have pushed these strategies on them to generate additional commissions.

ii. **Bid-Ask Spreads:** There are bid-ask spreads for each option and the consideration of spread is important because an investor buys an option at the higher asked price and sells an option at the lower bid price. Therefore, bid-ask spread is a cost of trading which has to be reckoned while calculating the pay-off associated with a complex strategy.

iii. **Dividends:** Options are not dividend protected and we have ignored the possibility of dividends being declared on the underlying stock prior to the expiration date.

iv. **Margin Requirements:** We have also ignored the margin requirements applicable to writing of options and we have assumed that investors receive the full amount of written options.

v. **Early Exercise:** The most important point we have ignored is the possibility of early exercise. We have wished away this possibility by assuming that the options are of the European type, but the fact remains that most of the equity options that are traded are of the American type. A written American put or a written American call that is in-the-money can be exercised early (prior to the date of expiration). Therefore, the investor executing a complex investment strategy like a bearish vertical spread using calls faces a higher risk than what we have assumed.

vi. **Timing of Cash Flows:** We have also ignored the timing of the different cash flows which, of course, is not very significant, when the initial cash flow and the expiration day cash flows occur within a period of one year.

The above caveats have to be borne in mind before an investor actively pursues any of the complex investment strategies outlined in this note. These investment strategies can appeal to investors with very low trading costs and in the Indian context these strategies can be profitably employed by institutional investors that can trade in the exchange either directly or through a stock broking subsidiary.

Volatility

It can be defined as a measure of the market speed. The variation in the market conditions is measured by volatility. Markets which move slowly are less volatile compared to the markets which move fast. If the market trends can be quantified into a single measure then it can be used to compute the price of an option using the Black-Scholes model. Low volatility and high volatility distributions when the price movements are random are illustrated below.

Figure 37: High Volatility Distribution

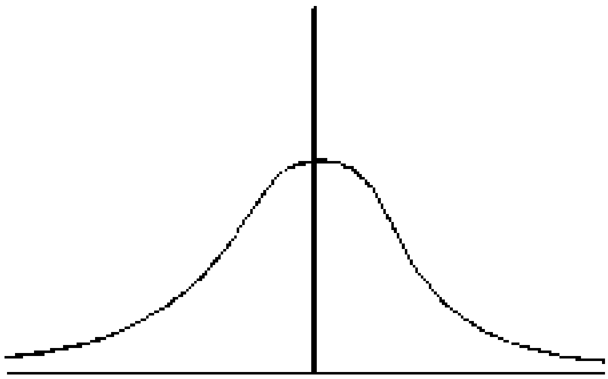
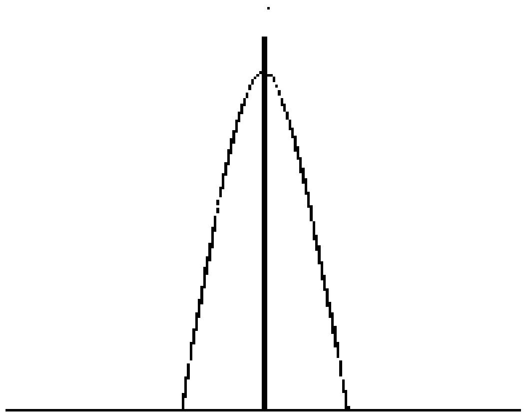
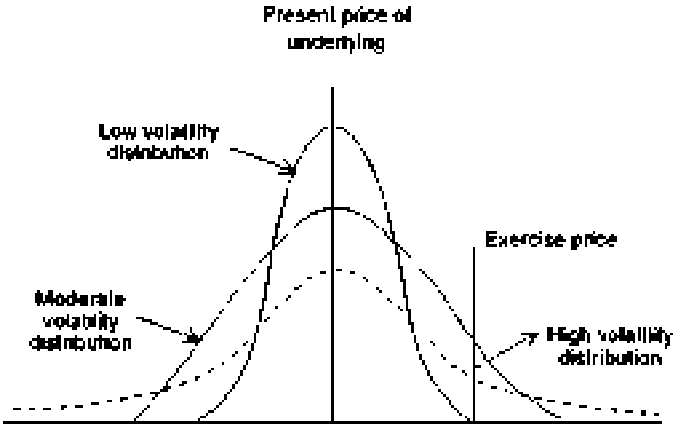


Figure 38: Low Volatility Distribution



In a low volatility market, the price movements are severely restricted and hence the options will command low premiums. In a high volatility market, there is a free price movement and hence options command high premiums. Price distributions of options at expiration are illustrated below.

Figure 39: Price Distributions of Options at Expiration



Let us describe the prices in terms of a normal distribution. Then this distribution has to be fed into a theoretical pricing model. Since all normal distributions are described by a mean and a standard deviation, these two numbers are fed into the pricing model. Recall that an important assumption in Black-Scholes model is that in the long run, a trade in the underlying instrument will just break even, i.e., there will be no profit or loss at that point. This break even price is taken to be the normal of the normal distribution.

Volatility as a Standard Deviation

When we measure volatility, we consider only the magnitude of movements and not the directions. The standard deviation can be used as a volatility measure. We can define the volatility associated with an underlying asset as a one standard deviation price change in percentage.

Lognormal Distribution

A normal distribution curve is symmetrical. The assumption about the symmetry of the distribution is that for each possible upward movement in the price of the underlying asset there is a possibility of equivalent downward movement also. Suppose we consider an instrument priced at $50, we assume that the price will move up to $125. Then there should be a possible downward movement also to – 25. But since there is no possibility of negative prices, the normal distribution assumption of symmetry has a flaw.

Similar to compounding of interest rates, the volatility can also be compounded at different intervals of time. For theoretical pricing of options, volatility is assumed to compounded continuously as if the price changes in the underlying instrument (either up or down) are continuous at the rate of volatility. When price changes are assumed to be normally distributed, the continuous compounding of these price changes will cause the prices at maturity to be log-normally distributed. Such a distribution is positively skewed upside, because upside prices resulting from a positive rate of return will be greater in absolute terms than downside prices resulting from a negative rate of return.

Black-Scholes model is a continuous time model. It assumes that volatility of the underlying instrument is constant over the life of the option but is continuously compounded. These two assumptions mean that the possible prices of the underlying instrument at the expiration of the option are log-normally distributed. This is the reason for higher value of the option with higher exercise prices than those with lower exercise prices though both the prices are equidistant from the price of the underlying instrument. In absolute terms, the log-normal distribution allows for greater upside price movements than downside price movements.

If we have to allow for unlimited upside price movement of an underlying instrument then under a normal distribution we have to allow for unlimited downside movement also. But since options cannot take negative values, it becomes unrealistic. This drawback is overcome when we use lognormal distributions which allow for an open ended upside prices, at the same time limiting the prices to zero. The price prediction under the Black-Scholes model focuses on the magnitude of changes and not on the direction of the changes.

Types of Volatilities

Volatility is the one input in a theoretical option pricing model which cannot be directly observed. But many option strategies require an accurate prediction of volatility. Therefore, an option trader needs some method of determining whether his/her expectations about volatility are actually realized in market price.

Future Volatility

Future volatility is that which every trader wants to know, the volatility that best describes the future distribution of prices of an underlying contract. When future values can be accurately predicted then future volatility can be calculated and used in the theoretical pricing model to arrive at an accurate theoretical value. But the uncertainty factor proves impractical to use future volatility.

Historical Volatility

Though future is unpredictable with certainty, you can make a wise guess about the future volatility from the historical data. The latter will serve as an attracting point to make an estimate of future volatility. Additional information will further help in arriving at a more realistic figure for future volatility. The two important parameters to be considered for calculation of historical volatility are historical period over which the volatility is to be calculated and the time interval between successive price changes. The longer the historical period the better the volatility estimate. To become completely familiar with volatility characteristics of a contract a trader may have to examine a whole variety of historical time periods.

Implied Volatility

In a theoretical option pricing model, the parameter values from historical data are substituted to arrive at a price. But this is not the most common way of computing the option price because it is difficult to measure the volatility of the underlying asset. Historical volatility may not be an accurate estimate and it changes over time. A direct measurement of volatility is, therefore, difficult in practice. Nevertheless, the option prices are quoted in the market. This implies that even if we do not know the volatility, the market knows it. For instance, consider the Black-Scholes formula. The inputs are interest rate, the price of the underlying asset, exercise price, time to expiry and the volatility of the price of the underlying. Except volatility all the other parameters can be easily measured and are either quoted constantly or specified in the contract itself. Consider a call option. Since a call option price increases with volatility there is a direct relationship between the two. We can take the option price quoted in the market and working backwards deduce the market’s opinion about the volatility of the option over the remaining life of the option. This volatility arrived from the quoted price of the option is called the implied volatility.

The calculation of implied volatility is not direct and it should be arrived by trial and error. On an initial assumption of a particular value of volatility, the option price is calculated using Black-Scholes formula. If the calculated price is the same as the quoted price, then assumed volatility is the implied volatility; if not, the same procedure is repeated with another volatility data until we arrive at a value for which the calculated price equals the quoted price. One unusual feature of implied volatility is that it does not appear to be constant across exercise prices. That is, if the value of the underlying asset, the interest rate and the time to expiry are fixed the prices of options across exercise prices should reflect a uniform value for the volatility. But in practice, this is not the case, even puts and calls give slightly different implied volatilities. The following figure shows the implied volatility as a function of exercise price. It can be observed how the volatility of the options deeply in the money is greater than for those at-the-money. This is called the smile effect

Figure 40: Smile Effect

In practice, volatility is neither constant nor predictable for time scales of more than a few months. This limits the validity of any model that assumes the contrary. This problem may overcome by pricing options with implied volatility. Thus, one trading strategy is to calculate implied volatilities of all options on the same underlying asset and the same expiry date and then buy one with the lowest volatility and sell one with the highest with the belief that prices move in such a way that implied volatilities become more or less comparable and the trader makes a profit on his/her portfolio.

Causes of Volatility

There are two main reasons for volatility on a stock price in the market:

i. Trading of the stock in the stock markets which implies that volatility will be more when the markets are operational as compared to the time when markets are closed.

ii. Information obtained by the investors about the expected future performance of the company or the stock, which affects the stock prices.

While these are two different assumptions about the reasons for volatility, various studies conducted on the subject implied that the volatility was mainly as a result of trading rather than information about future expected returns.

Differences between American Futures Options and American Spot Options

In case of markets where the futures prices are higher than the spot (current) prices, American Futures options are worth always more than American Spot options (options on the underlying assets). This is true whether the futures contract and options contract have the same or different maturities.

Differences between European Futures Options and European Spot Options

The European Futures options which can be exercised on maturity always equal the European options on the underlying asset (European Spot options).

Option Fund

The process of creation of an option fund involves a fixed lower limit in value and an upper investment in stock indices. The lower limit can be achieved by investing in risk-free securities or assets, bank deposits or government bonds to ensure a fixed minimum return and the balance on call options.

Another way would be to keep the call options for enjoying the upper exposure coupled with a portfolio insurance policy (protective puts).

Option funds ensure that while returns may not be very high, there is surety that the return will be there even if the stock prices are very volatile. The ratio of investment between risk-free assets and stock options depends on the requirement of the fund manager for guaranteed minimum returns.

EXOTIC OPTIONS

Options which are more complicated than the standard European or American options are referred to as exotic options. Most of them are traded in the over-the-counter market and are designed by financial institutions to meet the specific requirements of the clients. These are used in the marketplace either for yield enhancements or disaster insurances.

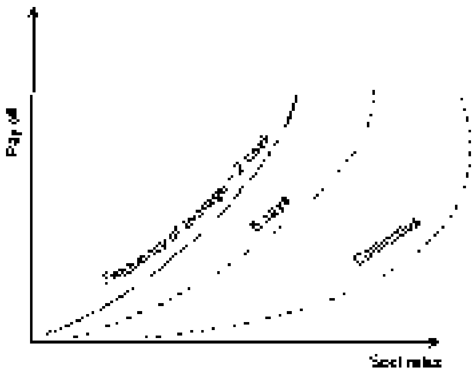
Types of Exotic Options

Asian Options

These are options whose pay-off depends on the average price of the underlying asset during a prespecified period of the life of the option. Assume that you have bought an Asian call option on a stock at strike price X. The average of the stock prices of the option during a particular period of option life is Sa then the pay-off from this option is max (0, S_a – X). Similarly, if you buy an Asian put option then the pay off is max (X – S_a, 0). The pay-off of an Asian option depends on the averaging period. The pay-off of an Asian call option is given below for various averaging periods.

Asian options are used to avoid manipulation of the prices of the options on the underlying asset by the traders of the options, which might turn harmful to the issuer of the underlying asset. If you own options on a firm's shares and if the pay-off depends on the price of the shares on a particular day then you can manipulate the price of the firm's shares on that particular day and can ensure a better pay-off. If the pay-off is determined on the average price of the shares over a particular period of time, say 60 days, the price manipulation may not be possible and hence you have a limited profit potential in this case and this will not affect the issuer.

Figure 41: Asian Options



Barrier Options

These are the options whose pay-off depends on whether the underlying asset price reaches a certain level during a certain period of time.

There are numerous variations on barrier options. A barrier option may be a knock in or a knock out option. A knock in option is one that comes into existence only when the underlying asset price reaches a certain barrier. A knock out option is one that ceases to exist when the underlying asset price reaches a certain barrier. Barrier options are cheaper than the plain vanilla options.

Assume that you purchase a knock out put option with both strikes price and exercise price equal to 40 and knock out boundary (H) = 45. If during the life of the option the stock price never rises above 45 then pay-off will be equal to max (0, X – S_t). If S rises above 45 the put is cancelled and the put buyer receives the rebate R irrespective of the stock price on the expiration date.

Bermudan Option

It is a non-standard American option in which early exercise is restricted to certain dates during the life of the option, but the exercise price is always the same.

Binary Options

These are options, which have discontinuous pay offs. For instance, a cash or nothing call pays off nothing if stock price is below the strike price and pays a fixed amount say, Q if the stock price rises above the strike price. The pay-off of a binary option is given below.

Figure 42: Binary Option

Assume that you buy a binary call option at strike price $50, and if on the expiration date the stock price turns out to be $45, then the pay-off is zero. If the stock price turns out to be $55 then the pay-off will be a fixed amount Q irrespective of the value of the stock price.

Chooser Option

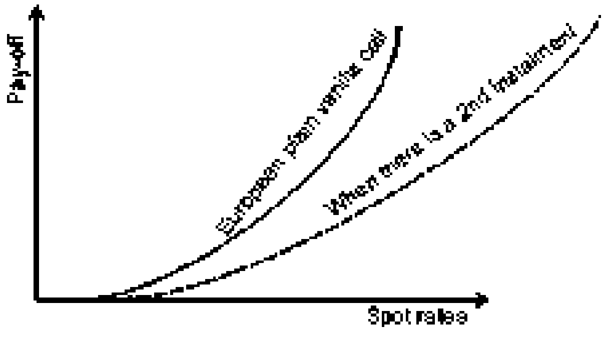
A chooser option is one in which the option holder has a choice to make an option a call or a put after a specified period of time. These are also called as-you-like-it options. These are useful for hedging a future event that has a high level of uncertainty in occurrence.

Compound Options

These are options on options. There are 4 main types of compound options viz., a call on a call; a call on a put; a put on a call; a put on a put.

Suppose you own a compound call and you have to decide whether to exercise a compound option until the expiration date. If decided to exercise then you will receive the underlying call option and time until expiration. If the underlying option is exercised then you receive the underlying asset. The following graph shows the pay-off profile of a call on a call. The pay-off here depends on the number of installments used up for exercising the call.

Figure 43: Compound Option



Forward Start Options

These are options paid for now but that will start at a certain time in future. The exercise price is specified to be the current price at the beginning of the option's life. For a forward start option, there are three dates to consider viz., the valuation date, the date the option life begins, and the expiry date of the option. The following graph illustrates a forward start option profile.

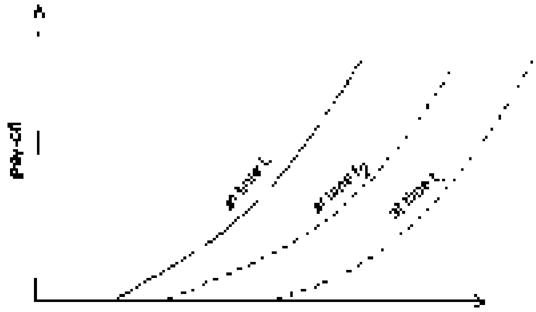
Three time periods involved are denoted by t_1, t_2 and t_3. Here t_{123}.

t_1 indicates the valuation date.

t_2 indicates the time at which the option begins.

t_3 indicates the expiry date.

Figure 44: forward Start Option



Flex Options

These are options where the traders agree to non-standard terms. These non-standard terms may involve strike prices or exercise dates. These options were created by the stock exchanges, which dealt in options in order to attract back the investors who were showing more interest towards the Over-The-Counter options.

Lookback Options

The pay offs from these options depend on the maximum or minimum stock price reached during the life of the option. Assume that you hold a Lookback call. What does it imply? You can buy the underlying asset at the lowest price achieved during the life of the option. Similarly if you hold a Lookback put option you can sell the underlying asset at the highest price achieved during the life of the option.

You buy a Lookback call option on a stock, which is European. Both the strike price and the spot price of the stock at the time of purchase is $55. Assume that the stock's minimum price during the life of the option is $48, the stock price at the expiration date is $57. The pay-off from your call option will be $9 (57 – 48).

Rainbow Options

These are options involving two or more risky assets. For example, there is an option called basket option whose pay-off depends on the value of a portfolio of assets.

Exchange Options

These are options to exchange one asset for another under which in return for foregoing one asset, the investor can receive another asset.

Home-made Artificial Options

It is possible to create patterns similar to options in order to produce the pay-off features of the options market for other securities like treasury bills. This is a type of portfolio insurance.

Hedging Exotic Options

Hedging exotic options may not be as simple as hedging regular options. It is sometimes easier to hedge using the underlying asset as compared to hedging with the plain vanilla option.

Uses of Options

Options have the following uses:

i. **Reducing the variability of returns on stocks:** An investor can ensure that low returns are eliminated and high returns are levelled by exercising an option.

ii. **Betting on information:** Based on the information and rumours floating the market, investors can benefit by purchasing options to gain from the volatility of the stock.

iii. **Combined optimal portfolio:** Options can be combined with other fixed income securities, thus creating a portfolio with characteristics of a fixed income security. Lending and borrowing at more attractive rates will be possible on such a portfolio.

Risks Associated with Options

These risks that are unique to options affecting both the buyers and the writers. An understanding of these risks is essential because the temptation to use options for unbridled and reckless speculation is stronger than the need to use options as risk modifiers.

Risks of Buying Options

The principal risk associated with the buying of options is that an investor runs the risk of losing his entire investment in a relatively short period of time. This is because of the fact that an option is a wasting asset which becomes worthless when it expires. Therefore, the purchaser of an option who neither sells it in the secondary market nor exercises it prior to expiration will lose the entire investment in the option. The gravity of this risk largely depends upon the extent to which the investor utilizes the feature of leverage embedded in the options. The following example illustrates this point.

Illustration 18

Consider three investors, A, B and C who are bullish on the prospects of an equity stock currently trading @ Rs.500 per share. There is a 3-month European call option on the stock with an exercise price of Rs.500 per share selling at Rs.50 per share in the options market. Assume that each one of the three investors can invest a sum of Rs.5,00,000 in the stock. Investor A choses to invest in 1000 shares of the stock. Investor B chooses to invest in 1000 calls (each call covering one share) by paying a premium of Rs.50 per call and invest the remaining Rs.4,50,000 in risk-free bonds carrying a rate of interest of 12% p.a. Investor C chooses to invest in 10,000 calls (each call covering one share) by paying a premium of Rs.5,00,000.

From our description, it is clear that investor A has opted for an unlevered position in the stock market. Investor B has chosen the options route to control the same quantity of the underlying stock as investor A and at the same time limit the downside risk. Investor C has chosen the options route to control a larger quantity of the underlying stock than investors A or B. Therefore, investor C is the most levered investor among the three. Let us now examine the financial consequences of their investment decisions by constructing the expiration day cash flow table.

MP(T)	Investor A		Investor B		Investor C	
	CF (T)	ROR (%)	CF (T)	ROR (%)	CF (T)	ROR (%)
650	650000	30%	613500	22.7%	1500000	200%
600	600000	20%	563500	12.7%	1000000	100%
550	550000	10%	513500	2.7%	500000	0%
540	540000	8%	503500	0.7%	400000	–20%
500	500000	0%	463500	–7.3%	0	–100%
490	490000	–2%	463500	–7.3%	0	–100%
450	450000	–10%	463500	–7.3%	0	–100%

Notes: The expiration day cash flows for the three investors have been calculated as follows:

Expiration Day Cash Flows Associated with the Example

i. CF(T) for Investor A at MP (T) of Rs.650

= Market value of stock on expiration date
= 650 x 1,000
= 6,50,000

$$\text{Rate of Return} = \frac{(6,50,000-5,00,000)}{5,00,000} \times 100$$

= 30%

ii. CF(T) for Investor B at MP (T) of Rs.650

= Value of calls on expiration date + Interest on the risk-free bonds for 3 months + Sale proceeds of the bonds
= (650 – 500) x 1,000 + (4,50,000 x 0.12 x 0.25) + 4,50,000
= 6,13,500

$$\text{Rate of Return} = \frac{(6,50,000-5,00,000)}{5,00,000} \times 100$$

= 22.7%

iii. CF(T) for Investor C at MP (T) of Rs.650

= Value for calls on expiration date
= (650 – 500) x 10000
= 15,00,000

$$\text{Rate of Return} = \frac{(15,00,000-5,00,000)}{5,00,000} \times 100$$

= 200%

The table reveals that the leverage feature embedded in options can cut both ways and the risk associated with the use of this leverage feature is the maximum when the funds available for investment in the underlying stock are completely invested in options. The wasting nature of options can result in the complete loss of the investment if the investor's belief turns out to be incorrect.

Risks of Writing Options

The risks of writing options can be summarized as follows:

- The writer of an option faces the risk of being assigned an exercise. The implications of this risk for call writers and put writers are as follows: (i) The call writer who has written a call on a stock which he does not own (naked call writer) will end up incurring losses proportional to the increase in the price of the asset above the exercise price because he has to buy the asset from the market at the higher price and deliver it at the lower (exercise) price. (ii) The put writer must have adequate financial capacity and liquidity to buy the stock at the exercise price. This risk of being assigned an exercise is more significant for the writer of an American option because he can be assigned an exercise at any time during the life of the option.
- The writer of the covered call foregoes the opportunity to benefit from an increase in the value of the underlying asset above the option premium, but continues to bear the risk of a decline in the value of the underlying interest.
- Transactions involving buying or writing of multiple options (like straddles and strangles) and transactions involving buying/writing options in combination with Short/Long positions in the underlying stocks present additional risks to the investor. The investor attempting such transactions must understand that there is a possibility of incurring losses on both sides of the combination transaction and an increased risk exposure can result when one side of the trade is exercised or liquidated while the other side remains outstanding.

SUMMARY

- An option is a contract where the seller gives the buyer the right but not the obligation to purchase a designated instrument or asset as a specific price which is agreed upon at the time of entering into the contract.
- The factors influencing the option price are the current price of the underlying asset, the strike price of the option, the time left to maturity, the volatility of the underlying asset, the risk-free rate of interest in the economy and the dividends (if any) expected during the life of the option.
- There are four elementary trading strategies in options namely, long call, short call, long put and short put.
- Other types of options are currency options, index options, futures options, borrowers options, lenders options, over-the-counter options, etc.
- Arbitrage with options involves buying calls and selling puts of the same stock with the same strike price and expiry date. The three main types of arbitrages involve synthetics, conversions and reversals.
- Black-Scholes option pricing model aims to establish a no-arbitrage portfolio to value the option when the stock prices are binomial, as both the stock price and option price are influenced by the same underlying source of uncertainty in the stock price movements.
- Volatility is a measure of the market speed in relation to the variations in the stock prices.
- Options are used for reducing the variability of returns, betting on information and generating optimal portfolios.

Chapter XI

Sensitivity of Option Premiums

After reading this chapter, you will be conversant with:

- Delta, Theta, Vega, Rho and Gamma
- Analysis of Scenario
- Portfolio Insurance

Introduction

A wide variety of factors can affect an option's value. If a trader uses a theoretical pricing model to evaluate options, any of the inputs into the model can represent a risk since there is always a probability of these inputs being incorrectly estimated. Even if the trader could make some accurate estimations, some unexpected change in market conditions may affect the value of his option position. So, the trader must learn to make decisions under changing market conditions and to assess his exposure to risk with his option position.

The sensitivity analysis of option premium deals with the measurement of changes in option price due to the change in the underlying parameters that determine the option prices. These parameters include stock price, time period, interest rate and volatility.

As the price of the underlying asset rises or falls options are more or less likely to finish in-the-money and their values rise or fall accordingly. As volatility rises, the extreme outcomes become more likely resulting in an increase in an option's value. As volatility falls or as expiration date approaches the extreme outcomes are less likely to occur and the option value decreases. The effects of changing market conditions on an option's value are summarized below.

Table 1

Factor	Change	Effect on Call Price	Effect on Put Price
Price of the underlying asset	Increase	Increase	Decrease
	Decrease	Decrease	Increase
Volatility	Increase	Increase	Increase
	Decrease	Decrease	Decrease
Time to expiration	Decrease	Decrease	Decrease

Table 2: The Effect of Changing Interest Rates on Option Values

Interest	If Domestic Interest Rates Rise	If Domestic Interest Rates Fall	If Foreign Interest Rates Rise	If Foreign Interest Rates Fall
Calls on stock will...	Rise in value	Fall in value	(not applicable)	(not applicable)
Puts on stock will...	Fall in value	Rise in value	(not applicable)	(not applicable)
Calls on a foreign currency will...	Rise in value	Fall in value	Fall in value	Rise in value
Calls on a futures contract will…. (stock type settlement)	Fall in value	Rise in value	(not applicable)	(not applicable)
Puts on a futures contract will... (stock type settlement)	Fall in value	Rise in value	(not applicable)	(not applicable)
Calls on a futures contract will... (futures type settlement)	Remain unchanged	Remain unchanged	(not applicable)	(not applicable)
Puts on a futures contract will... (futures type settlement)	Remain unchanged	Remain unchanged	(not applicable)	(not applicable)

It is more difficult to ascertain the effect of changes in the interest rates on the option prices as there is no specific effect on the option prices for the changes in interest rates. We can assume that a call is a substitute for buying a stock and a put is a substitute for selling a stock.

For instance, suppose you want to purchase a certain stock. If the interest rates are rising the cash outlay required to buy the stock will be high and hence you will prefer the call. Similarly when the interest rates are low, the carrying cost associated with stock is not so great and calls become less attractive alternative to purchasing the stock. Hence, rising interest rates cause call option values to rise and falling interest rate cause stock option calls to fall.

Similarly if we are considering the sale of a stock, the alternative is the purchase of a put. When interest rates are rising, sale of a stock is desirable because the amount received on the sale can be invested to fetch high returns. The fall in interest rates would make puts more attractive. Hence, rise in interest rates will tend to reduce the put price and falling interest rates will cause put options to rise in value.

There are five measures of sensitivities. They are:

- Delta
- Gamma
- Theta
- Rho
- Vega.

Let us discuss each one of them in more detail:

DELTA

The delta of a stock option can be defined as the ratio of change in the price of an option to the change in the price of the underlying asset. An increase in the value of the underlying asset makes the premiums on calls to increase and the premiums on puts to decrease, given that all other factors remain constant. Delta measures the sensitivity of the option value to changing stock prices. Delta of any option gives an idea about the number of units of a stock that should be held by any investor for creating a riskless hedge. Since the value of the call increases, when the stock price increases the delta of a call will always be positive. But as the value of a put decreases with the increase in the stock price, the delta of a put will always be negative. An option can never gain or lose value faster than the underlying asset. So, the delta of a call has an upper bound of 1. An option cannot move in a direction opposite to the asset and hence the lower bound of a call is zero. Since the puts have opposite characteristics of a call the boundary of the delta of a put option ranges between –1 and 0. The change in the option versus the underlying price are depicted in the following figure.

Figure 1: Delta of Call on Non-dividend Paying Stock

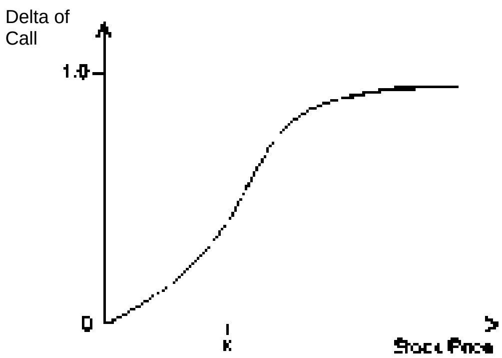
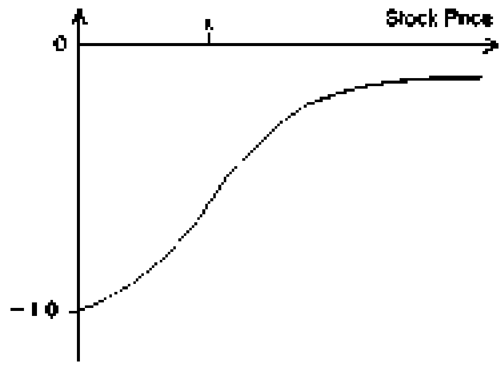


Figure 2: Delta of Put on Non-dividend Paying Stock



If change in the stock price is Δp and corresponding change in the call price is Δc, then first derivative reflecting sensitivity will be $\Delta c / \Delta s$. The change in the call price is measured for a very small change in the stock price.

Suppose an investor buys a European call option on a stock priced at $50, with a standard deviation 10%. The option has 3 months to expiration. The strike price of the option is $50 and risk-free interest rate is 8%. Table 3 shows how the option value changes for the respective change in the stock price. For example, if stock price changes from $50 to $50.25, the call value changes from $4.46 to $4.6072 and if the stock price moves up from $50 to $51, the call value increases from $4.46 to $5.0573.

Table 3

Stock Prices	Call Prices	N (d_1)
48.00	3.3815	0.5000
49.00	3.8952	0.5394
49.50	4.1656	0.5595
49.75	4.3188	0.5694
50.00	4.4600	0.5793
50.10	4.5173	0.5832
50.25	4.6072	0.5893
50.50	4.7543	0.5987
51.00	5.0573	0.6179
52.00	5.7192	0.6539

Compare these values with the values of N(d_1) calculated in Black-Scholes model. You can observe the difference between the two. Suppose the stock price changes from $50 to $52, the call price changes from $4.46 to $5.7192 and $\Delta c / \Delta s$ = (5.7192 – 4.46)/(52 – 50) = 0.6296 N(d_1) for a stock price of $50 is 0.5793. If the stock price changes from $50 to $50.1, the corresponding change in the above ratio will be $\Delta c / \Delta s$ = 0.0573/0.1 = 0.5730. The corresponding value of N(d_1) is 0.5793. Thus for small changes in stock prices, $\Delta c / \Delta s$ approaches N(d_1).

The difference between the values of $\Delta c / \Delta s$ and N(d_1) becomes zero when we consider very small changes in the stock price.

Consider a European call option on a non-dividend paying stock. If the call price is 'c' and underlying stock price is S, then we can calculate the delta of the call option by the following formula –

Delta call = $\Delta c / \Delta s$ = N(d_1)

Where, d_1 is calculated according to the Black-Scholes model. Similarly, the delta of European put option on a non-dividend paying stock can be defined as,

Delta put = $\Delta c / \Delta s$ = N(d_1) –1

The calculation of delta is also useful in hedging a portfolio. Consider a portfolio P containing a short position of one European call on a non-dividend paying stock and delta units of the stock. The price of the call is 'c' and that of the stock is S.

Therefore, the value of the portfolio will be –

P = – c + N (d_1)S

In our example, the stock price is $50 and the corresponding call price is $4.46. N($d_1$) = 0.5793. The cost of the portfolio is,

P = – 4.46 + 0.5793 x 50

= $24.5050

If the stock price goes up to 50.20, the value of the portfolio will be–

P = – 4.5754 + 0.5793 x 50.20

= $24.5054

Thus, the value of the portfolio changes by $0.0004 for a $0.20 change in the stock price. If the change in the stock price is very small, the value of the portfolio will remain unaffected but if the change in the stock price is large the corresponding change in the portfolio will go on increasing. Suppose the stock price moves up to \$51, the value of the portfolio will be –

$$P = -5.0573 + 51.00 \times 0.5793$$
$$= \$24.487$$

The portfolio value has changed by \$0.0184 due to the \$1 change in the stock price. The above portfolio is called delta-neutral portfolio because for a very small change in the stock price the value of the portfolio remains unaffected. In simple terms, the delta of this portfolio is zero and the value of the portfolio is immune to the change in the stock prices. It is important to note that the investor's position remains delta neutral for very short time period. This happens because delta changes not only when the stock price changes but also changes when other factors like standard deviation and time change. For creating the delta hedge of a portfolio, we have to continuously rebalance the portfolio as the stock price changes. This act of regular change in the portfolio is also called rebalancing, and by following this rebalancing we can create a risk-free portfolio, which can at least earn the risk-free return. The concept of delta-neutral portfolio earning a risk-free rate was the key result in finding the option pricing model by Black-Scholes. In our example, if the stock price increases to \$52 by the end of one week, delta will rise from 0.5793 to 0.6539 and to maintain a risk neutral portfolio, we have to increase the number of the shares from 0.5793 to 0.6539. Hedging schemes, which require continuous rebalancing are also called dynamic hedging.

In case of a portfolio of derivatives and other assets where there is a single underlying asset, that will be the weighted sum of all the derivatives of other assets forming part of the portfolio.

$$\therefore \Delta p = \sum_{j=1}^{n} W_j \Delta j$$

Where,

Δ_p = Δ of Portfolio

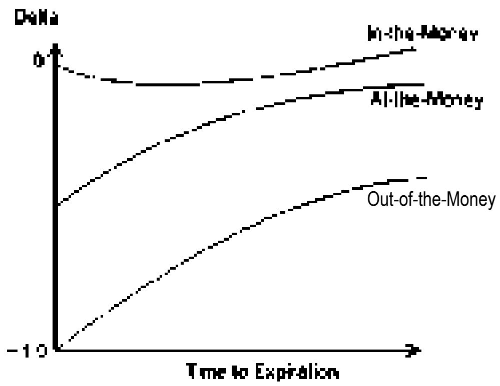
Δ_j = Δ of j derivative

W_j = Weight of j derivative in the portfolio.

Interpretation

If we draw a figure with delta on X-axis and stock price on Y-axis, we can infer that delta tends to approach 1.0 when the call option is deep-in-the-money. Similarly, when the call is deep-out-of-the-money delta approaches zero. Delta of call will be most sensitive to change in the stock prices, when the underlying stock price approaches the exercise price. Delta of a put option will be always negative. The delta of the deep-in-the-money put approach is –1, while the delta of a deep-out-of-the-money put approaches zero. The same is explained in the following figure 3.

Figure 3: Delta of Different Put Options



This implies that for every two options purchased, one underlying asset has to be sold to establish a neutral hedge. Since puts have negative deltas the purchase of puts will require one to purchase the underlying contract. A put with a delta of 0.5 implies that you have to purchase one underlying asset for every two puts purchased. A portfolio is said to be delta neutral when the deltas of all the components of that portfolio add up to zero. The portfolio may consist of underlying contracts, calls and puts with different exercise prices and expiration dates.

THETA

Theta can be defined as a measure of option or derivative sensitivity with respect to expiration time. If the stock price and other factors of the option pricing models are constant, the price of the option will change with the increase and decrease in the option life. Both call and put options lose value as expiration approaches. Theta is the rate at which the option loses value as time passes. Theta is negative of the first derivative of option price with respect to the time remaining until expiration. Theta of a call and a put can be greater or less than zero. But in normal circumstances, it is always less than zero, because as the time to expiration decreases, the value of the options also decreases. Theta can also be called as time decay of an option. Theta is expressed in terms of time. Though the time cannot be negative, theta assumes negative values because the options lose value as time passes. A long option position will always have a negative theta and a short option position always has a positive theta. For a European call option on a non-dividend paying stock, theta can be, defined as follows:

$$\text{Theta of call} = \frac{-SN'(d_1)\,\sigma}{2\sqrt{T-t}} - rXe^{-r(T-t)}\,N(d_2)$$

$$\text{Theta of put} = \frac{-SN'(d_1)\,\sigma}{2\sqrt{T-t}} + rXe^{-r(T-t)}\,N(d_2)$$

where, d_1 and d_2 are defined as per Black-Scholes model.

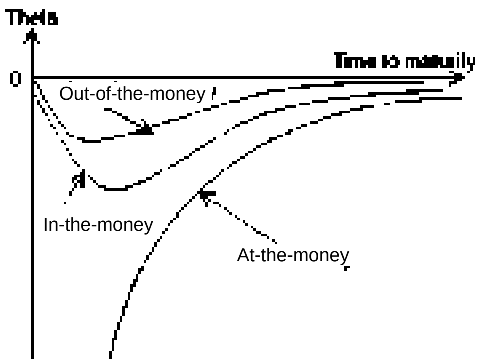
$$N'(d)\ \frac{1}{\sqrt{2\pi}}\,e^{-d^2/2}$$

Now, continuing our earlier example, we have call values c = 4.46 for S = \$50, volatility = 40% and T – t = 90 days.

For these values, option's theta = – 6.745.

The following figure shows that after 0.01 year the value of the option decline by 0.6745, if other parameters of option pricing model remains constant, as the expiration day comes nearer the value of call will fall and will be worthless at expiration. Theta of option varies with changing stock prices and expiration of time. Theta of put and call change in very different manner depending upon whether the options are in-the-money or out-of-the-money. The following figure shows how theta of a call option varies with respect to the change in the time to expiration.

Figure 4:Theta of a European Call Option



VEGA

Vega measures the sensitivity of the option premium with respect to the volatility of the asset provided other factors determining the option premium are constant. Vega can be termed as the first derivative of an option price with respect to the volatility of the underlying stock. Since volatilities change over a certain time period, the option premium of both call and put is liable to behave accordingly. Vega of call and put will always be identical and positive because all options gain value with rising volatility.

Interpretation of Vega

If an option has a Vega of 0.3 for each percentage increase (decrease) in volatility, the option will gain (lose) 0.3 in theoretical value. If the option has a theoretical value of 3.5 at a volatility of 20% then at 21% volatility the option will have a value of 3.8. If Vega of any option is very high, the value of an option will be very sensitive to even a small change in the volatility of the underlying assets. Vega is sometimes called kappa, lambda or sigma as well. Vega of any European call or put option on a non-dividend-paying stock can be measured by the following formula:

$$\text{Vega of Call or Put} = S\sqrt{T-t}\,N'(d_1)$$

Where, $N'(d_1) = \dfrac{1}{\sqrt{2\pi}} e^{-d_1^2/2}$

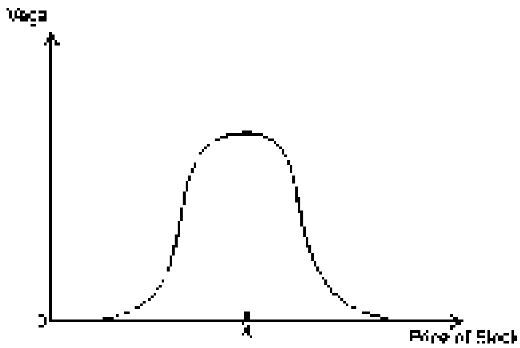
Continuing with our example, we can calculate the value of the Vega of call and put on a non-dividend paying stock.

Vega of call or put $= 50\ (0.25)1/2\ N(d_1)$

$= 11.793$

Vega of all options declines as expiration approaches. Therefore, a long-term option will always be more sensitive to a change in volatility than a short-term option with similar characteristics. A four month option will have a greater Vega to a percentage change in volatility than a one month option. Vega will be highest for a near-the-money option. For deep-in-the-money and deep-out-of-the-money, the Vega will always below and tends to be zero. The following figure shows how vega of an option changes with price of the stock.

Figure 5: Vega of an Option



RHO

Rho can be defined as a measure of the sensitivity of option value to change in interest rates. Rho is the first derivative of an option premium with respect to the interest rate. As we know that call option is positively related to the interest rate whereas put option is negatively related to the interest rate. Thus, Rho of any call will be always positive and Rho of any put will always be negative. For an European put option on a non-dividend paying stock,

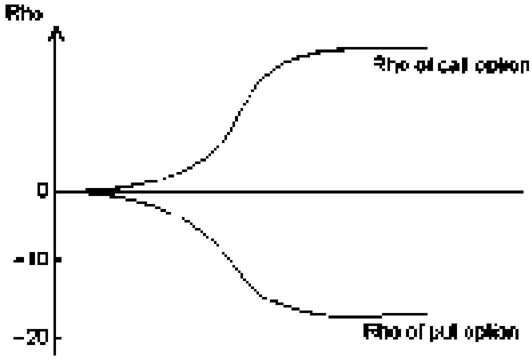
$$\text{Rho} = -X\,(T-t)e^{-r(T-t)}\,N(-d_2)$$

Similarly, the Rho of an European call for non-dividend paying stock can be given as

$$\text{Rho} = X\,(T - t)e^{-r(T-t)}\;N(d_2)$$

Rho will be lower for deep-out-of-the-money call, while it will be higher for a deep-in-the-money call. On the other hand, Rho will be lower for a deep-in-the-money put and generally it will be higher for a deep-out-of-the-money put. Rho tends to be sensitive to the stock price when a call is near-in-the-money, whereas Rho of a put tends to be sensitive to the stock price, when put is in-the-money. Rho of a call and a put will change, with the expiration of time and it tends to approach zero as expiration approaches.

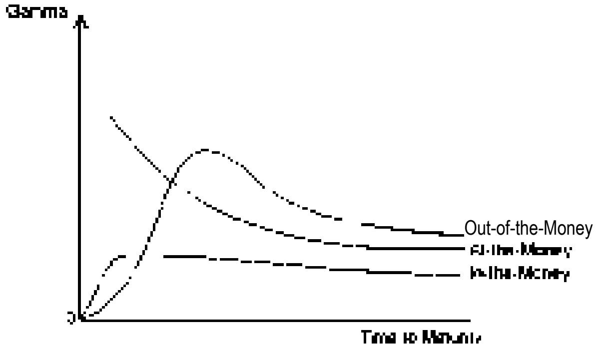
Figure 6: Rho of an Option



GAMMA

The gamma of any option is the rate of the change of the option's delta with respect to the price of the underlying stock. Gamma does not measure any sensitivity of option premium with respect to the underlying parameters deciding the option value. Gamma of any option indicates the sensitivity of delta with respect to the change in the stock prices. The gamma of a put and call will always be equal. Gamma is second order derivative of option premium with respect to the stock prices. It is the rate of change of delta to the changes in the option prices. Higher gamma reflects the greater sensitivity of option's delta with respect to the stock price. Gamma of deep-out-of-the-money options (both call and put) will always be lower and will be less sensitive to the change in the stock prices. The following figure depicts how gamma varies with the stock price and gamma essentially measures the slope of the graph.

Figure 7: Gamma of an Option



For a European call or a put option on a non-dividend-paying stock, the gamma can be calculated by the following formula:

$$\text{Gamma of a call or a put} = N'(d_1)/S\,\sigma\sqrt{T - t}$$

Gamma also varies with the time remaining until expiration. For an option that is near-the-money gamma increases as expiration approaches. The greater value of the gamma reflects the greater sensitivity of the delta with respect to the stock prices, when the expiration is approaching for near-the-money option. For an option that is deep-out-of-the-money, the gamma will fall as expiration comes nearer. The following figure shows how gamma varies with time remaining until expiration for options-at-the-money, in-the-money and out-of-the-money.

Interpretation of Gamma

Gamma is a measure of how fast an option changes its directional characteristics, acting more or less like an underlying position. A large gamma number, whether positive or negative implies high degree of risk and a low gamma number implies a low degree of risk. The gamma can also help a trader maintain a delta-neutral position by enabling him to make a quick estimate of how the delta is changing.

While discussing the delta, we have constructed a delta-neutral portfolio, on the same lines we can create a gamma neutral portfolio consisting 0.5793 shares and short position of one call. Whenever price of the stock changes from $50 to $55 the value of the portfolio will change accordingly. For small change in the stock price, we know that the price of the delta-neutral portfolio will not change. For large change in the stock price, the value of the portfolio will fall, which has been shown below:

Table 4

Stock Price	Call Price	0.5793 Shares	Portfolio Value
45	2.431	26.0685	23.6375
50	4.460	28.9650	24.5050
55	7.799	31.8615	24.0625

(All values are in dollars)

Since in this portfolio we have sold one call, so the gamma of the portfolio will be negative and will be equal to – 0.04712. The negative gamma of this portfolio ensures that large change in the stock price will make the portfolio lose value. This holds good for both the increase and decrease in the stock price. For a delta-neutral portfolio with positive gamma, we can construct such portfolio with the use of a put. The value of the positive gamma portfolio will increase with the fluctuation in the stock price. Hence, it will be always desirable to have a positive gamma.

ANALYSIS OF SCENARIO

While proper use of Delta, Gamma, Theta, Rho and Vega can bring in neutrality of risk in the portfolio, it is not practically possible to balance one's portfolio every now and then due to the time and cost involvements. It is better to keep analyzing the extent of risks rather than trying to eliminate them totally. When the risk becomes unacceptable (based on a predetermined level), an appropriate change in the underlying asset or its derivatives can be made.

In addition, one can resort to scenario analysis, under which, the profitability of one's portfolio can be measured under different levels(scenarios).

Scenario analysis can be done with the help of the following:

i. **Monte-Carlo Simulation:** With Monte-Carlo Simulation various probabilities of outcome can be generated for the future. The scenario can be picturized for possibility of losses based on the simulations of Monte-Carlo.

ii. **Testing Stress:** Testing stress involves the analysis of the portfolio based on past bad experiences or worst possible cases/situations.

iii. **Value at Risk:** With value at Risk,[1] the confidence level is set which implies that values above the prescribed confidence level entail profits or losses and the same is analyzed.

1 Value at Risk is discussed in detail in the chapter "Value at Risk".

PORTFOLIO INSURANCE

A portfolio manager may reduce his losses by insuring his portfolio. This is done by buying put options on the stock index in addition to the stock. Else one can create put options synthetically. This strategy is known as portfolio insurance or dynamic hedging.

The portfolio manager continually tries to adjust the hedge ratio of his portfolio to the movements in the market, instead of having a static ratio. This is done by buying and selling put options as and when required.

In case the manager opts for creation of synthetic positions, he must take a position in the underlying asset ensuring that the delta of the position is equal to the delta of the option. The Gamma and Vega should also be ideally matched. Synthetically, created options are superior to options available in the market because the option market may not have enough liquidity to absorb the volume of trades and the dates required may not match the dates of strike and exercise in the markets. Index futures can also be used to create portfolio insurance if the market for futures is sufficiently liquid to absorb all the trades. Based on past experience from the American markets it seems that buying options traded in the market is far safe than creating them synthetically, as the markets may not be able to absorb huge sales of synthetic options when there is high volatility. During the great crash of the Dow Jones index in October, 1987, those managers that had opted for portfolio insurance by buying traded put options were safeguarded as compared to those that had created them synthetically, as the latter could not find takers fast enough in the market.

Let us now take an example to understand how a synthetic option can be created.

Suppose a portfolio manager is having a long position in certain assets and he wants to protect the value of the underlying assets and if he does not find any option available in the market to cover his position, than he can create a synthetic put option himself. This position of a put with underlying position in an asset is equivalent to buying a long call. Therefore, the hedger or manager really wants to buy a call with the same exercise price as the put. Now coming to the characteristics of the call, we will consider the call with the following characteristics:

Exercise price	=	Rs.100
Time to expiration	=	10 weeks
Stock price	=	Rs.101.35
Interest rate	=	8%
Volatility	=	18.3%

Now with all these details in hand we can calculate the value of delta of the call option. Delta of the call option is the rate of change in the call value with respect to the change in the underlying stock price. The value of delta of a put on an index can be calculated using the following formula,

$$\Delta = e^{-q(T-t)} [N(d_1) - 1] \text{ and}$$

$$d_1 = \frac{\ln(S/X) + (r - q + \sigma^2/2)(T - t)}{\sigma\sqrt{T - t}}$$

The value of the delta calculated with the use of the above formulae comes to 0.57. This value of the delta signifies that if the manager actually owned the call in theory he would have position equivalent to owning 57% of his asset. So, if he wants to take the combination of the underlying asset and the Rs.100 put, he has to sell off 43% of his holding in the asset. Now suppose after one week the value of the asset has risen to Rs.102.26. The delta of the option will change and will go up to 0.62. If the fund manager wants to equalize his position to a long call he will have to own 62% of the underlying asset. He must, therefore, buy-back 5% of his original holding in the asset. Now assume that after one week the value of the asset falls to Rs.99.07. Using the new market value of the asset, the value of the delta comes to 0.46. In order to maintain his original position again, the fund manager has to sell 16% of the asset so that he owns only 46% of his original holding. Here, the act of the fund manager is nothing but continuous reshuffling of his original holding to adjust his position with the same delta characteristic as a call.

The following table shows that how the continuous rebalancing is required after the change in the stock price.

Table 5

Week	Asset Value (Rs.)	Delta of Call Needed for Replications	% of Asset Adjustment	Desired
0	101.35	0.57	57%	Sell 43%
1	102.26	0.62	62%	Buy 5%
2	99.07	0.46	46%	Sell 16%
3	100.39	0.53	53%	Buy 7%
4	100.76	0.56	56%	Buy 3%
5	103.59	0.74	74%	Buy 18%
6	99.26	0.45	45%	Sell 29%

To replicate the call the hedger will have to buy-back some of the assets when the market goes up and on the other hand he has to sell some of his assets when the market declines. This rehedging process is an attempt to replicate the automatic rehedging characteristic of the option. As a hedge against an underlying position an option has the characteristic of offering greater protection as the market moves adversely and less protection as market moves favorably. In other words, the option automatically adjusts itself to fit the required amount of the contribution. Whenever a portfolio manager attempts to replicate the characteristics of an option by constant reshuffling the underlying position he is simply doing the automatic rehedging (gamma) characteristic of the option. This method can be used to cover the long or short position against any unfavorable situation.

SUMMARY

- There are five measures of sensitivity: delta, gamma, theta, rho and vega.
- Delta is the ratio of change in the price of an option to change in the price of the underlying asset.
- Gamma is the rate of change of the option's delta with respect to the price of the underlying stock.
- Theta is a measure of sensitivity of the option with reference to the time to expiration.
- Rho is a measure of the sensitivity of the option value to change in the interest rates.
- Vega is the measure of sensitivity of option premiums with respect to volatility of the asset provided other factors determining the option premium are constant.
- Portfolio insurance or dynamic hedging is the process of reducing losses by buying put options on the stock in addition to the underlying stock or by creating put options synthetically.

Chapter XII

Financial Swaps

After reading this chapter, you will be conversant with:

- The Concept of Financial Swaps
- Interest Rate Swaps
- Options on Swaps
- Currency Swaps
- Pricing of Swaps

Introduction

The term 'swap' has two different meanings in the financial markets. In one definition, it refers to the simultaneous purchase and sale of currency for different maturities or vice versa. The other definition states that it is the agreed exchange of future cash flows with or without any exchange of cash flows at present. The base on which the cash flows are exchanged may be different and it gives rise to different types of swaps.

Financial swaps are broadly classified into –

i. Interest rate swaps

ii. Currency swaps.

Swaps have been defined variously as:

- a transaction in which two parties agree to exchange a predetermined series of payments over time;[1]
- an agreement between two parties to exchange interest payment for specific maturity on an agreed upon notional amount;[2]
- an arrangement whereby one party exchanges one set of interest payments for another, example fixed for floating rate.[3]

An agreement between two parties to exchange a series of payments, the terms of which are predetermined can be regarded as a financial swap. If the terms provide for exchange of interest payments without involving exchange of principal payments it is normally referred to as an interest rate swap. If the terms of agreement also provide for exchange of principal, which normally happens when two currencies are involved, it is called a currency swap.

Swaps can be used to convert liabilities or assets to the benefit of the owner. With the help of a swap, a floating rate liability (loan) can be converted into a fixed rate liability (loan), thus ensuring that the volatility in the interest rates does not increase the burden of payments or else, vice versa convert a fixed rate liability (loan) into a floating rate liability (loan) when the interest rates fall steeply in the market.

Similarly, the nature of an asset can be changed to convert a floating rate earning asset into a fixed rate earning asset or vice versa according to the requirements of the holder.

Swaps can be divided into short-term, medium-term and long-term swaps. While short-term swaps have maturity periods of less than three years, medium-term swaps mature between three and five years and long-term swaps have a life extending beyond five years.

EVOLUTION OF SWAP MARKET

Financial swaps are private contractual agreements between two parties to exchange cash flows in the future according to specified terms and conditions. The swap market came into existence in the late seventies when currency traders employed the technique of swaps to evade British controls on the movement of foreign currency. The swaps on currency were in existence in the form of back/parallel loans earlier. (Parallel loans/Back to back loans are currency exchange agreements whereby a UK holding company will lend £ to the US subsidiary in the UK and the US firm will lend $ to the UK subsidiary in the US to avoid exchange controls.)

1 Financial Derivatives; Keith Redhead; Prentice-Hall of India.
2 Multinational Financial Management; Alan C Shapiro; Prentice-Hall of India.
3 Financial Derivatives; David Winstone; Chapman & Hall.

The First Swap

If a swap transaction involves exchange of interest payments then it is known as an interest rate swap. The first interest rate swap took place in London in 1979 and further in 1981, Salomon Brothers negotiated a benchmark currency swap between IBM and the World Bank.

The earlier forms of currency swap existed before this date in the shape of back-to-back loan.[4] The Swiss franc/deutschemark/US dollar currency swap between the World Bank and IBM created interest and activity in swap arrangements.

Initially, deals were on a matched basis whereby a bank would bring two counterparties together with the same matched requirements. In 1981, the swap market was worth a few hundred million dollars, but today it is worth several trillion dollars, divided into interest rate swaps and currency swaps and is still growing. Most of the capital market issues are swapped today, with a few exceptions.

Later in 1984, especially in the US dollar interest rate swap market, banks started developing warehousing whereby a single counterparty would approach them and without another counterparty the bank would enter into a swap arrangement with them. A temporary hedge would be taken in the bond or futures market until a suitable counterparty could be found. Standard terms introduced by the ISDA and BBA in 1985 also assisted growth in the swap market.

The swap market is still one of the fastest growing financial markets in the world.

Swap Facilitators

Swaps are mutual obligations among the swap parties. But it may not be necessary for the counterparties involved in a swap deal to be aware of each other because of the role assumed by a swap dealer (market maker) or swap broker. Collectively, the swap facilitators are known as 'Swap Banks' or simply 'Banks'.

SWAP BROKER

When a swap facilitator does not take any financial position in a swap arrangement he initiates and he dissociates himself from the deal after making an arrangement between the counterparties who have approached him, then he is called a 'swap broker'. He charges a fee (commission) for the services provided and he is not a party to the swap contract. He merely acts as an intermediary. Thus, a swap broker is an economic agent who helps in identifying the potential counterparties to a swap transaction. A swap broker is also called a market maker.

SWAP DEALER

Swap dealers bear the financial risk associated with the deal he is arranging in addition to the functions of a swap broker and becomes an actual party to the transaction. He serves as a financial intermediary, earning profits by helping complete the swap transactions. The swap dealer faces two main problems: (i) pricing of swaps, and (ii) managing of default risk of the counterparty.

SWAP COUPON

The fixed rate of interest on the swap.

NOTIONAL PRINCIPAL

The principal amount on which the interest calculation is made.

BASIS POINTS (BP)

Basis point is 1/100th of 1%, i.e., 10 basis points = 0.1%.

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4 Back-to-back loans is a loan arrangement involving two distinct loans between the same parties. In the first loan, Party 1 is the lender and Party 2 is the borrower. In the second loan, Party 2 is the lender and Party 1 is the borrower.

Principles behind Swaps

The economic benefits of a swap transaction are numerous. There is an intensive use of swaps in the recent past. The viability of swaps rests on important economic principles. The most important among them are the principle of comparative advantage and the principle of offsetting risks.

Given the fact that swaps are off-balance sheet items, they are beneficial to both the users and the banks. Earning profits on swap deals without increasing the total assets can boost the Return on Equity (ROE) of the bank balance sheet, as the profit increases, without increase in the underlying assets/liabilities.

Comparative and Absolute Advantage

Assume that two countries A and B produce two goods X and Y. Country A has more than sufficient natural resources to produce good X compared to country B. Country B has more than sufficient natural resources to produce good Y. A and B can minimize their efforts and cost in producing a good if they can exclusively concentrate on one particular product in which they are enjoying a better position than the other. In this case, A is said to have an absolute advantage over B in producing X and B has an absolute advantage over A in producing Y. If they mutually agree to produce only X and only Y respectively, then there will be a mutual benefit to each of them and their overall cost will also be minimized. But consider a situation where A has an absolute advantage in both, but B's position is relatively better in producing Y than X. Then B is said to have a comparative advantage in producing product Y.

A similar argument can be extended to swap agreements where the counterparties involved use the principle of comparative advantage to reduce their cost of funding. One party may enjoy a higher credit rating that enables it to raise funds cheaper than another party, which has a lower credit rating. The principle of comparative advantage can be used in such a way that both the parties are benefitted by entering into a swap arrangement among them to reduce their net cost of funding.

Offsetting Risks

A bank or a financial institution may have fixed rate assets and floating rate liabilities. For instance, a bank has given loans at a fixed rate of interest for a long-term, but has to pay its depositors periodical interest based on the T-Bill rate or any other benchmark rate. The bank is exposed to interest rate risk because of this non-matching of assets and liabilities. The bank can offset this risk by entering into a fixed to floating rate swap thereby converting the fixed rate asset into a floating rate asset.

Limitations of Swap Market

The swap market has some limitations:

i. It is difficult to identify a counterparty to take the opposite side of the transaction once a party has approached the swap dealer with his/her requirements.

ii. The swap deal cannot be terminated without the agreement of the parties involved in the transaction.

iii. Existence of inherent default risk.

iv. Underdeveloped secondary markets for swaps, mainly as a result of very slow development of standardized documentation. This clearly shows that swaps are not easily tradable.

v. The theory of comparative advantage of one party in a market as compared to the other market is one of the benchmarks for deciding on a swap. It should be noted that the comparative advantage enjoyed by one party in the floating rate market as compared to the fixed rate markets is mostly because the floating rates are for a short-term period of about six months (usually tied to LIBOR) and can be changed in case the credit rating of the party changes, while the fixed rates are for usually longer periods of time (2 to 5 years) and as such, cannot be changed with the changes in the party's credit rating. So, in short, the comparative advantage theorem is illusionary.

vi. The swap market is not exchange controlled and it is an over-the-counter market. This calls for an extra caution on the part of the parties involved to look into the creditworthiness of the counterparties before entering into an agreement.

The above limitations make the swap market transactions restricted to the firms and financial institutions.

INTEREST RATE SWAPS

Definition

There are many different types of swaps that have evolved over time. The most common among them are the interest rate swaps, currency swaps and the cross currency interest rate swaps.

An interest rate swap is defined as an agreement between two or more parties who agree to exchange interest payments over a specific time period on agreed terms. The interest rates agreed may be fixed or floating. If there is an exchange of interest obligations then it is termed a liability swap. If there is an exchange of interest income then it is an asset swap.

The simple interest rate swaps are popularly called plain vanilla swaps. There are many variants on the plain vanilla swaps. These swap variants are the major innovations in the swap market and are tailored to suit different needs of different customers.

The basic swap techniques can be explained using plain vanilla swap concept. The plain vanilla swaps are those swaps where fixed rate obligations are exchanged for floating rate obligations over a specific period of time on a notional principal. They are also called coupon swaps or generic swaps.

Parties in a Swap Transaction

There are two parties to a swap transaction, fixed rate payer/receiver and floating rate receiver/payer. A fixed rate payer is the provider of floating rate funds and hence the purchasers of the swap lose when interest rate falls and gain when interest rate rises. A floating rate payer is the provider of fixed rate funds and hence the seller of the swap loses when interest rate rises and gains when interest rate falls.

Swap Market Terminologies

Trade Date: It is the date on which swap is entered into. This is the date when both the parties have agreed for a swap.

Effective Date: Effective date is the date when the initial fixed and floating payments begin. Effective date is also called value date. If the effective date is after two days of the trade date, then it is called spot date. The maturity of a swap contract is computed from the effective date.

Reset Date: The applicable LIBOR for each period is to be determined before the date of payment. It is usually determined before the commencement of the applicable period. Generally for the first payment, the LIBOR rate applicable will be set at the trade date if the value date is two days after the trade date. The first reset date will generally be 2 days before the first payment date, the second reset date will be 2 days before the second payment date and so on.

Maturity Date: The date on which the interest accrual stops.

Assignment Broker: Market maker in swaps.

Let us take two illustrative examples to understand: There are two parties X and Y who are interested in raising funds; firm Y can raise funds in fixed and floating markets at 10% and LIBOR + 0.25% respectively. Firm X can raise funds in fixed and floating markets at 10.75% and LIBOR + 0.50% respectively. These rates are applicable for a $100m borrowing for 2 years. While both X and Y can borrow both in fixed and floating market, firm X is interested in borrowing fixed interest rate while firm Y is interest in borrowing in floating rates.

Table 1

Firm	Objective	Fixed Interest	Floating Interest Rate
X	Fixed Rate	10.75%	LIBOR + 0.50%
Y	Floating Rate	10.00%	LIBOR + 0.25%

In the table 1, we can see that the cost of borrowing for Y is lower than that of X in both the markets. This difference is called quality spread, which can be quantified for both fixed and floating rate markets as below.

Fixed market	10.75% – 10.00%	= 0.75%
Floating market	LIBOR + 0.50% – LIBOR + 0.25%	= 0.25%

The advantage enjoyed by Y is known as absolute advantage, hence we say that Y has an absolute advantage in fixed rate and floating rate markets. However, it can be observed that the cost of funds for X is higher in fixed rate market by 75bp whereas the same is higher by 25bp in floating rate market. It means that X has a relative advantage in floating rate market. This advantage is known as comparative advantage. Hence, we can say that X has comparative advantage in floating rate market. Given their objectives X should borrow in fixed rate market and Y should borrow in floating rate market. However, considering the comparative advantage enjoyed by X it is possible to reduce the cost of funds to both X and Y if they borrow in the markets where they enjoy comparative advantage and then swap the borrowing. The reduction in the cost depends on the quality spread.

In this case the amount of benefit that can be derived by both the parties will be the difference between the quality spreads which is 50bp (i.e. 0.75% – 0.25%). Assume that both the firms want to share the benefit equally between them.

Under the swap arrangement:

Y – borrows funds in fixed rate market and lends to X

X – borrows funds in floating rate market and lends to Y.

Let us assume that X lends to Y at LIBOR and Y lends to X at 10%.

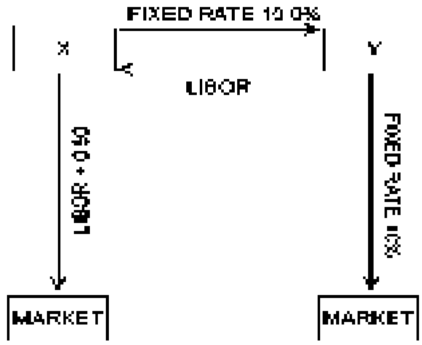
The net cost of funds to X and Y using the swap arrangement can be seen by examining their cash flows. (see the figure 1).

Table 2

	Paid To Counterparty	Received from Counterparty	Paid to Market	Net Cost	Savings
Y	LIBOR	10%	10%	LIBOR	LIBOR + 0.25% Minus LIBOR
X	10%	LIBOR	LIBOR + 0.50	10.50%	10.75% Minus 10.50%

As seen from the above, funds are available to Y at LIBOR as against LIBOR + 0.25 and X at 10.50 instead of 10.75%. Thus, swap enables reduction in cost of funds.

Figure 1: Swap Arrangement



Interest Rate Swaps with Intermediary

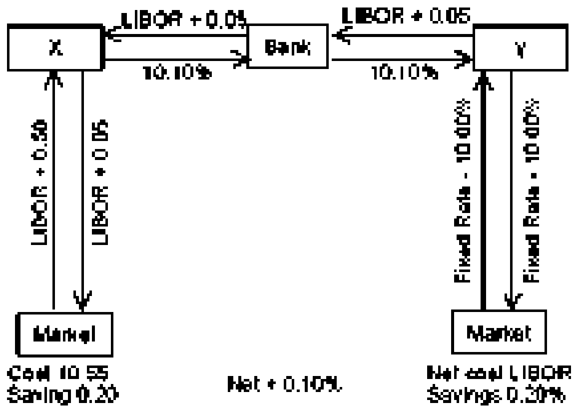
The above is an illustration of a swap involving only two parties. These two counterparts are end users of the swap. As indicated above, swap requires those two parties with equal and opposite needs which must come in contact. This requirement of Double coincidence of wants' which is more an exception than a rule, has created a role for intermediaries. An intermediary is often needed to bring together the counterparties in a swap agreement. In that case, part of the total benefit has to be shared with the swap intermediary. The total benefit from the above swap is 0.5%. If the intermediary charges a fee of say 0.1% and the net benefit of the swap is shared equally, each party will be able to lower its cost of funds by 0.2%. Banks, by virtue of their special position in the financial markets and knowledge of the diverse needs of clientele, are in a good position to fulfill this role. Initially, intermediaries arranged swaps for earning brokerage, fees, etc. But these days, due to high liquidity, intermediaries themselves are taking positions. Having taken a position, they subsequently enter into swap with another party as and when a client is available, so that they do not run the interest rate risk. This results in squaring of their positions. If they are unable to balance their swap books, they can hedge interest rate risk by using other derivatives like interest rate futures, forward rate agreements, etc.

The following illustration helps us to understand the structure of a swap when an intermediary is involved. We will use the data of the earlier illustration.

Illustration 1

Firm	Objective	Fixed Interest	Floating Interest Rate
X	Fixed Rate	10.75%	LIBOR + 0.50%
Y	Floating Rate	10.00%	LIBOR + 0.25%

Swap Arrangement with Intermediary



The net cost of funds to X, Y and the earnings to the bank can be seen by examining their cash flows (see the figure 2).

	Swap Market		Cash Market		
	Paid	Received	Borrowing Cost	Net Cost	Net Savings
Y	LIBOR + 0.05	10%	10%	LIBOR + 0.05	(LIBOR + 0.25%) Minus (LIBOR + 0.05) = 0.20
X	10.10%	LIBOR + 0.05	LIBOR + 0.50	10.55%	10.75% Minus 10.55% = 0.20
Bank					
Y	10.00%	LIBOR + 0.05	–	–	(10.10 + LIBOR + 0.05)
X	LIBOR + 0.05	10.10%	–	–	–(10.00 + LIBOR +0.05)

Firm X borrows at LIBOR + 0.50% and enters into an interest rate swap transaction, making a fixed rate payment of 10.10%, in exchange for floating rate receipt of LIBOR + 0.05. This effectively leaves X with a fixed rate borrowing at a rate of 10.55%, a saving of 0.20% p.a. Firm Y borrows at 10% fixed rate enters into an interest rate swap transaction, making a floating rate payment of LIBOR + 0.05, in exchange for fixed rate receipt of 10.10. The effect leaves Y with a floating rate borrowing at a rate of LIBOR + 0.05, a saving of 0.20% p.a.

The bank, in this transaction acting as an intermediary, for the position it has taken, earns a net 10bp for assuming the credit risk on both companies (the two interest rate swap transactions can be completely independent of each other). Once a swap is entered into, there arises a need to both the parties to pay and receive the interest payments during the life of the swap. An agreement is entitled by both the parties at specific terms of swap. We will now see the specifications of various dates that are related to a swap.

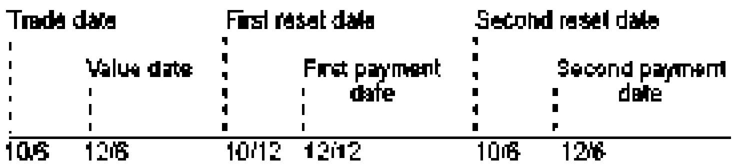
We shall extend our illustration to understand the relevance of dates in a swap contract. Let us consider the swap between X and the Bank. In terms of swap, the Bank pays LIBOR + 0.05 to X, and receives 10.10%. The payment of interest is made semi-annually and hence the applicable LIBOR for each interest period needs to be decided in six months. If we sequence the events, they can be as given below:

- Swap agreement is entered.
- Swap becomes effective from a given date.
- Application LIBOR for 1st payment is determined.
- Actual payment of interest is made or received.

Illustration 2

We will extend the example which we mentioned earlier i.e., between firm X and the Bank. Firm X and the Bank enter into a 2 year swap contract on 10th June 20x1. Firm X will pay a fixed rate of 10.10% (semi-annually) to Bank and inturn, it receives the flexible rate LIBOR + 0.05% (semi-annually).

Two Year Swap



The trade date is the date on which the parties agree to the swap, i.e., 10/6/20x1 in our example. Value date is when the initial fixed and floating payments begin to accrue, i.e., two days subsequent to the trade date. The date, two business days after the trade date is called spot date. In our example, if the value date is 12/6/20x1 then both spot and value date and effective date will be the same.

The floating rate level is first set on the trade date and then reset at specified intervals. In our example, trade date is 10/6/20x1 and its effective date (value date or spot date) is 12/6/20x1. The first payment is scheduled for 12/12/20x1, that is six months from the effective date and second payment is scheduled for 12/6/20x2. The six month LIBOR relevant for the second payment calculation will be generally two days before the settlement of the first payment, i.e., 10/12/20x1. This sequence will be generally followed in the remaining period of the swap contract once it is entered, unless otherwise mentioned in the contract.

Above, we have seen the date of applications involved in the swap and the way they reset their floating rate which is applicable for the swap. Now, the next point, to be addressed is, how both the parties calculate the amount to be passed from one party to the other. In the swap, the fixed and floating payments are generally netted against each other.

The amount that both parties have to be paid are calculated based on the day count conventions which are fairly standard. But there are many ways for settling the day count.

The following are the generally followed conventions:

Fixed	Floating
30/360	Actual/360
Actual/Actual	Actual/Actual
Actual/360	Actual/365
Actual/365	30/360

Actual/360: In this convention, the actual number of days are counted between previous fixed day payment date and forthcoming fixed day payment date, including previous fixed date and excluding forthcoming fixed day.

Example: If the previous fixed day payment date and forthcoming fixed day payment date are 04-09-20x1 and 04-03-20x2, then fixed day count fraction will be 181/360.

Actual/Actual: In this convention, the numerator will be calculated according to the method of actual/360, but the denominator changes depending on whether the forthcoming payment date is in a leap year. If the forthcoming year is a leap year then the days will be counted on a pro rata basis.

Example: If the previous fixed day payment date and forthcoming fixed day payment date are 04-09-20x1 and 04-03-20x2, then fixed day count fraction will be calculated as (119/365) + (63/366).

Actual/365: This convention is similar to that of actual/360, except that the denominator will be taken as 365.

30/360: In this convention each month will be taken as 30 days, including previous fixed date and excluding forthcoming fixed date.

Example: If the previous fixed day payment date and forthcoming fixed day payment date are 04-09-20x1 and 04-03-20x2, then fixed day count fraction will be (27 + 30 x 5 + 3) i.e. 180/360.

There are Certain Exceptions to this Rule: If the forthcoming fixed date is 1st of any month and the previous month does not have 30 days then actual days in that month will be taken for calculating fixed day count fraction.

Example: If the previous fixed day payment date and forthcoming fixed day payment date are 01-09-20x1 and 01-03-20x2, then fixed day count fraction will be (30 x 5 + 28) i.e. 178/360.

Example: If the previous fixed day payment date and forthcoming fixed day payment date are 01-08-20x1 and 01-02-20x2, then fixed day count fraction will be (30 x 5 + 31) i.e. 181/360.

Payment Day Convention: When the payment day falls on a banking holiday, then there are three methods for finding payment day:

i. Modified following business day.

ii. Following business day.

iii. Preceding business day.

Modified following business day: In this convention, when the payment day falls on weekend or on a holiday then the payment day will be the next business day. If the next business day falls in the coming month then the preceding day will be the payment day.

Following business day: In this convention, when the payment day falls on a weekend or on a holiday then the payment day will be the following business day, even if the next business day is falling in the coming month.

Preceding business day: In this convention, when the payment day falls on a weekend or on a holiday then the payment day will be the preceding business day.

In the previous illustration, we have seen how to determine the value date and reset date. Here, we will extend our example further to illustrate how both the parties exchange their cash flows based on the day count convention. Let us consider the swap between X and the Bank which is entered on 10 June 20x1 and for the notional principal of $100 million. In terms of swap, the Bank pays X, LIBOR + 0.05 (Actual/360 convention) and receives 10.10% (Actual/365 convention). The payment of interest is made semi-annually and the duration of swap contract is 2 years. Now we will calculate actual exchange of cash flows between X and the Bank, if the LIBOR for the contract is materialized as follows:

1st half period 10.05

2nd half period 10.50

3rd half period 10.30

4th half period 9.80

Trade date: 10/6/20x1

Value date: 12/6/20x1

1st payment date 12/12/20x1

2nd payment date 12/06/20x2

3rd payment date 12/12/20x2

4th payment date 12/06/20x3

Table 3: Cash Flows for the Bank

Date of Payment	Paid (million)	Received (million)	Net Position (million)
12/12/20x1	5.050	4.980	–0.070
12/06/20x2	5.275	4.980	–0.295
12/12/20x2	5.175	4.980	–0.195
12/12/20x3	4.925	4.980	+0.055

Note: Since the LIBOR rate is varying and the bank pays LIBOR + 0.5, the paid amount is $\frac{10.05 + 0.05}{2}$ = 5.050 (as the payment is for six months). Like wise, the calculation has been done for the other rates.

Table 4: Cash Flows for X

Date of Payment	Received (million)	Paid (million)	Net Position (million)
12/12/20x1	5.050	4.980	+0.070
12/06/20x2	5.275	4.980	+0.295
12/12/20x2	5.175	4.980	+0.195
12/12/20x3	4.925	4.980	–0.055

Note: Since the convention is actual/365 and it is for 6 months actual days are 180. The interest rate is 10.10% which is multiplied by the factor 180/365 resulting in 4.980.

LIBOR: London Inter Bank Offered Rate, which is a rate decided on daily basis based on a sample of lending rates offered by leading banks in London. The 6-months LIBOR is mostly used for swaps, implying that this is the rate payable for borrowing US dollars for six months in London.

Warehousing: In real life situations, it takes time to match the swap offer of one company with the requirements of the other. Many financial institutions profit from this situation by entering into a swap with the offering company and hedging the interest risk till a counterparty is found. This is known as warehousing.

One way of hedging the interest risk in warehousing is by financial futures. Through financial futures, the swap bank can lock the interest rates to avoid volatility losses as the price of the futures rise and they become profitable to the bank in case the interest rates fall.

Swap Quotations: A swap quote for US dollar interest rate swap fixed to LIBOR would be 2 years (T + 20 – 35). This quote can be interpreted as follows:

Two year bullet repayment loans are quoted by the bank in which the bid rate is 20 basis points over yields on the US Treasury Bills versus LIBOR and the ask rate is 35 basis points over yields on US Treasury Bills versus LIBOR.

Assume that a financial institution has issued a fixed rate bond with a coupon of 30 basis points over Treasury bill rate, which is currently 8.1%. The proceeds of this issue are used to fund a loan at floating rate linked to LIBOR. The floating rate charged will be LIBOR + 30 basis points. This is equivalent to a fixed rate liability and a floating rate asset. This is referred to as asset-liability mismatch.

The difficulty arises when interest rates change significantly. Assume that the interest rate falls and the interest received on the loan may be less than that to be paid on the bond, the spread gets reduced. Similarly, when the rates raise the interest received may be greater than that paid thereby enhancing the spread earned. This is one instance where an interest rate swap can be used for hedging the interest rate risk involved.

Assume that you are the risk manager of a financial institution. You have fixed rate deposits ($20 million) (8%) to be serviced and you have floating rate assets in the form of loans, the interest payments on which are linked to LIBOR. You are exposed to interest rate risk. The risk arises when the interest rates fall because your payments are fixed and your receipts would be declining. So, you wish to convert your fixed rate liability to a floating rate one by exchanging the floating rate payments for fixed rate payments. If you are able to find a counterpart with opposite requirements then you can directly enter into a swap agreement with that party. There is another alternative in which you can contact a swap dealer and ask him to arrange for a swap. The swap dealer if financially sound and ready to bear the default risk involved, would act as a counterparty and take the opposite position himself. Otherwise, he will arrange for a counterparty with matching requirements and he will act as an intermediary between you and the counterparty.

If swap dealer is the counterparty, to offset the risk rising from accepting floating rate payments, he may enter into another swap agreement with another party in which he does a floating to fixed swap in which he pays LIBOR and receives fixed at 8.5%. If this second swap period is less than that of the first one then his risk is hedged only for the shorter period. Thus, the swap dealer will be able to offset the substantial portion of his/her risk by transacting with both the parties simultaneously. But if the swap periods do not match and LIBOR also changes during the later period of the swap the swap, dealer is exposed to risk. The swap dealer's cash flows will be as follows:

Table 5

Period	To you	From you	To Third Party	From Third Party
1.	1,600,000	LIBOR	LIBOR	1,700,000
2.	1,600,000	LIBOR	LIBOR	1,700,000
3.	1,600,000	LIBOR	LIBOR	1,700,000
4.	1,600,000	LIBOR	0	1,700,000
5.	1,600,000	LIBOR	0	1,700,000

In the above case, we assume that the second swap is for 3 years only. The dealer's net cash flow will be $1,00,000 in the first three years and the cash flows in the next two years will depend on LIBOR. If LIBOR is less than 8% his loss will be the difference. If LIBOR is grater than 8% then the dealer makes a profit.

Other Types of Interest Rate Swaps

Basis Swap: A swap in which a stream of floating interest rates are exchanged for another stream of floating interest rates, is known as basis swap. Such type of swap is possible when,

- Both the floating interest rate streams are based on the same structure, but different instruments.

  Example: 'A' promises to pay 'B' and 'B' promises to pay 'A', 3 months LIBOR to 3 months Treasury Bill yield.

  Note: Aspects need to be checked while paying interest;

  – **Interest base:** Money market (actual/360 or 365) or

    Bond (30 days month and 360 days year)

  – **Periodicity:** Annually, Semi-annually, Quarterly.

- The two interest rate streams are calculated using same index, but with different tenor.

  Example: 'A' pays 3 months LIBOR and 'B' pays 6 months LIBOR.

- The two interest rate streams are calculated using same index and same tenor, but with one of the rates having margin. Example 'A' pays 3 months LIBOR + 1% and 'B' pays 3 months LIBOR.

Forward Swaps

Forward swaps are those swaps in which the commencement date is set as a future date. Thus, it helps in locking the swap rates and use them later as and when needed. Forward swaps are also known as deferred swaps (different from deferred rate swaps) as the start date of the swap is delayed (deferred). This is attractive to those users who do not need funds immediately but would like to benefit from the existing rates of interest.

Suppose your firm is contemplating to invest in a project 2 years hence, and the initial outlay required will be $20 million when the project is started. You are not sure of the movement of the interest rates in the next 2 years. The loan will be taken for a 5-year term. You would like to protect your firm against interest rate risk and want to enter into a fixed-floating rate swap then you can enter into a forward swap agreement with another firm now on which the payments will start 2 years hence.

Deferred Rate Swaps

It is different from a forward rate swap, in that it allows the fixed rate payer to enter into a swap at any time up to a specified future date. Thus, it works to the convenience of the fixed rate payer that the payment can be deferred until a time when the rates are lower so that he ends up paying less than what would have been paid, if paid at the rate on the commencement date. It is particularly attractive to those users of funds that need funds immediately but do not consider the current rates of interest very attractive and feel that the rates may fall in future.

Callable Swaps

A callable swap gives the holder, i.e., the fixed rate payer, the right to terminate the swap at any time before its maturity. Should the interest rates fall, the fixed rate payer exercises his right and terminates the swap since the funds will be available at a lower rate now. This right has a fee in terms of a higher fixed rate at the commencement of the agreement than what would be normally charged and calculated as a percentage of the swap's notional principal.

Putable Swaps

A putable swap gives the seller of the swap (the floating rate payer) to terminate the swap at any time before its maturity. If the interest rates rise, the floating rate payer will terminate the swap. The option premium in this case will be a higher floating rate charged at the beginning of the swap. Sometimes, a termination fee is also charged which is calculated as a percentage of the swap's notional principal.

Extendible Swaps

In an extendible swap, the fixed rate payer gets the right to extend the swap maturity date. If the interest rates rise and are expected to rise further then such an extendible swap works to the advantage of the fixed rate payer since he is required to pay less than the current rates. The premium charged for this right will be a higher fixed rate than the prevailing rates at the beginning of the agreement. In some cases, an extension fee is also charged. Assume that during the tenor of an interest rate swap, one party to the swap wishes to extend it by two more years and if the proposal is accepted by the counterparty then the swap becomes an extension swap.

Rate Capped Swaps

An interest rate swap which incorporates the cap feature is called a rate capped swap. If a floating rate payer anticipates a rise in interest rates then he can purchase a cap at a fee payable upfront to the fixed rate payer so that the floating rate payable cannot exceed the capped rate. This gives more protection to the floating rate payer. An upfront fee is payable by him to the fixed rate payer.

Another type of rate capped swap is the mini-max swap which has both a floor and a ceiling rate to the floating rate.

Zero Coupon Swaps

In a zero coupon swap the fixed rate payer makes a single fixed payment at the maturity of the swap from the proceeds of the bond repayment. It is a variation of the plain vanilla swap. The interest is calculated on a discount basis, while the floating rate payer makes periodic payments.

Assume that your firm has just issued a floating rate 3 year bond in the Eurodollar market and you would like to swap the floating rate liability for a fixed rate liability. But at the same time, you would like to conserve cash as much as possible for operational purposes and hence you prefer zero coupon funding. This can be achieved by making use of zero coupon swap whereby you receive floating rate payments which can be used to pay the liability on the bond and you pay a lump sum at the end of the swap contract, which is effectively a zero coupon liability.

Forward Swaps

A forward swap is any appropriate swap whose commencement date is sometime in future, i.e., set forward, in this way it is possible to lock into swap rates and use them at a latter date, when required. Forward swap rates and current swap rates are not necessarily be the same.

Amortizing Swaps

If the interest rates are fairly stable then the floating payments are also reduced over time. This swap is particularly useful if a swap is undertaken to manage the risk arising from mortgage loans. Since the principal on a mortgage loan is amortized over the life of the loan, an amortizing swap is particularly useful for managing the associated interest rate risk.

Amortized Swaps

These swaps are the ones where the notional principal amount on which interest is paid decreases according to a predetermined schedule mostly based on a sinking fund. With a plain vanilla, the amount remains the same. A plain vanilla swap is suitable where loan interest is payable periodically, but the principle being borrowed is repaid in one lump sum at the end of the period. It is a bullet repayment and the plain vanilla is sometimes called a bullet swap for this reason.

Main customers for this type of swap are:

- Customers of banks who wish to match repayment schedule on loans as precisely as possible.
- Customers of banks who wish to manage the interest rate risk involved in predicated funding requirement, or investment programs.

Accreting Swaps

Assume that there is an infrastructure project, the capital outlay of which is very high. Normally, loans on such projects will be given in installments and the interest payments are made on the increasing loan amounts. Typically, the loan is committed at the outset and the additional loans will be made available at a market rate (which will be changing every time). These floating rate payments can be converted into fixed rate payments through an accreting swap where the principal amount increases every time additional loan is availed. It is same as amortized swap, except that the notional principal amount increases according to predetermined schedule. Such a swap could be used by a bank which has agreed to lend increasing sums over time to its customers so that they may fund projects.

Roller-Coaster Swaps

In interest rate swap deal, interest rate risks can be shifted by converting a floating rate liability to a fixed rate liability, or vice versa. IRS can take different forms as they can be structured to meet each corporate’s specific requirements. Ideally, to minimize the interest rate risk over the life-span of loan, a corporate should move from a floating to a fixed rate term at the bottom of an interest rate cycle, and do the opposite at its crest. It is a combined feature of both amortized swap and accreting swap, i.e., the notional principal increases and decreases during the life of the transaction, going up and down according to a schedule agreed at the time of the deal.

OPTIONS ON SWAPS

Options on swaps or swaptions can be written on any kind of swap and give the holder the option to enter into swaps at a certain date in future on terms agreed at the time of purchase of the swaption. They ensure that the interest paid on a swap in future will not exceed a certain pre-decided level. Swaptions give a right but not obligation to the buyer to exercise his choice. Swaptions can be either American or European. European swaptions are more popular and can be exercised only on maturity, while the American ones can be exercised any time before maturity.

Swaptions can be either Call Swaptions or Put Swaptions.

Call Swaption

A call swaption gives its buyer the right to enter into a swap as a fixed rate payer. The writer of the call swaptions will be floating rate payer if the option is exercised.

Assume that your firm wishes to enter into a fixed-floating rate swap because you expect the rates to rise and hence you want to pay a fixed rate and receive a floating rate. But there is a speculation that the rates may start falling after a certain period and hence you may buy a call swaption so that depending on the rate movement in the future you can enter into a swap deal or allow your option to expire.

Put Swaption

Here the buyer gets the right to enter into a swap as a floating rate payer. The writer becomes the fixed rate payer when the option is exercised.

Other Types of Swaps

COMMODITY SWAPS

In a commodity swap, the counterparties make payments based on the price of a fixed amount of a certain commodity in which one party pays a fixed price for the good and the other party pays a market rate over the swap period. The first commodity swap took place in the Chase Manhattan Bank, in New York, in 1986.

In order to regularize the commodity swaps the Commodity Futures Trade Commission (CFTC) has come out with the following rules and regulations:

i. No commodity swap can be terminated by one of the parties, without the consent of the other party.

ii. Contracts to be entered into by the parties only for commodities dealt by them.

iii. Only institutions and companies can indulge in commodity swaps. Individuals are not allowed to do so.

iv. No mark-to-market process with variation margins allowed.

v. No collateral or margin loans permitted for commodity swaps.

Assume that you are a wheat farmer producing 400 tons of wheat every year. You are not sure about the price of wheat for the next five years due to unpredictable nature of government policies that fix the price every year. You can avoid the risk arising from fluctuating nature of prices by using a swap where you receive a fixed price and pay a floating rate to the counterparty. Thereby you are assured to receive a fixed amount every year for your commodity for the next five years.

EQUITY SWAPS

An equity swap means an exchange of dividends earned and capital gains on a portfolio, which is based on a stock index against periodic interest payments.

It is similar to an interest rate swap, in that it has a fixed period, a fixed rate payer and a floating rate payer.

Assume that you are managing a portfolio of stocks invested in an index fund. The underlying index is the S&P 500. You turn bearish following the recent movement in the stock prices and you wish to hedge your position against any adverse movement in the future. So, you can use a swap where you pay the return on S&P 500 and receive a fixed payment in exchange. Both fixed rate receipt and floating rate payments are based on the notional principal, i.e., your portfolio value. This is possible say, if you find another party which is interested in the S&P 500 investment and is ready to pay you the fixed interest returns on say, sterling pounds and sterling interest rates.

Underlying Motives for Swap Transactions

The basic questions, which nag everyone, are why someone should enter into a swap contract? Why companies want to change their cash flows from fixed to floating or floating to fixed? While there can be many reasons for undertaking a swap transaction, the following are some of the significant motives:

i. Quality spreads (lower financing costs).

ii. Currency risk management.

iii. Interest risk management.

In addition, swaps may be used to:

- Enter new markets.
- Larger scale of operations.

Quality Spreads (Lower Financing Costs)

One of the important reasons for entering into a swap transaction is to reduce the interest cost. The reduction in the interest cost can be achieved because of the quality spreads prevailing in the market. Quality spread is the difference between borrowing power of two parties in the market. For example, Firm X can borrow at a fixed rate of 10%, while Firm Y can borrow at a fixed rate of 12%. This difference between the interest rates of X and Y is called the quality spread. This difference in the interest rates arises because of the difference in the credit ratings of the two firms. In the above case, Firm X could have been rated better by the market in comparison to Firm Y. Firms X and Y face interest rates of LIBOR + 1 and LIBOR in the floating rate market. The following table summarizes the rates faced by both the firms.

Table 6

Firm	Fixed Rate	Floating Rate
X	10	LIBOR + 1
Y	12	LIBOR

As seen from the above, firm X has absolute advantage in the fixed rate market whereas firm Y has absolute advantage in the floating rate market. Considering that both have absolute advantage in different markets it can be beneficial if both of them borrow in the markets where they have advantage and swap the borrowings if the same is in line with their objectives of borrowing. In such a situation, the benefit that can be derived by the swap will be the sum of the quality spreads in both the markets. Thus, in this case the quality spread in the fixed rate market is 2% whereas the same in case of floating rate market is 1% and hence the benefit that can be derived from the swap will be 3%. We have already seen earlier in our illustration 1 that a swap can bring benefits to both the parties even when a single party has absolute advantage in both the markets. The essential difference to be noted is that the benefit that can be derived from the swap in that case is the difference between the quality spreads. While the mechanics are clear that it still needs to be understood why such quality spreads exist in the market.

Credit Rating: As stated earlier the firm with a higher credit rating attracts a lower rate of interest. However, when the firm faces a floating rate market the risk premium demanded will be low relative to the fixed rate market since the interest rate in case of floating rate market moves in line with the market. Hence, the spread in floating rate market and fixed rate market are likely to differ.

Market Saturation: Market saturation is one of the important reasons, which results in differential spreads to prevail. For example, IDBI and ICICI raised money through debt issues in the domestic market in the recent past. If this continues, the market is likely to reach a stage where the acceptability of the paper may be low not necessarily because the quality of the paper is low, but because the market has seen too much of the same paper. This can result in the market demanding a return higher than what would be otherwise considered as normal. In such a situation, they can raise the funds abroad and swap them for the domestic currency. By this mechanism, the firm can achieve the same objective of the borrowing funds in the domestic market.

Financial Norms: The financial leverage of a firm adds to the financial risk thereby influencing the risk premium demanded. However, what is considered as an acceptable level of leverage varies from market-to-market. It is often said that high leverage is an acceptable proposition in the Japanese markets though it might have undergone some change after the real estate bubble. In such a situation, a firm with a particular level of leverage may be able to get a better rate in overseas market when compared to the domestic market thus resulting in the prevalence of quality spreads.

Currency Risk Management

Managing the currency risk is vital for modern corporates as they have cash inflows and outflows in different currencies. A corporate can use different methods to manage its currency risk. One of the methods for corporates to manage the currency risk is by entering into currency swaps. Let us take an example: A firm whose exports are denominated in GBP has borrowed funds in dollars in view of the low interest rates in the Euro dollar market. However, since its cash inflows are in GBP, the firm is exposed to exchange risk. At this point, the firm can change its loan portfolio into GBP by entering into currency swap so that both receivables and payables will be in the same currency.

Interest Rate Risk

Swap will give an opportunity for the corporates to manage the interest rate risks by entering into interest rate swaps. If a corporate borrowed in floating rate and expects that interest rates will increase, then it can enter into an interest rate swap as a fixed rate payer. Due to this it will be able to manage the increase in interest rates more efficiently. Example: Firm X borrowed floating rate funds at LIBOR + 1%. After sometime if the firm feels that the interest rate may increase it may prefer borrowing in fixed rate. The firm can achieve this by undertaking either of the following activities:

i. Repay the existing loan and borrow at fixed rate.

ii. Enter into an interest rate swap.

The first choice will be more cumbersome because the firm has to go to the market again to borrow at fixed rate, which may not be cost effective. In the second choice, the firm has more flexibility in managing its existing interest rate risk. Also, there will not be any significant costs involved in entering into the swap.

Real Time Trading on the Swap Market

In all the above illustrations, we have structured the swap to suit the needs of the client and the basic assumption we have made is that all the swap transactions taken by the bank will be matched with another party. All the above illustrations are, of course, very simplistic, but in real time there can be many more complicated structures in swaps due to the following reasons:

- More than one bank may be involved.
- The swaps and the borrowing in cash market may take place at different times.
- A bank may run unmatched position, either by choice or because of its difficulty in finding a counterparty.
- Objectives may be more complicated.

Due to the above reasons and owing to the fast growth in interest rate derivative products, banks themselves started giving both bid and ask rates for the swap contracts. In the following table, we have given the market rates published by the Financial Times on November 4, 1998. Here bid side represents that the Bank is ready to pay fixed rate in return for floating rate and ask side represents that Bank is ready to take floating rate payment in return for fixed payment.

Table 7: Interest Rate Swaps

	D-Mark		Euro		£ Stlg		US $		Yen	
Nov. 03	Bid	Ask	Bid	Ask	Bid	Ask	Bid	Ask	Bid	Ask
1 year	3.49	3.52	3.59	3.64	6.42	6.45	4.85	4.88	0.38	0.41
2 year	3.49	3.52	3.54	3.58	5.99	6.03	4.78	4.81	0.47	0.50
3 year	3.61	3.64	3.64	3.68	5.94	5.98	4.90	4.93	0.58	0.61
4 year	3.76	3.79	3.79	3.83	5.93	5.97	5.01	5.04	0.68	0.71
5 year	3.92	3.95	3.94	3.98	5.91	5.95	5.13	5.16	0.78	0.81
6 year	4.07	4.10	4.09	4.13	5.90	5.94	5.21	5.24	0.88	0.91
7 year	4.21	4.24	4.23	4.27	5.90	5.94	5.30	5.33	0.98	1.01
8 year	4.33	4.36	4.34	4.38	5.89	5.93	5.37	5.40	1.09	1.12
9 year	4.44	4.47	4.45	4.49	5.88	5.92	5.44	4.57	1.20	1.23
10 year	4.53	4.56	4.54	4.58	5.87	5.91	5.51	5.54	1.31	1.34
12 year	4.69	4.72	4.69	4.73	5.85	5.90	5.66	5.69	1.51	1.55
15 year	4.88	4.91	4.88	4.92	5.83	5.89	5.79	5.82	1.71	1.75
20 year	5.09	5.12	5.09	5.13	5.79	5.86	5.90	5.93	1.90	1.95
25 year	5.22	5.25	5.22	5.26	5.78	5.86	5.92	5.95	1.95	2.00
30 year	5.29	5.32	5.29	5.33	5.76	5.85	5.97	6.00	2.05	2.10

Sample of Bid and ask rates as at the close of London business on the trading day. US dollar is quoted at annual money actual/360 basis against 3 months LIBOR, pound and Yen are quoted on a semi-annual actual/365 basis against 6 months LIBOR, D-mark and Euro quoted on annual bond 30/360 basis against 6 month LIBOR with the exception of the 1 year rate which is quoted against 3 months LIBOR.

Source: Intercapital Brokers Ltd.

Enter New Markets

Many companies can enter new markets, mainly in other countries, by resorting to swapping to reduce currency risks, as explained in currency risk management above.

Larger Scale of Operations

By swaps a firm may be able to reduce the risks and the volatility of the profits. Thus, for a given amount of capital, more business transactions may be made with the assurance of lower risks. For example, let us assume that XYZ Ltd. must hold £1 of capital to earn £0.1 (10 pence) of profit and the volatility of its profits is £0.01 (1 penny). Without swapping, the company will only try to do £10 worth of trades for every £1 of capital, fearing that the volatility may affect its profits otherwise.

Now, say that by swapping, its risk volatility reduces to 5% of the current £0.01. It means that XYZ ltd. can increase its trades to £10 x 20 times = £200 of trade for every £1 of capital held.

CURRENCY SWAPS

A currency swap is a contract involving exchange of interest payments on a loan in one currency for fixed or floating interest payments on equivalent loan in a different currency. Currency swaps may or may not involve initial exchange of principal. A plain vanilla currency swap is a fixed-fixed currency swap in which each party pays a fixed payment on the loan taken by them.

Along with interest rate swaps, the currency swaps market rose from the earlier parallel and back-to-back loan structures which were developed and designed in the United Kingdom as a means of circumventing foreign exchange controls and to prevent an outflow of British capital. In the 1970s, the British government imposed taxes on foreign exchange transactions that involved its currency. Due to this, the parallel loan became a widely accepted transaction by which these taxes could be avoided. The back-to-back loan is similar to the parallel loan with small modifications. In 1979, these taxes on foreign exchange transactions were removed and due to this British firms need not have to take back-to-back loans. However, during the 1980s, banks modified those loans and launched currency swaps. They achieved similar economic purposes like those of parallel and back-to-back loans. Currency swaps effectively decreased the use of these loans due to the following advantages:

i. In currency swaps, if one party defaults the other party can terminate the contract and still claim for the damages.

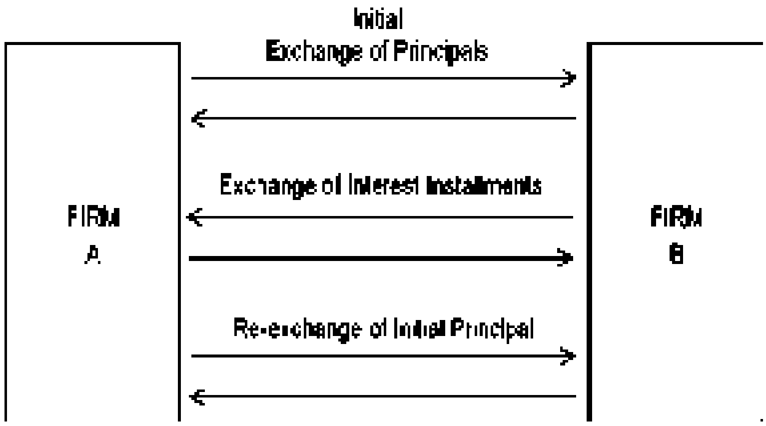
ii. As the currency swap is not a loan, it does not appear as a liability on the contracted party balance sheet unlike parallel loans.

iii. Currency swaps have high liquidity. Due to this banks themselves are ready to take risk in swap transaction.

In the back-to-back and parallel loans (which are still in practice) the documentation is cumbersome and counterparties have to find others with mirror currency requirement. Changes in interest rates and foreign exchange rates during the life of the structures also cause difficulties. Currency swaps do not involve foreign currency loans like their predecessors. Instead, in a typical currency swap, one party agrees to make periodic payments, based on either fixed or floating interest rates, to a counterparty who in turn makes periodic payments to the other in a different currency. The payments are based on principal amounts which are fixed at the initiation of the swap. Unlike interest swaps, where no exchange of principal takes place, in a currency swap the principal amount is generally exchanged at the beginning of the transaction and re-exchanged upon maturity.

The following flow chart shows the mechanics of currency swaps:

Figure 2: Currency Swaps



Basic Steps in Currency Swaps

Currency swaps involve three steps, although the first may be notional.

The steps are:

Step 1 : Initial exchange of principal

Step 2 : Exchange of interest rate

Step 3 : Re-exchange the principal at the end of the contract.

The principal amount is agreed at the outset. The principal amount is agreed in one currency along with the exchange rate which will be used to determine the equivalent amount in the other currency. The principal amounts may be physically exchanged on the commencement date of the swap or may be notionally exchanged as with an interest rate swap. The exchange rate will usually be the spot, but an off-market rate may also be used, which will, in turn, alter the subsequent interest rate flows.

A notional swap of principal has the same outcome as a physical exchange. Funds raised in the spot market instead of being exchanged as part of the swap arrangements are simply exchanged into the desired currency in the foreign exchange market.

Interest rate obligations have been swapped, resulting in interest payments and receipts on agreed dates based upon the swapped principal amounts. Interest will be either fixed or floating as appropriate to the type of swap and each counterparty's obligations. Naturally the two interest rate flows will be in different currencies. At maturity the principal will be re-exchanged.

Assume that you are the treasurer of a German firm and you are in need of dollar funds but you are not in a position to borrow dollars now. There is a US firm X which needs Euro now but it cannot borrow Euro due to some financial constraints. You can exchange the funds in the currency you have for the desired currency with firm X. That is nothing but a currency swap. The motivation behind this currency swap is the actual need for funds denominated in a different currency. In a typical currency swap there are three steps involved. They are:

i. Exchange of principal amount.

ii. Periodic interest payments to each other on the principal amount borrowed.

iii. Re-exchange of the principal amount borrowed.

A currency swap need not involve an initial exchange of principal if the parties involved are concerned about only periodic requirements of different currencies. In such a situation the principal involved will be notional and only periodic interest payments will be exchanged between the two parties concerned. Similar to interest rate swaps, in cross currency interest rate swaps, the interest payments are netted. These payments are determined by the prevailing exchange rates on the payment date.

Illustration 3

Assume that there are two firms A and B who are in need of dollar funds and sterling funds respectively. A wants $100 million and B wants 65 million sterling. The exchange rate is 0.65 £/$. They have access to the foreign currency market at the following interest rates.

Firms	Dollars	Sterling
Firm A	10.5%	11.8%
Firm B	8.5%	11%

The above table shows that the firm B has an absolute advantage in both dollar and sterling markets. But A has a comparative advantage in sterling market in relation to the dollar, as it has to pay only 0.8% more in the sterling market as compared to

2.0% more in the dollar market. Assume that A wants dollar funds and B wants sterling funds, a currency swap can be arranged between them using the comparative advantage principle. So that A and B can reduce their effective cost of borrowing to the extent of the available spread in different currency markets.

The spread can be calculated as follows:

The spread in the dollar market is 2% and that in the sterling market is 0.8%. The effective swap spread is (2 – 0.8) = 1.2%. This is called quality spread differential. The two parties can share this spread to their advantage in reducing their effective cost of borrowing in a number of ways depending on the creditworthiness of each of them. If the spread is equally shared between them, the effective cost of borrowing of each of them is reduced by 0.6% in the respective markets in which they wish to borrow. Since A wants $ funds and its cost is 10.5% by going in for a swap agreement with B, the cost can be reduced to 9.9%. Similarly, B's cost of borrowing pounds can be reduced to 10.4%. The steps involved in the swap will be as follows:

i. B borrows dollar funds at 8.5% and lends it to A at 9.9% (10.5 – 0.6).

ii. A borrows sterling at 11.8% and lends it to B at 11.8%.

B is gaining 1.4% on dollar payments from A which can be used to pay the sterling borrowing to A and hence the effective cost of B works out to be 10.4%.

The above example assumed that there was no intermediary, i.e., a swap dealer. But in practice, a swap dealer arranges the swap agreement between the two potential parties. Assume that there was a swap dealer who arrange the swap. The dealer charges a fee as commission for the arrangement initiated by him. The spread differential worked out earlier will be shared between the two parties and the dealer. Let us assume that the spread 1.2% is equally shared among them. Then the swap will be as follows:

The firm A borrows sterling at 11.8% and B borrows dollars at 8.5%. They exchange their borrowings to get the benefit of the desired loan at a lower rate than the market rate at which it is available. Let us assume that the spread is shared as follows. A spread of 0.5% for each of A and B and 0.2% for the intermediary. The financial intermediary, i.e., the swap dealer gains 1.5% on dollar loans and loses 1.3% on sterling loans and hence the net gain is 0.2%. The firm A is able to get dollars at 10% (0.5% lower) and B gets sterling funds at 10.5% (0.5% lower). Thus, the currency swap has helped them to achieve lower funding rates in the desired markets.

In the above case, you may argue that the swap dealer is exposed to exchange risk due to the offset of gain in one currency with the loss in another currency. This risk can be avoided if the dealer can hedge with forwards or futures each year during the life of the swap.

The exchange risk can be shifted to A or B also. There is no unique way of arranging a swap. If the swap dealer feels that firm B is more creditworthy than firm A then he can arrange the swap in such a way it turns out to be more favorable to B than A. The spread need not be shared equally always. The dealer can charge more from the party he considers to be more risky.

Fixed to Fixed Currency Swap (Non-amortizing)

The counterparties to a fixed to fixed currency swap may wish to enter the swap because of comparative advantage, the same kind of motivation as with interest rate swaps. The comparative advantage may be in either direction.

Illustration 4

IBM is an American company and in this instance it is able to access its own domestic bond market at low fixed rates because it is a familiar name. It issued a $150 million debenture for 4 years to the public at 10% per annum. It wanted to convert its dollar liabilities to sterling liabilities. It approached Citibank for arranging a swap. British firm BAT issued a £100 million bond for 4 years at 14% per annum and it likes to change its liabilities into dollars (see table below). It has approached the Citibank for converting pounds liabilities to dollar liabilities. Citibank arranged a swap to both parties. At the time of arranging the swap spot rate for dollar/pound is 1.50.

The following table gives how IBM and BAT can access the funds in the market.

5 Year Loan

	US $	UK £	Objective
IBM-USA	10%	13%	£
BAT-UK	12%	14%	$

IBM has a better credit rating than BAT as can be seen from the above rates. IBM has absolute advantage in overall and a comparative advantage in US dollars as cost of funds is 2% lower than that of cost of funds to BAT. BAT has a comparative advantage in sterling, as BAT is only 1% higher as against 2% in the dollar market.

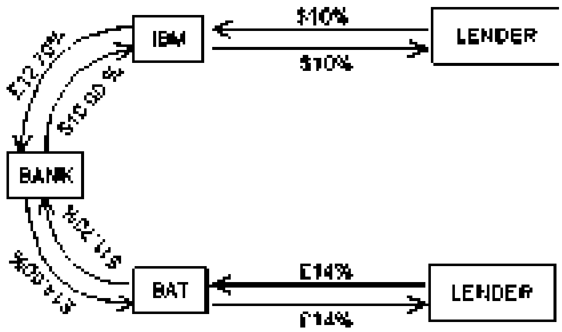
IBM wishes to borrow pounds and BAT wishes to borrow US dollars. Each actually borrows in the market where they enjoy a comparative advantage, i.e., IBM borrows US dollars, BAT borrows pounds. Each swaps with other so that IBM effectively borrows sterling and BAT effectively borrows US dollars. The quality spreads in US dollar market and pound market are 2% and 1% respectively; so the maximum gain that can be shared among the parties to the swap, including the dealer, will be 1% (i.e. 2% – 1%). Let us assume that the benefit is shared among the three in such a way that IBM gains 30bp, BAT gains 30bp and the Bank earns 40bp.

Under the Swap Arrangement

IBM – Borrows funds in US dollar market and lends to BAT

BAT – Borrows funds in pounds market and lends to IBM.

Swap Arrangement with Bank as Dealer



The flow diagram of this transaction, when a bank acts as a dealer is shown above.

The net cost of funds to IBM, BAT and the earnings to the Bank can be seen by examining their cash flows.

	Swap Market		Cash Market		
	Paid	Received	Borrowing Cost	Net Cost	Net Savings
IBM	£12.70%	$10.00%	$10.00	£12.70%	(£13.00%) Minus (£12.70%) = £0.30%
BAT	$ 11.70%	£14.00%	£14.00%	$11.70%	($12.00%) Minus ($11.70% = $0.30%)
Bank					
IBM	$10.00%	£12.70%	–	–	(1.70)% in $ minus
BAT	£14.00%	$11.70%	–	–	(1.30)% in £

As seen from the above, it is assumed that the bank lent and borrowed at different rates which in the end resembled a saving to later, IBM and BAT, while passing a spread to the bank. Theoretically, there can be any number of combinations of swap rates while keeping the benefit constant. However, all the swaps are priced in terms of going market rates.

Now, let us see the cash flows for IBM, BAT and the Bank. Exchange of principals

Dollar = $150
Sterling = £100
Spot rate = 1.50

Cash Flows for IBM

Exchange Period	Paid to Bank	Received from Bank
START	$150.0	£100.0
1st	£12.7	$10.0
2nd	£12.7	$10.0
3rd	£12.7	$10.0
4th	£12.7	$10.0
END	£100.0	$150.0

Cash Flows for BAT

Exchange Period	Paid to Bank	Received from Bank
START	£100.0	$150.0
1st	$11.7	£14.0
2nd	$11.7	£14.0
3rd	$11.7	£14.0
4th	$11.7	£14.0
END	$150.0	£100.0

Cash Flows for Bank

Exchange Period	IBM Paid	IBM Received	BAT Paid	BAT Received	Net $	Position in £
START	£100	$150	$150	£100	—	—
1st	$10.0	£12.7	£14.0	$11.7	+1.7	–1.3
2nd	$10.0	£12.7	£14.0	$11.7	+1.7	–1.3
3rd	$10.0	£12.7	£14.0	$11.7	+1.7	–1.3
4th	$10.0	£12.7	£14.0	$11.7	+1.7	–1.3
END	$150	£100	£100	$150	—	—

In the above table if you look closely at the net cash flows of the bank, the bank gets inflows in dollar and outflows in pound; so the gain for it depends on the exchange rate of dollar/pound.

Cash Flows for Bank

IBM	0% $ 12.70% £	BANK	11.70% $ 14.00% £	BAT
BANK		Receives		1.7% $
BANK		Pays		1.3% £

At the beginning of the transaction spot rate of dollar/pound is equal to 1.5.

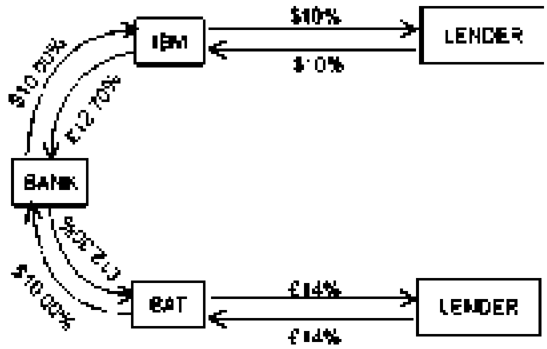
Notional amount = £100m
= $150m

Every 12 months bank receives = 150 x 0.017 = $2.55 m
Every 12 months bank pays = 100 x 0.013 = £1.30 m

The bank will realize this profit only if the exchange rate remains constant or the exchange rate does not move against it. As we already mentioned above that swap can be structured in a number of ways. So, if the bank wants to get constant gain in the swap transaction it can pass on the exchange risk to the other party.

Now we see how the bank can transfer its exchange risk upon BAT.

Swap Arrangement with Bank as Dealer



Swap Market			Cash Market		
	Paid	Received	Borrowing Cost	Net Cost	Net Savings
IBM	£12.70%	$10.00%	$10.00%,	£12.70%	(£13.00%) Minus (£12.70%) £0.30%
BAT	$10.00%	£12.30%	£14.00%	($10.00%) (–£1.70%)	($12.00 – $10.00) Minus ($14.00 – $12.30)
Bank					
IBM	$10.00%	£12.70%	–	–	£0.40%
BAT	£12.30%	$10.00%	–	–	–

As we have shown in the figure the bank can pass its exchange risk on to BAT. But in real life situations, the bank may not be in a position to pass on the risk to the other party because all the transactions are based on the ongoing market rates. In that situation, the bank has to manage its exchange risk by using other derivative products.

Other Types of Currency Swaps

Fixed to Floating Currency Swaps (Non-amortizing)

As in a currency swap, the parties exchange principal at the outset of the swap but one party pays a fixed rate of interest on the foreign currency it receives and the other party pays a floating rate of interest rate on the foreign currency it receives. It is a plain vanilla currency swap. At the swap's maturity, there is a re-exchange of principal amounts. Interest payments are periodically exchanged during the life of the transaction.

Fixed to Fixed Currency Swaps (Non-amortizing)

It is identical to the fixed for floating currency swap except that instead of a fixed and a floating rate of interest, both parties pay fixed rate of interest. This can be done by having a single agreement or two agreements for swapping.

Circus Swaps

Here two fixed-floating currency swaps are combined to form a fixed to fixed currency swap which is also called a circus swap. It can be created by combining a currency swap and an interest rate swap too, with floating rate or both having LIBOR based pricing.

PRICING OF SWAPS

Basics

Since swap is an exchange of two streams of cash flows it can be priced by determining the value of each stream of cash flows. The value of each stream of cash flows is the net present value of the cash flows in the stream. If the cash flows are in different currencies (as in currency swaps) the present values are converted to a single currency at the prevailing exchange rate. The price of the swap is the difference between the values of the two cash flows.

Valuation of Swap

Until now we have seen how the parties in a swap benefit from the swap contract. In this section we will describe how to value the swap. At the time of entering into the swap both the parties will have the same value for all inflows and outflows, but after entering into the swap the value may change due to changes in the interest rates. If the interest rates increase, the value of the fixed rate payer will decrease and if the interest rate decreases the value of fixed rate payer will increase. Depending on the value increase, if a party in the swap wants to realize the gain, it can reverse the existing swap with a new market swap.

Swaps can be valued on similar lines as bonds as they essentially involve a series of cash flows at different points of time. We first have to discount the inflows at an appropriate rate and determine the present value. We repeat this process in the same way for outflows also. This difference between the value of inflows and outflows is nothing but the value of the swap. Generally, the prevailing LIBOR rate is used for discounting the cash flows of floating rate and market quoted swap rate is used for discounting those cash flows associated with fixed rate.

Illustration 5

Hong Kong Bank has a fixed to floating rate swap on its books. As per the terms of the swap, the bank receives 12% fixed dollar semi-annually and pays 6 month dollar LIBOR. The swap entered in 15 months ago and had a maturity of 6 years. The notional principal was $100 million. The last payment and reset date was three months ago. The LIBOR for the current period is 12%. The current 3 month dollar LIBOR is 10% and the market for 4.5 years swap is quoting at 12.25% semi-annual versus LIBOR flat. Now we will see how to value the above swap.

Valuation of Floating Rate

Present value of floating rate: $= \dfrac{100 \text{ x } (1+0.12/2)}{(1+0.10/4)} = \$103.41\text{m}$

This is nothing but the present value of principal and interest to be paid three months from now, arrived at by discounting the same at current 3m LIBOR.

Table 8: Valuation of Fixed Rate

Time in Months	Cash Flows (in million $)
3	6
9	6
15	6
21	6
27	6
33	6
39	6
45	6
51	6
57	106

Present value of this cash flow is discounting at 12.25%

$= [6 + 6\ PVIFA_{(9,6\%)} + 100\ PVIF_{(9,6\%,)}] \times 1/(1 + 0.1225/4)$

$= 98.01$

Value of the swap $= 103.41 - 98.01$

$= \$5.40$ million.

Major Bottlenecks in Pricing a Swap

i. Arriving at an appropriate discount factor to discount the cash flows.

ii. Unlike bonds, swaps have 2 way cash flows. But we can overcome this problem by calculating the value along with the signs attached to the cash flows or by splitting the incoming and outgoing cash flows and valuing them separately.

iii. Cash flows on the floating side are unknown except for the first payment which is set at the outset. By substituting forward rates for future floating rates or by the discount factors computed from the prices of Eurodollar futures, one can overcome this problem.

SWAP VALUATION

There are two ways of valuing a swap:

i. Considering the swap as a package of long-term forward contracts.

ii. Considering the swap as a portfolio of two bonds.

Valuation of Interest Rate Swaps

In the case of the plain vanilla interest rate swap, the fixed leg should be considered as a fixed coupon bond while the floating rate should be considered as a floating rate note.

Assuming thus that at maturity the fixed and floating parties give each other equal amount of money, the pricing of the swap becomes simply the value of the fixed coupon bond minus the value of the floating rate note.

$$V = F_B - F_F$$

Where,

V = Value of the swap

F_B = Value of fixed coupon bond

F_F = Value of floating rate note.

As market rates change after the initial pricing of the swap the values of both the fixed leg and the floating leg will be different. One should be aware that the cash flows on the fixed leg do not change but the discount factor changes and hence the value. On the floating side, both the cash flows and the discounting factor change and hence the value change. Such a swap in which the present values of the fixed leg and the floating leg are not equal is called an off-market swap. This implies that the value of an off-market swap can be positive or negative and not zero.

Valuation of Currency Swaps

In the case of currency swaps, the valuation can be done considering the swap as a portfolio of two bonds. So, the swap value will be the difference between the current values of both the bonds, as per the following formula:

$$V = P_F - P_L$$

Where,

V = Value of the swap

P_F = Value of foreign currency bond

P_L = Value of local currency bond.

Suppose a French firm is in need of $40 million to finance a foreign investment. The French franc yields were higher than the US dollar yields. The French firm would have to pay 9% on a 5 year US dollar loan and 10% on a 5 year French Franc loan. Similarly, a US firm needs a loan of 291.2 million French francs for its French subsidiary but has an easier access to the US bond market. The US firm has to pay 8% on a 5 year US dollar loan and 11% on a 5 year French franc loan. Current spot rate is 7.68 Fr/$. The US firm can borrow in $ at 8% and French firm in French franc at 10%. Then they swap their borrowings to meet their requirements. The same can be shown in the following table:

Table 9

	Need	Borrowing Rates Available		Borrowing Takes place
US firm	FFr 291.2m	$8%	11% FFr	$8%
French firm	USA 40 m	$9%	10% FFr	FFr10%

Let $P_\$$ and P_F represent the values of the dollar and French franc bonds given the market interest rates r$ and rF on bonds in the two currencies. Then the French franc value of the swap for a spot exchange rate S is,

$$\text{Swap value} = P_F - SP_\$$$

This is the value of the swap to pay dollar and receive French franc. The dollar value of the swap can be deduced from the French franc value of the swap by dividing it by spot exchange rate S. The value of the swap for the other party, which has agreed to pay Francs and to receive dollar, is exactly the opposite of that computed above.

At the time of issue, the two interest rates were assumed to be equal to the market yield to maturity on five year risk-free bonds in dollars (8%) and French francs (10%). Assume that after a year the yield curves in dollar and French francs are flat and the interest rates have dropped to 7% and 8% on US dollar and French franc respectively. The exchange rate drops to 7.56 Fr/$. A swap payment of Fr 4.928 million has just been made.

The dollar bond was worth $40 million (its par value) when the swap was constructed with a dollar interest rate of 8%. The value of the bond after one year when the interest rate falls to 7% is,

$$P_\$ = 3.2\ PVIFA_{(7,4)} + 40\ PVIF_{(7,4)}$$

$$= 41.355 \text{ million}$$

Similarly, the French franc bond was worth Fr 291.2 million (par value) when the swap was contracted. After one year, the bond value is –

$$P_F = 29.12\ PVIFA_{(8,4)} + 291.2\ PVIF_{(8,4)}$$

$$= 310.49 \text{ million.}$$

The franc value of the swap is,

$$\text{Swap value} = 310.49 - 41.355 \times 7.56$$

$$= -2.1538$$

The dollar value of the swap will be,

$$\text{Swap value} = -2.1538/7.56 = -0.2849 \text{ million.}$$

The practical difficulty encountered in this problem is the determination of interest rates used on both legs of the swap. For each cash flow on the fixed rate leg, we should use a zero coupon term structure.

Pricing of Swaps by Swap Banks

Swap banks price each swap based on the following six factors:

i. How the swap has been designed?

ii. How long the swap will take till maturity?

iii. How many parties are there who match the swap?

iv. How creditworthy are the counterparties to the swap?

v. How could the swap be affected by regulatory implications of the countries to which both counterparties belong?

vi. How tight is the credit policy in the countries from there the swap counterparties hail?

Swap Risks

While the earnings of the swap bank are from the bid-ask spread of swaps and the fees charged (upfront fees), it has to entail the following risks, which are inherent to the swap business and are mostly inter-related:

i. **Interest Rate Risks:** Interest rate risks arise mostly on fixed rate legs of swaps. While the floating rate interest can be periodically adjusted to the prevailing interest rates, the fixed rate remains constant, a change in the level of interest rates in the market not accompanied by a change in the yield of debt instruments of the same time period as the interest rates, will entail interest rate losses to the bank. Unless the swap bank is fully hedged, losses will be incurred.

ii. **Currency Exchange Risks:** Currency exchange risks happen when there is an exchange rate commitment given to one party and there is a steep change in the exchange rate between the currencies in the swap. If the swap bank is not able to match the counterparty well in time, it will incur losses due to the exchange rate difference.

iii. **Market Risks:** Market risks occur when there is difficulty in finding a counterparty to a swap. Usually, longer maturity swaps have less takers and vice versa. Lower the number of takers, higher the risks of losses.

iv. **Credit Risks:** Credit risks are those risks which the swap bank has to bear in case the counterparty to a swap defaults on payment due to bankruptcy or any other defaults, legal or otherwise. The bank continues to be obliged to pay the other party of the swap, irrespective of the fact whether the former party defaulted or not. Market risks and credit risks together amount to default risks of the bank.

v. **Mismatch Risks:** Mismatch risks take place when the swap bank comes across mismatches in the requirements of both counterparties to the swap. Usually, banks have a pool of swaps and have no difficulty in finding matches, but if no party is found, the risk of mismatch losses is there. This risk is further aggravated in case one of the parties is at default.

vi. **Basis Risks:** Basis risks take place mostly in floating-to-floating rate swaps, when both the sides are pegged to two different indices and both the indices are fluctuating and there is no proper correlation between both.

vii. **Spread Risks:** Spread risks happen when the spread changes over the time period and the parties are matched. The spread risk is not the same as interest rate risk, as spreads may change as a result of change in basis points, while the interest rate may still remain constant.

viii. **Settlement Risks:** Settlement risks take place when the payments of currency swaps are made at different times of the day mainly because of different settlement hours in capital markets of two countries involved in the currency swap. If a limit on the size of the settlement is placed for each day, this risk is minimized.

ix. **Sovereign Risks:** Sovereign risks are those risks that can take place if a country changes its rules regarding currency deals. It mostly happens in the underdeveloped or developing countries which tend to have more political instability than the developed world.

Managing Swap Risks

If a swap bank could exactly match all its portfolio of swaps, it would be an optimal situation, riskless and profitable, without the bank having to bother much about managing risks and maintaining a team of risk management experts in its payroll.

But given the fact that in real life situations, optimization is not always the case, a bank has to minimize its risks as it cannot totally eliminate them.

To some extent, several risks are off-setting through natural hedging while the others must be measured and managed.

Some risks can be hedged through options, futures and other risk management tools.

Unsystematic risks (like credit risks) can be reduced by diversification and systematic risks (like sovereign risks) can be minimized by restricting or limiting one's entry to new and unstable countries.

SUMMARY

- Financial swaps means the agreed exchange of future cash flows with or without the exchange of cash flows at present. In other words, a financial swap is an agreement between two parties to exchange interest payments for specific maturity on an agreed upon notional amount.
- Broadly, financial swaps are classified as interest rate swaps and currency swaps.
- Swaptions are options on swaps that give the holder the right to enter into a swap at a future date. Swaptions can be either American or European and also either call swaptions or put swaptions.
- The underlying motives for swaps are lower financing costs, reduced currency or interest risk management, facility to enter new markets and larger scale of operations.
- The main swap risks are interest rate risks, currency exchange risks, market risks, credit risks, mismatch risks, basis risks, spread risks, settlement risks and sovereign risks.

Chapter XIII

Credit Derivatives

After reading this chapter, you will be conversant with:

- Types of Credit Derivatives
- Synthetic Collateralized Debt Obligations
- Pricing of Credit Derivatives

Introduction

Credit derivatives are the financial instruments designed to transfer the credit risk of one counterpart to another. Credit risk arises mainly due to the default of the debtor or due to the deterioration of the credit quality of the debtor. During the incidence of such risk the creditor could only receive the amount that can be recovered from the debtor. Therefore it became essential for investors' to assess and mitigate credit risk through efficient hedging strategies. Credit derivatives are the outcome of such efforts intended to dilute the effects of credit risk.

GENESIS

The need and demand for Credit derivatives emerged in the wake of various corporate and sovereign credit crises. The most popular incidents in this category include:

The Latin American Debt Crises in the early 1980s – During the year 1982, succumbing to the effects of high inflation, Mexico stopped the coupon payments to creditors. By the year 1989, the situation became grave by spreading to other Latin American countries. To cope up with the worsening debt situation the Unites States Treasury Department brought into force a plan, better known as the 'Brady Plan,' which is aimed at providing solution to creditor banks through credit enhancements and providing debt relief to debtors in exchange of some economic reform process to be undertaken by them. According to the Brady Plan debtors issued bonds, which are collateralized with US Treasury zero-coupon bonds, to their creditors. These bonds acted as an efficient default insurance measure to the creditors.

The Junk Bond Crisis in the 1980s – During the early 1980s many of the Savings & Loan institutions made their investments in high yield bonds issued by Drexel Burnham Lambert bank. The bubble burst after the failure of the trading strategies of this bank that resulted in huge losses to the investor institutions.

The Savings & Loan Crisis in the 1980s – The soaring interest rates of 1980s persuaded many S & L companies to offer long-term loans, which they financed through short-term depository funds. The problems generated due to the differences between long-term mortgage rates and short-term depository funds and due to the highly speculative nature of the investments made by S & L associations. As the problems compounded, losses accumulated and many of the S & L associations became bankrupt.

The Asian Financial Crisis of 1997-1998 – During the 1990s, the falling interest rates in the Asian region made the cost of capital cheaper and this created an overwhelming interest in the investors to divert their financial flows to Asia. But most of these financial flows had short maturity periods. When it became evident that the growth scenarios are not going as per expectations many of the financers refused to renew their loans and the borrowers could not pay their debt. This led to a financial crisis in Asia. The crisis reached its pinnacle when the Thai government introduced the free market flow system for its currency releasing it from the US dollar peg. This lead to the devaluation of many of the Asian currencies and further worsened their debt situation.

The Russian debt Crisis 1998 – Due to an inefficient tax collection and administration system, Russian government encountered a steep decline in its revenues after its transition from the totalitarianism to democracy. In order to overcome this situation the government issued ruble-denominated bonds at attractive interest rates. When the government realized that it could not repay these obligations, it tried to compensate by the issuance of more bonds. This entire process has driven the debt status of the state into a grave situation. To encounter this scenario, the government devalued its currency by increasing the currency fluctuation band. This led to a higher inflation in the economy. The sharp fall in oil prices in the year 1998 added to this issue and further worsened the situation leading the nation to a state of insolvency.

The Crisis of Argentina 2001 – The genesis of the Argentinean crisis can be found in the peg of the country's currency with the US dollar. The appreciation of US dollar in the 1990s had an adverse impact on the nation's economic situation. To overcome this scenario a new currency called Argentino was introduced free from dollar peg. Moreover, Argentina had increased the interest rates on its 3-month treasury bills to sustain capital inflows. But the prevailing deflation increased the burden of the government and led to the reduction in country's capital reserves. Thus, the government has officially declared a moratorium on its debt repayments.

The Enron Case – In the year 2001, one of the America's biggest corporate giant Enron filed its bankruptcy. The reasons for the failure of Enron were considered to be over expansion, mismanagement and employees' greed for personal enrichment. To hide the financial performance of Enron, accountants and audit consultants tried to manipulate the records, which led to the monetary loss for thousands of shareholders and employees of the company.

Credit Derivatives market emerged as a consequence of various financial debacles, some of which are mentioned above. In the aftermath of these incidents it became obvious for the creditors to protect their interests and money from the claws of credit risk. This notion was supported by research and developments in the area of financial engineering. Before the advent of credit derivatives various financial instruments like Letters of credit, Brandy bonds etc., were used as risk hedging mechanisms. In the light of several bankruptcies the volumes of trading in credit derivatives increased. The first credit related instruments traded on exchanges are QBI Futures and QBI Options. QBI refers to the Quarterly Bankruptcy Index. These instruments are based on the number of personal bankruptcy filings per quarter. The QBI Futures value is directly proportional to the bankruptcy filings and in case of any ambiguity investors opted for QBI Options contract.

In the year 1999, two internet-based electronic platforms emerged for facilitating the trading and information sharing in credit derivatives segment. In April 2003, JP Morgan and Morgan Stanley launched the Trac-x, a group of credit derivative indexes based on the prices of default swaps. The main objective of this index is to serve the purposes of financial institutions and other investors who either want to hedge against credit risk or assume credit risk to reap investment gains.

There has been a substantial increase in the use of credit derivatives over the last few years. Banks still remain the largest users. This is so due to their substantial use of CDS as hedging tools for their loan books and their active participation in synthetic securitizations. Insurance companies have also become an important player in the segment.

The growth in the application of these instruments of credit derivatives by hedge funds has had a predominant effect on the credit derivatives market itself. Hedge funds have been regular users of CDS especially around the convertible arbitrage strategy. They have also been involved in many of the 'fallen angel' credits where they have been significant buyers of protection. Given their ability to leverage, they have substantially increased their volume of CDS contracts traded, which in many cases has been disproportionate to their absolute size.

In portfolio products such as synthetic CDOs, the total notional for all types of credit derivatives portfolio products share has been increasing along with the growth of the credit derivatives market. This is due to fundamentally symbiotic relationship between the synthetic CDO and single name CDS markets, caused by dealers originating synthetic tranches either by issuing the full capital structure or hedging bespoke tranches.

There has been an increase in liquidity for correlation products, with daily two-way markets for synthetic tranches now being quoted. The credit options market, in particular the market for those written on CDS, has grown substantially.

A number of issues still remain to be resolved. First, there is a need for the generation of a proper term structure for credit default swaps. The market needs to build greater liquidity at the long end and, especially, the short end of the credit curve. Greater transparency is also needed around the calibration of recovery rates. Then, the issue of the treatment of restructuring events still needs to be resolved. Currently, the market is segregated along regional lines in tackling this issue, but it is hoped that a global standard will eventually emerge.

TYPES OF CREDIT DERIVATIVES

Credit derivatives can be broadly categorized as:

Default Swaps

Also called Credit Default Swaps (CDS), these instruments involve taking a position by parties to the contract on the credit quality of the reference obligation. The buyer of the instrument will be at advantage if the credit quality of the reference obligation decreases. This will increase the premium on the credit default swap and the buyer can sell the swap at an increased market premium. On the other hand, the seller of the default swap can be benefited from a situation wherein the credit quality of the reference obligation increases resulting in a decrease in the present value of the swap. The seller can make a profit on the instrument by buying it back at market premium. Thus, default swaps can be of great use in hedging the risk exposures in credit transactions, increasing gains by assuming credit risk on reference obligation and in exploiting other arbitrage opportunities.

Buying credit protection is economically tantamount to shorting the credit risk. Also, selling credit protection is economically equivalent to going long the credit risk. This protection is there until some specified maturity date. For this protection, the protection buyer makes quarterly payments, to the protection seller, until a credit event or maturity, whichever occurs first. This is known as the premium leg. The actual payment amounts on the premium leg are determined by the CDS spread adjusted for the frequency using a basis convention, usually Actual 360.

If a credit event does occur before the maturity date of the contract, there is a payment by the protection seller to the protection buyer call this leg of the CDS the protection leg. This payment equals the difference between par and the price of the assets of the reference entity on the face value of the protection, and compensates the protection buyer for the loss. There are two ways to settle the payment of the protection leg, the choice being made at the initiation of the contract. They are:

Physical Settlement: The Physical settlement is the most widely used settlement procedure. It requires the protection buyer to deliver the notional amount of deliverable obligations of the reference entity to the protection seller in return for the notional amount paid in cash. In general there are several deliverable obligations from which the protection buyer can choose which satisfy a number of characteristics. Typically, they include restrictions on the maturity and the requirement that they be pari passu – most CDS are linked to senior unsecured debt.

If the deliverable obligations trade with different prices following a credit event, which they are most likely to do if the credit event is a restructuring, the protection buyer can take advantage of this situation by buying and delivering the cheapest asset. The protection buyer is therefore long a cheapest to deliver option.

Cash Settlement: This is the alternative to physical settlement, and is used less frequently in standard CDS but overwhelmingly in tranched CDOs, as discussed later. In cash settlement, a cash payment is made by the protection seller to the protection buyer equal to par minus the recovery rate of the reference asset. The recovery rate is calculated by referencing dealer quotes or observable market prices over some period after default has occurred.

APPLICATION OF A CDS

The CDS can do almost everything that cash can do and more. Some of the main applications of CDS are:

- The CDS makes it easy to short credit. This can be done for long periods without assuming any repo risk. This is very useful for those wishing to hedge current credit exposures or those wishing to take a bearish credit view.
- CDS are unfunded so leverage is possible. This is also an advantage for those who have high funding costs, because CDS implicitly lock in Libor funding to maturity.
- CDS are customizable although deviation from the standard may incur a liquidity cost.
- CDS can be used to take a spread view on a credit as with a bond.
- Dislocations between cash and CDS present new relative value opportunities. This is known as trading the default swap basis.

DETERMINING THE CDS SPREAD

The premium payments in a CDS are defined in terms of a CDS spread, paid periodically on the protected notional until maturity or a credit event. It is possible to show that the CDS spread can, to a first approximation, be proxied by either (i) a par floater bond spread (the spread to Libor at which the reference entity can issue a floating rate note of the same maturity at a price of par) or (ii) the asset swap spread of a bond of the same maturity provided it trades close to par.

Application of these relationships relies on several assumptions that break down in practice. For example, assuming a common market-wide funding level of Libor, we ignore accrued coupons on default, the delivery option in the CDS and counterparty risk. Inspite of these assumptions, cash market spreads usually provide the starting point for where CDS spreads should trade. The difference between where CDS spreads and cash LIBOR spreads trade is known as the Default Swap Basis, defined as:

Basis = CDS Spread – Cash Libor Spread.

FUNDED VERSUS UNFUNDED

Credit derivatives, including CDS, can be traded in a number of formats. One of the most regularly used format is known as swap format and this is the standard for CDS. This format is also termed ‘unfunded’ format as the investor makes no upfront payment. Subsequent payments are simply payments of spread and there is no principal payment at maturity. Losses require payments to be made by the protection seller to the protection buyer, and this has counterparty risk implications.

The other format is to trade the risk in the form of a credit linked note. This format is known as ‘funded’ because the investor has to fund an initial payment; typically par. This par is used by the protection buyer to purchase high quality collateral. In return the protection seller receives a coupon, which may be floating rate, i.e., Libor plus a spread, or may be fixed at a rate above the same maturity swap rate. At maturity, if no default has occurred the collateral matures and the investor is returned par. Any default before maturity results in the collateral being sold, the protection buyer covering his loss and the investor receiving par minus the loss. The protection buyer is exposed to the default risk of the collateral rather than the counterparty.

CDS portfolio products are products that enable the investor to go long or short the credit risk associated with a portfolio of CDS in one transaction. Recently, we have seen the emergence of a number of very liquid portfolio products, whose aim is to offer investors a diverse, liquid vehicle for assuming or hedging exposures to credit markets.

Various types of default swaps include Binary or Digital Default Swaps, Basket Credit Default Swaps, Cancelable Default Swaps, Contingent Default Swaps, Leveraged Default Swaps and Tranched Portfolio Default Swaps. Default swaps help in reducing the default risk in an economy and also in reducing the price deterioration of the reference obligation. This will in turn helps in preserving a good bank-client relationship and helps an individual to reduce his regulatory capital.

Total Rate of Return Swaps

Total Rate of Return Swaps represent the non-funded position in a reference obligation. The benefit derived by the receiver of the instrument is directly proportional to the price of the reference obligation. Similarly, the benefit to the buyer is inversely proportional to the price of the reference obligation. Like that of default swap TROR helps in reducing economic risk as a whole. Coming to an individual point of view TROR will be beneficial in terms of providing a hedge mechanism against default risk, credit deterioration risk and market risk.

Credit-spread Products: Credit spread refers to the difference between the yield of a risky bond and the yield of a risk-free bond. Credit-Spread Products are another kind of credit derivatives used in hedging various credit related risks. The most commonly used credit-spread products are credit-spread options, credit-spread forwards and credit-spread swaps. Credit-spread options will be beneficial to investor when the investors are uncertain about the possible decrease in the underlying asset. In case the investors are sure about the possible decrease in the underlying asset then it will be advantageous for them to opt for either credit-spread forwards or credit-spread swaps. Similar to other credit derivative products, credit-spread products provide multiple benefits to the investors like arbitrage, cost reduction, regulatory capital reduction etc.

SYNTHETIC COLLATERALIZED DEBT OBLIGATIONS

Synthetic Collateralised Debt Obligations (Synthetic CDOs) were conceived in 1997 as a flexible and low-cost mechanism for transferring credit risk off bank balance sheets. The primary motivation was the banks' reduction of regulatory capital. Instruments that are most commonly found in this segment include:

Credit-Linked Notes (CLNs): Credit-Linked notes refer to an underlying obligation with an embedded credit feature. The coupon rate is dependent on the credit quality of the reference obligation. While the motivational factor for CLN issuer is the transfer of default as well as deterioration risks, the motivational factor for CLN buyer is yield enhancement. CLNs are useful to those investors who are unable to trade in derivatives securities due to regulatory or other impediments.

***Collateralized Debt Obligations*:** Collateralized Debt Obligations are different from credit-linked notes in the sense that these instruments are arranged by a Special Purpose Vehicle (SPV) of financial institutions usually containing triple-A rating. Moreover, CDOs can provide credit exposure to a basket of 200 or more credits and provide specific risk profiles to investors. CDOs are beneficial to the owners of the assets who can lay-off credit without the notice to the investors and maintain good relationship with investors. From the investors point of view CDOs are useful in yield enhancement and in accessing pay-off profiles. CDOs can be differentiated in terms of SPVs motivation. CDOs are termed as arbitrage CDOs in the event of SPVs making profit as a difference between income generated from tranches and default swap premiums and coupons of risk-free assets. On the other hand, if the SPVs motive is to reduce regulatory capital then the CDOs used in such a circumstance are called balance sheet CDOs. The difference in CDOs can be made in terms of SPVs repayment to investors. If the liability repayments are made through successive selling of assets related to tranched portfolio then such a CDO is called market value CDO. In case the repayments are made through coupon flows and notional amount repayments then the CDOs are called as cash flow CDOs. The latest variations in CDOS can be found in instruments like Tranched Portfolio Default Swaps, Tranched Basket Default Swaps and CDO Squared Structures. Tranched Portfolio Default Swaps are different from that of Tranched Basket Default Swaps in a sense that in TPDS default exposure is linked to a certain amount of loss and in TBDS it is linked to a certain number of defaults. CDO squared structures are the most advanced form of CDOs that generate higher returns at the expense of increased complexity and risk.

Being a novel concept in the credit derivatives arena synthetic structures are continuously monitored and rated by different rating agencies to make the investor better informed about the quality of these instruments. The credit rating of synthetic structures can be found and analyzed using coverage ratios. The most famous instruments in this segment include JP Morgan's own Clip structure, Deutsche Bank's J-Port and Repon, and UBS's Alpine structure.

More recently, however, the fusion of credit derivatives modelling techniques and derivatives trading have led to the creation of a new type of synthetic CDO, which we call a customised CDO, which can be tailored to the exact risk appetites of different classes of investors. As a result, the synthetic CDO has become an investor-driven product.

What is also of interest is that the dealer-hedging of these products in the CDS market has generated a substantial demand to sell protection, balancing the traditional protection-buying demand coming from bank loan book managers.

The performance of a synthetic CDO is linked to the incidence of default in a portfolio of CDS. The CDO redistributes this risk by allowing different tranches to take these default losses in a specific order. To see this, consider the synthetic CDO. It is based on a reference pool of 100 CDS, each with a Rs.10m notional. This risk is redistributed into three tranches; (i) an equity tranche, which assumes the first €50m of losses, (ii) a mezzanine tranche, which take the next Rs.100m of losses, and (iii) the senior tranche with a notional of Rs.850m takes all remaining losses.

The equity tranche has the greatest risk and is paid the widest spread. It is typically unrated. Next is the mezzanine tranche which is lower risk and so is paid a lower spread. Finally, we have the senior tranche which is protected by €150m of subordination. To get a sense of the risk of the senior tranche, note that it would require more than 25 of the assets in the 100 credit portfolio to default with a recovery rate of 40% before the senior tranche would take a principal loss. Consequently, the senior tranche is typically paid a very low spread.

The advantage of CDO is that by changing the details of the tranche in terms of its attachment point (this is the amount of subordination below the tranche) and width, it is possible to customise the risk profile of a tranche to the investor's specific profile.

Full Capital Structure Synthetics

In the typical synthetic CDO structured using securitization technology, the sponsoring institution, typically a bank, enters into a portfolio default swap with a Special Purpose Vehicle (SPV).

The SPV typically provides credit protection for 10% or less of the losses on the reference portfolio. The SPV in turn issues notes in the capital markets to cash collateralize the portfolio default swap with the originating entity. The notes issued can include a non-rated 'equity' piece. Mezzanine debt and senior debt creating cash liabilities. The remainder of the risk, 90% or more, is generally distributed via a senior swap to a highly rated counterparty in an unfunded format.

Reinsurers who typically have AAA/AA ratings have traditionally had a healthy appetite for this type of senior risk, and are the largest participants in this part of the capital structure – often referred to as super-senior AAAs or super-senior swaps. The initial proceeds from the sale of the equity and notes are invested in highly rated liquid assets.

If an obligor in the reference pool defaults, the trust liquidates investments in the trust and makes payments to the originating entity to cover default losses. This payment is offset by a successive reduction in the equity tranche, then the mezzanine and finally the super-seniors are called to make up losses.

MECHANICS OF A SYNTHETIC CDO

When nothing defaults in the reference portfolio of the CDO, the investor simply receives the Libor spread until maturity and nothing else changes. Consider what happens if one of the reference entities in the reference portfolio undergoes the first credit event with a 30% recovery, causing a Rs.7m loss.

The equity investor takes the first loss of Rs.7m, which is immediately paid to the originator. The tranche notional falls from Rs.50m to Rs.43m and the equity coupon, set at 1500bp, is now paid on this smaller notional. These coupon payments therefore fall from Rs.7.5m to 15% times Rs.43m = Rs.6.45m, if traded in a funded format. The Rs.3m recovered on the defaulted asset is either reinvested in the portfolio or used to reduce the exposure of the senior-most tranche (similar to early amortization of senior tranches in cash flow CDOs).

The senior tranche notional is decreased by Rs.3m to Rs.847m, so that the sum of protected notional equals the sum of the collateral notionals which is now Rs.990m. This has no effect on the other tranches.

This process repeats following each credit event. If the losses exceed €50m then the mezzanine investor must bear the subsequent losses with the corresponding reduction in the mezzanine notional. If the losses exceed Rs.150m, then it is the senior investor who takes the principal losses. The mechanics of a standard synthetic CDO are therefore very simple especially compared with traditional cash flow CDO waterfalls.

CDO STRATEGIES

Investors in correlation products should primarily view them as buy and hold investments, which allow them to enjoy the spread premium. This is a very straightforward strategy for mezzanine and senior investors. However, for equity investors there are a number of strategies that can be employed in order to dynamically manage the idiosyncratic risk. Some strategies below are:

i. The investor buys CDO equity and hedges the full notional of the 10 or so worst names. The investor enjoys a significant positive carry and at the same time reduces his idiosyncratic default risk. The investor may also sell CDS protection on the tightest names using the income to offset some of the cost of protection on the widest names.

ii. The investor may buy CDO equity and delta hedge. The net positive gamma makes this trade perform well in high spread volatility scenarios. By dynamically re-hedging, the investor can lock in this convexity. The low liquidity of CDOs means that this hedging must continue to maturity.

iii. The investor may use the carry from CDO equity to over-hedge the whole portfolio, creating a cheap macro short position. While this is a negative carry trade, it can be very profitable if the market widens dramatically or if a large number of defaults occur.

Credit Options

Activity in credit options has grown over the years driven mostly by one-off repackaging deals, it has extended to an increasingly vibrant market in both bond and spread options, options on CDS and more recently options on portfolios and even on CDO tranches. This growth of the credit options market has been boosted by declines in both spread levels and spread volatility. The reduction in perceived default risk has made hedge funds, asset managers, insurers and proprietary dealer trading desks more comfortable with the spread volatility risks of trading options and more willing to exploit their advantages in terms of leverage and asymmetric pay-off. The more recent growth in the market for options on CDS has also been driven by the increased liquidity of the CDS market, enabling investors to go long or short the option delta amount.

Hedge funds have been the main growth user of credit options, using them for credit arbitrage and also for debt-equity strategies. They are typically buyers of volatility, hedging in the CDS market and exploiting the positive convexity. Asset managers seeking to maximize risk-adjusted returns are involved in yield-enhancing strategies such as covered call writing. Bank loan portfolio managers are beginning to explore default swaptions as a cheaper alternative to buying outright credit protection via CDS.

PRICING OF CREDIT DERIVATIVES

The complexity in monitoring the market price of an underlying credit obligation often makes the pricing of credit derivatives a difficult task. Together with this understanding the creditworthiness of a debtor is often a cumbersome task as it is not easily quantifiable. Moreover, the incidence of default is not a frequent phenomenon and makes it difficult for the investors to find the empirical data of a solvent company with respect to default. Though, one can take the help of different ratings published by ranking agencies, often these ratings will be different and will create chaos among investors.

For effectively pricing derivatives various factors should be taken into consideration such as default probability of the reference obligation, default probability of the counterparty and the correlation between the defaults of reference asset and the counterparty. Pricing methods for credit derivatives can be broadly categorized into two segments.

a. Traditional models or Structural models

b. Reduced form models.

Structural models are closely related to the Merton model, 1974. These models are divided into firm value models and first time passage models. The firm value models postulate that if the asset value of the company goes below its debt value at the maturity time of the debt then such company is considered to be bankrupt. According to first-time passage models bankruptcy occurs when the asset value drops below a pre-fixed limit even before the maturity of debt.

Reduced form models do not take into consideration the asset-liability structure of the company for analyzing defaults. Rather they derive their factor inputs from explicit economic reasons. The key ingredients of these models are debt prices. Under these models default is modeled through a stochastic process which involves multiplication of an exogenous default intensity or hazard rate with certain time frame. The output of this process will be the risk-neutral default probability.

All these models are widely used in pricing credit derivatives instruments. Efforts are in progress to develop a coherent combination of structural and reduced form models that can bring more transparency and accuracy into this field.

Application

Credit derivatives are useful in several ways to the people and institutions associated with these contracts. The major applications of credit derivatives can be categorized into five types. They are:

i. **Hedging:** Credit derivatives can help in mitigating various types of risks like market risk, credit risk and operational risk. During 1990s, credit markets evolved as new actively traded environment in the financial markets regime.

The emergence of credit derivatives provided a much awaited relief for the investors to hedge against various risks encompass these financial markets. The most commonly found risk categories associated with interest rate, currency, equity and commodity markets are liquidity risk and volatility risk. Futures, swaps and options are selectively used in these environments to mitigate these risks and enhance credit quality.

ii. **Yield Enhancement:** Yield enhancement is another important application of credit derivatives. Investment banks, Hedge funds and Individual investors are largely motivated by yield enhancement trait of credit derivatives. Many of the credit derivatives like CLNs and CDOs provide the investors with above the market yield. The major strategies adopted using these instruments include covered credit-spread put selling strategy, covered credit-spread call selling strategy, shorting a digital credit straddle strategy, credit-spread forward strategy, selling a credit-spread straddle strategy etc. Most of these strategies feature a higher down side risk and this requires the investors to be cautious about potential losses.

iii. **Cost Reduction and Convenience:** Credit derivatives provide investors with cost reduction advantages along with a highly convenient mode of trading. Cost reduction will be advantageous in an environment where the cash market is illiquid and makes trading in credit instruments expensive. In such an environment, institutions with poor credit ratings can be benefited by limiting their funding requirements. It is considered to be cheaper and convenient either to short or swap credit derivatives. Further, credit derivatives can also help in maintaining good bank-customer relationship.

iv. **Arbitrage:** The replication feature inherent in credit derivatives makes them provide arbitrage opportunities to the investors. Credit derivatives can be replicated with many other financial instruments. Taking the return factors and market risk into consideration investors can go short or long on specific instruments without incurring any additional costs.

v. **Regulatory Capital Relief:** The new Basel Accord focuses on assessing risk exposures for sovereigns, banks and corporations based on internal and external ratings. Significance is given to internal ratings approach in particular as it allows banks to assess their risk components based on customized approaches. Pillar 1 of the Basel accord introduced new minimum capital requirements for banks with regard to market, credit and operational risks. As per the Basel Accord requirements, trading book of financial institutions requires lower capital charges. In this context, credit derivatives can be posted by the financial institutions in trading book. Moreover, the Basel Accord has granted a capital relief of 100% for TRORs and 80% for default swaps is granted in the event of an exact match between maturity and notional amount.

Risk Management

Risk management refers to the identification, measurement and management of risk related to a particular enterprise. Risk management involves reduction of risk to the comfortable limits of both the management and the regulators. This can be done through elimination of risk, conversion of risky positions into risk-free positions and entering into derivatives position. Novel and sophisticated concepts like Value at Risk (VaR) and Credit at Risk (CaR) address the issues of estimation of loss in the event of risk. While VaR estimates the maximum amount of loss in the even of any kind of risk, CaR specifically estimates the maximum amount of loss in the event of a credit default risk or credit deterioration risk. In the recent years many credit risk management software tools have evolved. Managers and other professionals have to choose among these tools keeping in view the subjective requirements of their organizations and the scope of their risk management functions. It also equally important for the institutions to analyze the nature of their portfolios, before introducing any risk management mechanism.

The growing emphasis on credit risk management makes it extremely essential to understand and adopt risk control mechanisms offered by credit derivatives. The book "Credit Derivatives: Application, Pricing and Risk Management" offers a comprehensive description of the evolution, applications, pricing and risk management measures related to the credit derivatives segment.

SUMMARY

- Credit derivatives are the financial instruments designed to transfer the credit risk of one counterpart to another and thereby dilute the effects of such risk. There are three types of credit derivatives – default swaps, credit-spread products, and total rate of return swaps.
- Synthetic CDOs are the flexible and low-cost mechanism designed for transferring credit risk off bank balance sheets. The performance of a synthetic CDO is linked to the incidence of default in a portfolio of CDS.

Appendix

Draft Guidelines for Introduction of Credit Derivatives in India

March 26, 2003

Credit Derivatives – Draft Exposure Guidelines for use of Commercial Banks

1. Background

1.1 Effective management of credit risk is a critical factor in comprehensive risk management and is essential for the long-term financial health of business organizations, especially banks. Credit risk management encompasses identification, measurement, monitoring and control of the credit risk exposures. Reserve Bank of India had issued Guidelines for Asset Liability Management in February 1999 followed by guidelines on management of other risks such as credit risk, market risk, liquidity risk, interest rate risk, foreign exchange risk and operational risks in October 1999. Detailed guidelines for management of credit risk have recently been issued in October 2002.

1.2 For enabling the banks and the financial institutions, in India, to manage their credit risk effectively it was being felt appropriate to permit them the use of credit risk hedging techniques like the credit derivatives, which are Over-The-Counter (OTC) financial contracts and can help banks and financial institutions in managing the risk arising from adverse movements in the credit quality of their loans and advances, and their investments. Banks can derive many benefits from the credit derivatives such as,

- Transfer credit risk and hence free up capital, which can be used in other opportunities,
- Diversify credit risk,
- Maintain client relationships, and
- Construct and manage a credit risk portfolio as per their risk preference and appetite unconstrained by funds, distribution and sales effort.

1.3 A Working Group on introduction of Credit Derivatives in India, comprising officers from the Reserve Bank of India and industry was set-up to study the need and scope for allowing banks and financial institutions to use credit derivatives, the regulatory issues involved and make suitable recommendations in this regard. The Group has since submitted its report, which is available on the Reserve Bank of India Website, **rbi.org.in**. The draft guidelines detailed herein are based on the recommendations of the Working Group and have been customized keeping in view the present regulatory environment, the state of development of the market for credit derivatives and the preparedness of the banks for using the credit derivative products.

2. Conceptual Aspects

2.1 *Definitions*

2.1.1 For the purpose of clarity, the various terms used in this exposure Guidance Note are explained hereunder. The definitions are largely based on the ISDA (International Swaps and Derivatives Association) Credit Derivatives Definitions 1999 as modified from time to time. The Working Group has suggested the use of the ISDA Credit Derivatives Definitions 1999 by the participants in the transactions. However, the participants may also use any other definitions as mutually agreed between them.

i. **Credit derivatives** are over-the-counter financial contracts. They are usually defined as "off-balance sheet financial instruments that permit one party to transfer credit risk of a reference asset, which it owns, to another party without actually selling the asset". It, therefore, "unbundles" credit risk from the credit instrument and trades it separately. Credit Linked Notes (CLNs), another form of credit derivative product, also achieves the same purpose, though CLNs are on-balance sheet products. Another way of describing credit derivative is that it is a financial contract outlining potential exchange of payments in which at least one leg of the cash flow is linked to the "performance" of a specified underlying credit sensitive asset.

ii. **Protection Seller** refers to the party that contracts to receive premiums or interest-related payments in return for assuming the credit risk on an asset or group of assets from the Protection Buyer. The Protection Seller is also known in the market as the Credit Risk Buyer or Guarantor.

iii. **Protection Buyer** refers to the party that contracts to transfer the credit risk on an asset or group of assets to the Protection Seller. The Protection Buyer is also known in the market as the Credit Risk Seller or Beneficiary.

iv. **Premium**, is the fee the protection buyer pays to the protection seller as in case of insurance business.

v. **Credit event** is defined as a scenario or condition agreed between the contracting parties that will trigger the credit event payment from the Protection Seller to the Protection Buyer. Credit events usually include bankruptcy, insolvency, merger, cross acceleration, cross default, failure to pay, repudiation, and restructuring, delinquency, price decline or rating downgrade of the underlying asset/issuer.

vi. **Credit event payment or settlement** is the amount that is paid following a credit event. This is defined in the contract, and is normally one of three types:

   a. **Physical Delivery:** Payment of par or other specified value in exchange for physical delivery of the Reference Asset (or a variety of assets) of the Reference Entity as allowed under some contracts.

   b. **Cash Settlement:** Payment of par less recovery value. The Reference Asset will normally retain some value after a credit event has triggered settlement of the contract. The recovery value is normally determined at a date up to three months after the credit event, by a dealer poll or auction.

   c. **Fixed Amount:** Payment of a fixed amount.

vii. **Reference Asset** refers to the asset to which payments under the credit derivative contract are referenced or linked. It is also called reference obligation.

viii. **Underlying Asset** refers to the asset on which credit risk protection is bought by the Protection Buyer. It could be a bank loan, corporate bond/debenture, trade receivable, emerging market debt, municipal debt, etc. It could also be a portfolio of credit products. This is usually also the Reference Asset.

ix. **Reference Entity** is the entity upon whose credit the contract is based.

x. **Deliverable Obligation** defines what assets are eligible for delivery as settlement in a physical delivery contract. It usually includes Reference Obligation but will often be broader to include other obligations.

xi. **Obligations** defines what assets may trigger a Credit Event. These are usually same as the underlying asset.

xii. **Sponsor** denotes the entity that places the portfolio in a Special Purpose Vehicle for issue of notes.

xiii. **Senior Debt** means that portion of funding in case of structuring of a Collateralized Debt Issue (CDO), which has the lowest risk weight, or the highest rated debt.

xiv. **Mezzanine Debt** refers to that portion of funding in case of structuring of a Collateralized Debt Issue (CDO), which has debt in ascending order of risk weights, or in descending order of ratings.

xv. **Equity** refers to the balance funding in case of structuring of a Collateralized Debt Issue (CDO), which has the highest risk weight, or the lowest rated debt.

2.2 *Types of Credit Derivatives and Basic Structures:*

Credit derivatives can be divided into two broad categories:

a. Transactions where credit protection is bought and sold; and

b. Total return swaps.

Transactions where Credit Protection is Bought and Sold

i. *Credit Default Swap (CDS):* It is a bilateral derivative contract on one or more *reference assets* in which the protection buyer pays a fee through the life of the contract in return for a *credit event payment* by the protection seller following a *credit event* of the reference entities. In most instances, the Protection Buyer makes quarterly payments to the Protection Seller. The periodic payment is typically expressed in annualized basis points of a transaction's notional amount. In the instance that no pre-specified credit event occurs during the life of the transaction, the Protection Seller receives the periodic payment in compensation for assuming the credit risk on the Reference Entity/Obligation. Conversely, in the instance that any one of the credit events occurs during the life of the transaction, the Protection Buyer will receive a credit event payment, which will depend upon whether the terms of a particular CDS call for a physical or cash settlement. With few exceptions, the legal framework of a CDS – that is, the documentation evidencing the transaction – is based on a confirmation document and legal definitions set forth by the International Swaps and Derivatives Association, Inc. (ISDA). If a Credit Event occurs and physical settlement applies, the transaction shall accelerate and Protection Buyer shall deliver the Deliverable Obligations to Protection Seller against payment of a pre-agreed amount. If a Credit Event occurs and cash settlement applies, the transaction shall accelerate and Protection Seller shall pay to Protection Buyer the excess of the par value of the Deliverable Obligations on start date over the prevailing market value of the Deliverable

Obligations upon occurrence of the Credit Event. The procedure for determining market value of Deliverable Obligations is based on ISDA definitions or may be defined in the related confirmation and some cases a pre-determined amount agreed by both parties on inception of the transaction is paid.

The structures of physically settled CDS and cash settled CSD are shown in Figure 1 and Figure 2 respectively.

Figure 1: Physically Settled Credit Default Swap

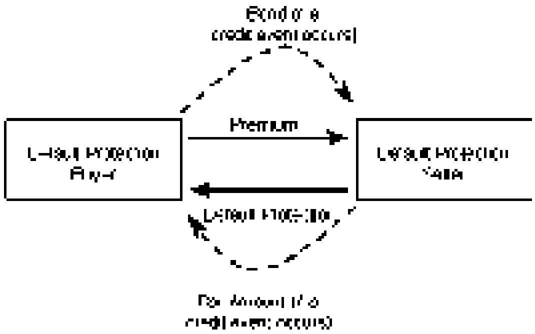
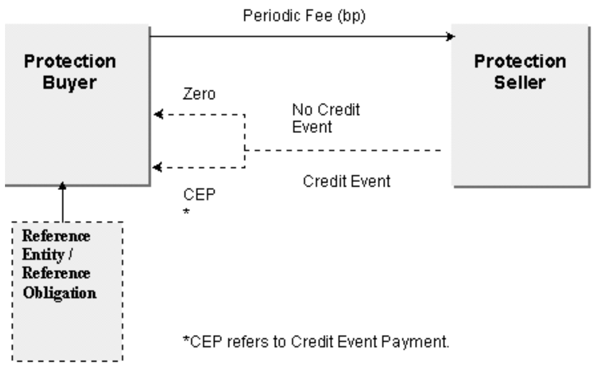


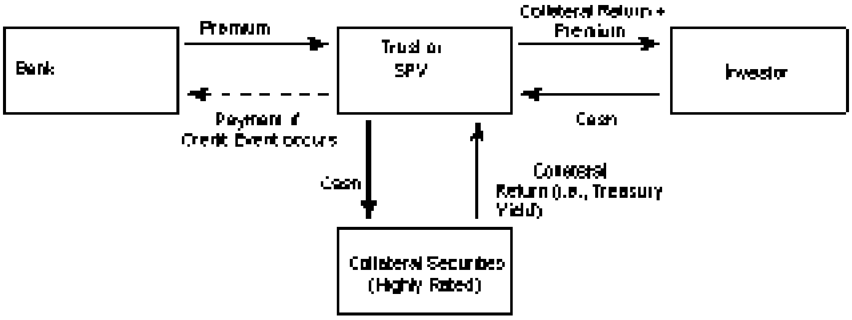
Figure 2: Cash Settled Credit Default Swaps



ii. *Credit Default Option:* It is a kind of CDS where the fee is paid fully in advance.

iii. *Credit Linked Note (CLN):* It is a combination of a regular note and a credit-option. Since it is a regular note with coupon, maturity and redemption, it is an on-balance sheet equivalent of a credit default swap. Under this structure, the coupon or price of the note is linked to the performance of a reference asset. It offers lenders a hedge against credit risk and investors a higher yield for buying a credit exposure synthetically rather than buying it in the publicly traded debt. CLNs are generally created through a Special Purpose Vehicle (SPV), or trust, which is collateralized with highly rated securities. CLNs can also be issued directly by a bank or financial institution. Investors buy the securities from the trust (or issuing bank) that pays a fixed or floating coupon during the life of the note. At maturity, the investors receive par unless the referenced credit defaults or declares bankruptcy, in which case they receive an amount equal to the recovery rate. Here the investor is, in fact, selling credit protection in exchange for higher yield on the note. The Credit-Linked Note allows a bank to lay off its credit exposure to a range of credits to other parties. Figure 3 shows a simple CLN structure.

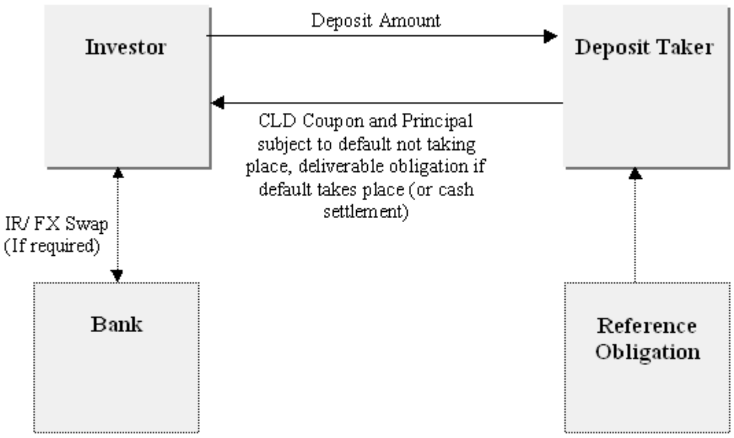
Figure 3: Credit Linked Note Structure



iv. *Credit Linked Deposits/Credit Linked Certificates of Deposit:* Credit Linked Deposits (CLDs) are structured deposits with embedded default swaps. Conceptually they can be thought of as deposits along with a default swap that the investor sells to the deposit taker. The default contingency can be based on a variety of underlying assets, including a specific corporate loan or security, a portfolio of loans or securities or sovereign debt instruments, or even a portfolio of contracts which give rise to credit exposure. If necessary, the structure can include an interest rate or foreign exchange swap to create cash flows required by investor. In effect, the depositor is selling protection on the reference obligation and earning a premium in the form of a yield spread over plain deposits. If a credit event occurs during the tenure of the CLD, the deposit is paid and the investor would get the Deliverable Obligation instead of the Deposit Amount.

Figure 4 shows the structure of a simple CLD.

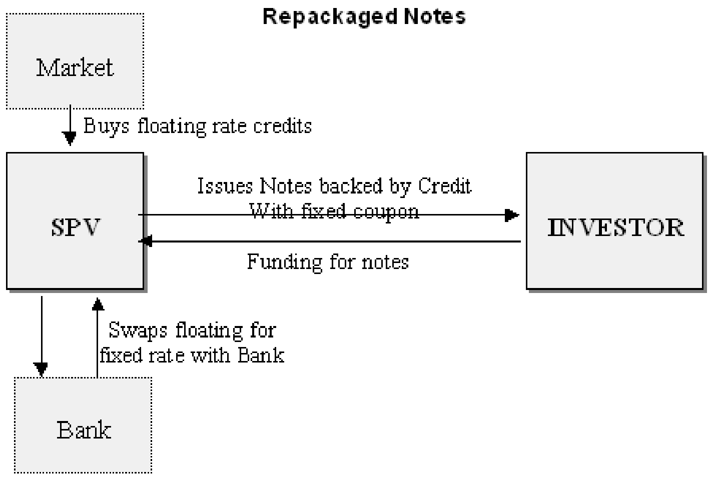
Figure 4



v. *Repackaged Notes:* Repackaging involves placing securities and derivatives in a Special Purpose Vehicle (SPV) which then issues customized notes that are backed by the instruments placed. The difference between repackaged notes and CLDs (Credit Linked Deposits) is that while CLDs are default swaps embedded in deposits/notes, repackaged notes are issued against collateral – which typically would include cash collateral (bonds/loans/cash) and derivative contracts. Another feature of Repackaged Notes is that any issue by the SPV has recourse only to the collateral of that issue.

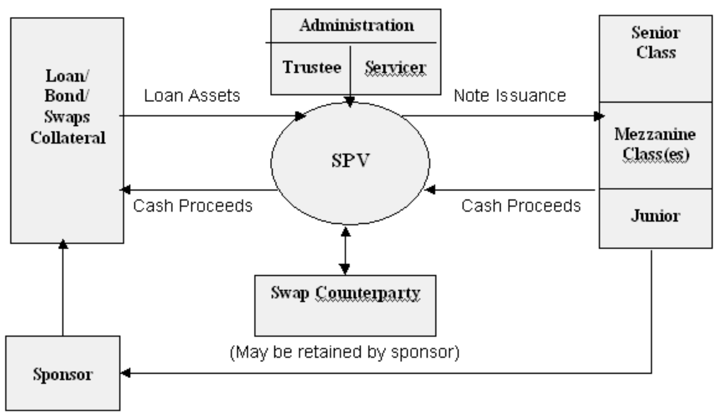
Figure 5 below pictorially depicts the transactions under a Repackaged Note.

Figure 5



vi. *Collateralized Debt Obligations (CDOs):* CDOs are specialized repackaged offerings that typically involve a large portfolio of credits. Both involve issuance of debt by a SPV based on collateral of underlying credit(s). The essential difference between a repackaging program and a CDO is that while a simple repackaging usually delivers the entire risk inherent in the underlying collateral (securities and derivatives) to the investor, a CDO involves a horizontal splitting of that risk and categorizing investors into senior class debt, mezzanine class and a junior debt. CDOs may be further categorized, based on the structure with which funding is raised. The funding could be raised by issuing bonds, which are called Collateralized Bond Obligations (CBOs) or by raising loans, which are called Collateralized Loan Obligations (CLOs). The transactions under a CDO are shown in figure 6.

Figure 6: Collateralized Debt Obligations



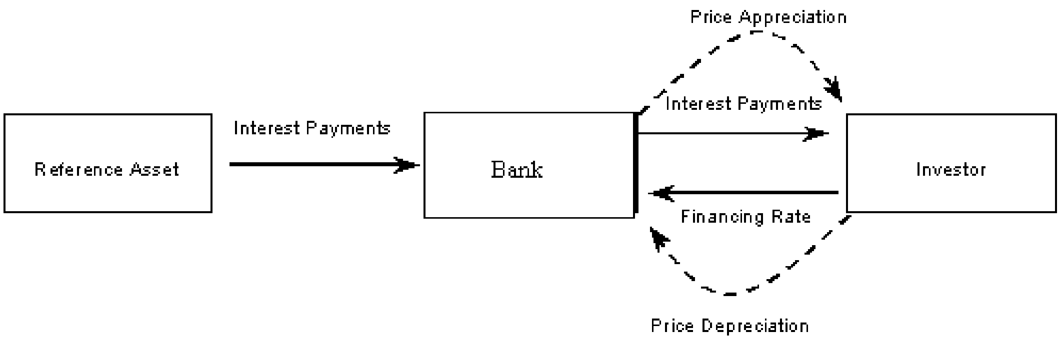
Total Return Swaps

Total Return Swaps (TRS), also called Total Rate of Return Swaps (TROR) are bilateral financial contracts designed to synthetically replicate the economic returns of an underlying asset or a portfolio of assets for a pre-specified time. One counterparty (the TR payer) pays the other counterparty (the TR receiver) the total return of a specified asset, the reference obligation. In return, the TR receiver typically makes regular floating payments. These floating payments represent a funding cost. In effect, a TRS contract allows the TRS receiver to obtain the economic returns of an asset without having to fund the assets on its balance sheet. Should the underlying asset decline in value by more than the coupon payment, the TRS receiver must pay the negative total return, in addition to the funding cost, to the TRS payer. At the extreme, a TRS receiver can be liable for the extreme loss that a reference asset may suffer following, for instance, the issuing company's default.

As such, a TRS is a primarily off-balance sheet financing vehicle. In contrast to credit default swaps, which only transfer credit risk, a TRS transfers not only to credit risk (i.e., the improvement or deterioration in credit profile of an issuer), but also market risk (i.e., any increase or decrease in general market prices). In TRS payments are exchanged among counterparties upon changes in market valuation of the underlying, in addition to the occurrence of a credit event as is the case with CDS contracts.

Figure 7 shows the structure of a simple TRS.

Figure 7: Total Return Swap



3. Scope of Application

Institutions Covered

i. These guidelines will apply to all commercial banks.

Extant RBI Instructions on Guarantees

ii. In terms of extant RBI instructions banks are precluded from issuing direct financial guarantees favoring other banks/financial institutions for loans extended except in case of infrastructure projects, provided the bank issuing guarantee takes a funded share in the project at least to the extent of 5% of the project cost and undertakes normal credit appraisal, monitoring and follow-up of the project. These instructions relating to bank guarantees will not be applicable to transactions pertaining to use of credit derivatives as derivatives are normally concluded under standardized master agreements, are structurally different from plain bank guarantees, and subject to ongoing risk controlling, risk management and valuation procedures.

Type of Activities

iii. Banks will be initially permitted to use credit derivatives only for the purpose of managing their credit risk, which includes

- Buying protection on loans and investments for reduction of credit risk,
- Selling protection for the purpose of diversifying their credit risk and reducing credit concentrations and taking exposure in high quality assets,

Market making activities by banks in credit derivatives are not envisaged for the present.

iv. For the present banks will not be permitted to take long or short credit derivative positions with a trading intent. It means that banks may hold the derivatives in their banking books and not in the trading books except in case of Credit Linked Notes, which can be held as investments in the trading book if the bank so desires.

Types of Derivative Products

v. The credit derivatives range from plain vanilla products to complex structures. The valuation standards, accounting norms, capital adequacy issues, methodologies for identifying risk components and concentrations of risks, especially in case of complex credit derivative structures are in the evolutionary stage. Therefore, currently RBI proposes to restrict banks to use simple credit derivative structures like credit default swaps and credit linked notes described in paragraph 2.2 (a) (i), (ii) and (iii) only, involving single reference entities, in the initial phase. The credit default options will be treated as credit default swaps for regulatory purposes.

Parties to the Transactions

vi. RBI has been allowing transactions between the banks and their financial services subsidiaries on the principle of arms' length relationship, i.e., the transactions should be on the basis of market related rates and based on free availability of information to both the parties. As the derivatives market will take time to develop, it would be difficult to have objective price discovery mechanism in the beginning and determine whether an arms' length relationship exits or not. Therefore, RBI proposes not to allow credit derivatives transactions between related parties till the players gain experience and maturity. Except for the above there will be no restrictions on the parties to the transactions.

Exchange Control Issues

vii. It is the intention of RBI to develop the credit derivatives as a domestic product for the domestic loan and investments market, initially. As under the present exchange control regulations, there are certain restrictions on non-residents to acquire, hold and dispose of immovable property in India, non-resident entities cannot be parties to credit derivative transactions in the domestic market for the present.

viii. The underlying assets on which credit derivatives can be written could be either the rupee denominated assets or foreign currency denominated assets originated by domestic entities and having resident entities as the obligors. In case of foreign currency assets, the premiums and the credit event payments can be denominated in foreign currency. In such cases, the participants in the transactions can only be such banks and financial institutions who are authorized to deal in foreign exchange.

4. Capital Adequacy and Provisioning

4.1 *Recognition of protection of credit risk - minimum conditions*

Bank fulfills the following criteria of recognition of protection of credit risk:

4.1.1 Existence of Adequate Risk Management Policies, Procedures, and Systems and Controls

The credit derivatives activity to be undertaken by bank should be under the adequate oversight of its Board of Directors and senior management. Written policies and procedures should be established to cover credit derivatives business. Banks using credit derivatives should have adequate policies and procedures in place to manage associated risks. There should be adequate separation between the function of transacting credit derivatives business and those monitoring, reporting and risk control. The participants should verify that the types of transactions entered into by them are not inappropriate to their needs and needs of the counterparty. Further, all staff engaged in the business should be fully conversant with the relevant policies and procedures. Any changes to the policy or engagement in new types of credit derivatives business should be approved by the Board.

Policies

The policy duly approved by the Board of Directors should cover at the minimum;

i. The bank's strategy, appetite and limits for different types of credit derivatives business,

ii. Authorization levels for engaging in such business and identification of those responsible for managing it,

iii. Procedure for measuring, monitoring, reviewing, reporting and managing the associated risks like credit risk, market risk, liquidity risk and specific risks,

iv. Fair and cautious valuation and risk assessment of a portfolio's position,

v. Calculation of derivative value adjustments independent of the business, size and reasons for adjustments to be transparent to the business management,

vi. Pursuing the underlying borrower when a credit event payment has been triggered,

vii. Determination of contractual characteristics of the products,

viii. Use of best market practices.

Procedures

The bank should have adequate procedures for:

i. Measuring, monitoring, reviewing, reporting and managing the associated risks,

ii. Full analysis of all credit risks to which the banks will be exposed, the minimization and management of such risks,

iii. Ensuring that the credit risk of a reference asset is captured in the bank's normal credit approval and monitoring regime,

iv. Management of market risk associated with credit derivatives held by banks in their trading books by measuring portfolio exposures at least daily using robust market accepted methodology,

v. Management of the potential legal risk arising from unenforceable contracts and uncertain payment procedures,

vi. Valuation procedures and mechanism to determine adequate liquidity, especially, where the reference asset is a loan or the derivative has multiple obligors. Sometimes, banks may face liquidity risk when counterparties are able to terminate transactions prematurely under the contract. This should be indicated in the bank's liquidity management policy,

vii. Determination of an appropriate liquidity reserve to be held against uncertainty in valuation. This is important especially where the reference asset is illiquid like a loan.

viii. Valuation adjustments to decrease the asset or increases the liability arising from the initial valuation of a credit derivative transaction by bank’s approved mathematical model. The purpose of the valuation adjustments are to report in the bank’s statements of accounts the “fair” economic value that the bank expects to realise from its credit derivative portfolios based upon current market prices and taking into account credit and market risk characteristics arising from those portfolio position.

Systems and Controls

The senior management should establish an independent framework for reporting, monitoring and controlling all aspects of risks, assessing performance, valuing exposures, monitoring and enforcing position and other limits. The systems and controls should:

i. Ensure that the types of transactions entered into by the counterparty are not inappropriate for their needs,

ii. Ensure that the senior most levels of management at the counterparty are involved in transactions by methods like obtaining from the counterparty a copy of a resolution passed by their Board of Directors, authorising the counterparty to transact in credit derivatives,

iii. Ensure that counterparties do not enter into transactions that violate other rules and regulations,

iv. Ensure adequate Management Information Systems to make senior management aware of the risks being undertaken, which should provide information on the types of transactions carried out and their corresponding risks, the trading income/losses, realized/unrealized from various types of risks/exposures taken by the bank, contribution of derivatives to the total business and the risk portfolio, and value of derivative positions,

v. Assess and account for the possibility of default correlation between reference asset and the protection provider,

vi. Ensure that trading activities, if undertaken (in case of credit linked notes for the present) are properly supervised and are subject to an effective framework of internal controls and audits so that transactions are in compliance with regulations and internal policy of execution, recording, processing and settlement,

vii. Ensure that the bank has the ability to pursue the underlying borrower when a credit event payment has been triggered.

4.1.2 Satisfaction of Minimum Criteria

The credit derivative should conform to the following **minimum criteria i.e.,** it should be **direct, explicit, irrevocable and unconditional**. These criteria are explained below:

Direct

The credit protection must represent a direct claim on the protection provider.

Explicit

The credit protection must be linked to specific exposures, so that the extent of the cover is clearly defined and incontrovertible.

Irrevocable

Other than a protection purchaser's non-payment of money due in respect of the credit protection contract, there must be no clause in the contract that would allow the protection provider unilaterally to cancel the credit cover.

Unconditional

There should be no clause in the protection contract that could prevent the protection provider from being obliged to pay out in a timely manner in the event that the original obligor fails to make the payment(s) due.

4.1.3 Satisfaction of Minimum Operational requirements

In order for protection from a credit derivative to be recognised, the following conditions must be satisfied:

a. The credit events specified by the contracting parties must, at a minimum, include:
   - failure to pay the amounts due according to reference asset specified in the contract;
   - a reduction in the rate or amount of interest payable or the amount of scheduled interest accruals;
   - a reduction in the amount of principal or premium payable at maturity or at scheduled redemption dates;
   - a change in the ranking in the priority of payment of any obligation, causing the subordination of such obligation.

b. Contracts allowing for cash settlement are recognized for capital purposes insofar as a robust valuation process is in place to estimate loss reliably. There must also be a clearly specified period for obtaining post-credit-event valuations of the reference asset, typically no more than 30 days;

c. The credit protection must be legally enforceable in all relevant jurisdictions;

d. Default events must be triggered by any material event, for example, failure to make payment over a certain period or filing for bankruptcy or protection from creditors;

e. The grace period in the credit derivative contract must not be longer than the grace period agreed upon under the loan agreement;

f. The protection purchaser must have the right/ability to transfer the underlying exposure to protection provider, if required for settlement;

g. The identity of the parties responsible for determining whether a credit event has occurred must be clearly defined. This determination must not be the sole responsibility of the protection seller. The protection buyer must have the right/ability to inform the protection provider of the occurrence of a credit event;

h. Where there is an asset mismatch between the exposure and the reference asset then:
   - the reference and underlying assets must be issued by the same obligor (i.e. the same legal entity); and

- the reference asset must rank *pari passu* or more junior than the underlying asset, and legally effective cross-reference clauses (for example cross-default or cross-acceleration clauses) must apply.

4.2 *Recognition of amount of protection bought and sold*

4.2.1 The credit event payment or settlement amount will determine the amount of credit protection bought /sold in case of CDS. This could be payment of par or other specified value in exchange for physical delivery of the Reference Asset (or a variety of assets of the Reference Entity as allowed under some contracts (**Physical Delivery Settlement**), or payment of par less recovery value (**Cash Settlement)** or payment of fixed amount as per the CDS agreement (**Fixed Amount Settlement)**. In case of CLN the amount of protection bought will be equal to the funds raised from issue of the CLNs and the amount of protection sold will be equal to the book value of the CLN.

4.2.2 Some credit derivative contracts may contain a materiality threshold specified for determining the loss that must be reached before a credit event is triggered. Therefore, the materiality threshold may affect the amount of credit protection that may be recognized.

4.3 *Capital Adequacy for Credit Derivatives in the Banking Book*

As stated in Paragraphs 3 (ii) and (iii) above banks will be initially permitted to use credit derivatives only for the purpose of managing their credit risk and not for taking derivative positions with a trading intent. It means that banks may hold the derivatives in their banking books and not in the trading books except in case of Credit Linked Notes, which can be held as investments in the trading book.

4.3.1 *Protection Buyer:* Where an asset is protected by a Credit Default Swap (CDS), the Protection Buyer may replace the risk weight of the underlying asset with that of the Protection Seller to the extent of amount of protection as determined as per paragraph 4.2 above. Where an asset is protected by a credit derivative funded by cash (CLN), the Protection Buyer may reduce the amount of its exposure to the underlying asset by the amount of funding received. For the unprotected portions the risk weight of the underlying asset will apply. The treatment of capital requirement will be modified if there are mismatches in the structures as discussed below.

Presence of Mismatches

In many credit derivative transactions, it is difficult to achieve an effective hedge due to the existence of mismatches and therefore, suitable adjustments will be made to the extent of credit protection recognizable on account of presence of such mismatches as outlined below:

a. **Asset Mismatches:** Asset mismatch will arise if the underlying asset is different from the reference obligation (in case of cash settlement) or deliverable obligation (in case of physical settlement). The recognition of availability of protection will be made in terms of provisions of paragraph 4.1.3(f) above.

b. **Maturity Mismatches**: If the maturity of the credit derivative contract is less than the maturity of the underlying asset, then it would construe as a maturity mismatch though the protection buyer would be completely hedged if the contract maturity were to be higher than the maturity of the underlying asset. In case maturity mismatches the capital adequacy will be determined in the following manner.

   i. If the residual maturity of the derivative product is less than one year no protection will be recognized and the risk weight of the underlying asset will apply.

   ii. If the residual maturity of the credit derivative is one year or more protection will be recognized and the risk weight will be weighted average of risk weight of the Protection Seller and risk weight of the reference entity (weighted by proportions of period for which protection is available and the period for which protection is not available, counted from the date of contract till maturity of the derivative. Thereafter, the risk weight of the reference will apply.

c. **Currency Mismatches:** A currency mismatch is caused if the credit derivative contract is denominated in a currency different to the underlying asset. In such an event, the credit protection obtained should be marked to market to the prevailing exchange rate and if the value of credit protection (valued in terms of the currency of the underlying asset) is less than the value of the underlying asset, the residual risk must be risk-weighted on the basis of the underlying asset.

4.3.2 *Protection Seller:* Where a Protection Seller has sold protection through a CDS it acquires credit exposure to the Reference Asset. This exposure is to be risk-weighted according to the risk weight of the Reference Asset. In a funded credit derivative (CLN), the Protection Seller acquires on balance-sheet exposure to both the Reference Asset and the Protection Buyer. The CLN can be held in the banking book or trading book as decided by the bank. If held in the banking book, the amount of exposure will be equal to the book value of the note and will be risk weighted by the higher of the risk weight of the reference entity or the Protection Buyer. Where the credit derivative is referenced to more than one obligor, the amount of credit protection provided would depend on the structure of the contract.

Capital Adequacy for Credit Derivatives in the Trading Book

As stated in paragraph 3 (v) above banks will hold investments in CLNs issued by Protection Sellers in their banking book or trading book. The assets in the trading book are held primarily for generating profit on short-term differences in prices/yields as against assets in the banking book which are contracted basically on account of relationship or for steady income and statutory obligations and are generally held till maturity. A CLN held in the trading book will represent a position to the note itself, with an embedded credit default product. A credit-linked note has a notional position to the specific risk of the Reference Asset. There is also specific risk to the Protection Buyer and general market risk according to the coupon or interest rate of the note. The risk weight for such positions would be the risk weight for ‘All other Investments’ i.e., 102.50% as per present guidelines.

4.5 Provisioning Requirements

4.5.1 Sufficient provisioning (based on what would be the provisioning applicable if the reference asset were on the seller's books) would have to be made by the credit protection seller if it is offering credit protection on a non-performing asset.

4.5.2 The protection buyer should not make any provision for a reference asset that has turned NPA and on which it has bought protection which is valid on date.

5. Exposure Norms

5.1.1 Exposure ceilings for all fund based and non-fund based exposures will be computed in relation to total capital as defined under capital adequacy standards. As per present policy, from April 1, 2003 exposure calculation will be computed on the basis of 100% of non-fund based exposures in addition to fund-based exposures.

5.1.2 While determining the overall sectoral/borrower group/individual company exposure, suitable reduction will be allowed in the level of exposure with respect to the credit protection bought by means of credit derivatives. Conversely, the protection seller's exposure would increase as the protection seller acquires what is equivalent to a credit exposure on the reference asset. For the credit protection seller, the method of measuring exposure that would be applicable would be similar to the manner in which non-fund based credit limits such as guarantees are reckoned. Once the exposure is computed to individual/group entities, banks will have to ensure that they are within the overall ceiling as laid out in the relevant RBI guidelines.

6. Issues Relating to Documentation

It is recommended that transactions in credit derivatives may be covered by the 1992 ISDA Master Agreement and the 1999 ISDA Credit Derivatives Definitions and subsequent supplements to definitions with suitable modifications to suit conditions in India. Credit Linked Notes that are typically issued as bonds will be subject to additional documentation requirements of bonds. However, banks should consult their legal advisors about adequate documentation and other legal requirements and issues of credit derivative contracts before engaging in any transactions.

7. Issues related to Accounting

7.1 Normal accounting entries for credit derivative transactions are fairly straightforward depending on cash flows that take place at various points in time during the tenor of the transaction. For example, for a credit default swap, there will be periodic payment of fees by the protection buyer to the protection seller. If there is a credit event, then settlement will be appropriately accounted depending on whether cash settled or settled via physical exchange versus par payment.

Fair Value Accounting

7.2 Prudent accounting principles require that derivatives create assets and liabilities which should be captured on the balance sheet at fair economic value based on current market prices taking into account credit and market risk characteristics arising from these positions. All future cash flows arising from the contracts should be brought to present value using appropriate discount rates from mid-market data. The determination of future cash flows may require use of appropriate valuation models ranging from simple deterministic derivations to exotic pricing models.

7.3 Banks may adopt suitable norms for accounting of Credit Default Swaps and Credit Linked Notes with the approval of their respective boards. All derivatives should be fair valued at least on a quarterly basis. The changes in fair value must be reported in current earnings.

8. Maintenance of Statutory Reserves on CLN Issued by Banks

Normally, CLNs will be issued by SPVs set-up by banks for specific purpose. However, it is possible that some banks may consider issuing CLNs themselves, in which case they have to maintain CRR and SLR as required. However, before issuing CLNs, banks will be required to take prior approval of RBI.

9. Disclosures

The banks will be required to disclose the following in the Notes on Accounts of their annual accounts in respect of the credit derivative transactions:

- The types of transactions carried out and their corresponding risks,
- The gains/losses, realized/unrealized from various types credit derivative transactions undertaken by the banks,
- Contribution of derivatives to the total business and the risk portfolio,
- Fair Value of derivative positions.

Source: RBI.

Chapter XIV

Weather Derivatives

After reading this chapter, you will be conversant with:

- Meaning of Weather Derivatives
- Pricing of Weather Related Options
- Current Developments

Introduction

Most of the industries in the world are directly or indirectly affected by weather changes. Of late, due to the adversity of the greenhouse effects and the burning of fossil fuels, the weather has become quite irregular. Drought, heavy or scanty rainfall, extreme temperature conditions are seen every now and then. Agricultural output becomes very irregular and this entails heavy losses not only to the farming community but also to the related industries.

In short, this implies that there is risk related to the irregularities of the weather or weather risk, in short.

Weather risk can be defined as uncertainty in the occurrence of normal weather conditions affecting thus, favorably or adversely literally each and every business enterprise. The US government estimates that weather impacts at least to the extent of $1 trillion to its GDP of $9 trillion, or a little less than 10%.

The Chicago Mercantile Exchange (CME) was the first exchange to transact in weather derivatives in order to ensure that the profitability or revenue expectation of a company are not adversely affected by the playfulness of the weather.

While the agro-products and food industries are affected directly by weather irregularities, it cannot be said that there is any industry which is not affected by a drought or a scanty rainfall situation. Let us take an example to understand this:

Scanty rainfall in Gujarat in 1991 affected severely the groundnut crop. As a result, there was a price hike in the edible oil market, as the groundnut oil was scarce and the other oils like sunflower, cottonseed and palmolein were in high demand. At the same time, tin makers were facing hard times, as the reduction in the crop and resultant reduction in the production of groundnut oil resulted in reduction in demand for oil tins. This just goes to show how the chain reaction of one agriculture related industry affects other industries that are not directly related to it. While the farmers, groundnut oil producers and tin makers were affected adversely, the manufacturers of other oils were benefitted.

Similarly, assume an electricity supply company. It expects to earn its revenues in the summer season when people turn on their coolers and air-conditioners in addition to fans. Now, if the summer is pleasant or cool, the consumption of electricity is bound to be lesser than expected, resulting is loss of expected revenue to the electricity company. At the same time the manufacturers of appliances like coolers and fans may be affected as the demand for these products will reduce.

Till date, the major takers of weather derivatives in USA are the utility companies, as compared to the agro-based ones. In fact, the utility companies were the first to enter into weather deals as their business was frequently affected due to weather uncertainties.

Weather changes should be taken not only as a local phenomenon but as an industrial concern. A company must take a proper study of its business to analyze the impact of weather risks on its profitability.

The profitability can be affected by the following factors, as far as weather uncertainties are concerned:

i. Lower production or productivity resulting in lower revenues.

ii. Variation in the price of the final product, as a result of changes in the demand and supply situation.

iii. Increased costs of production.

iv. Increased or decreased prices of inputs.

v. Increased demand for substitute products.

vi. Changed income of the public in the region.

History of Weather Derivatives

The first transaction on weather derivatives took place in 1997 in the Chicago Mercantile Exchange and was executed by Aquila Energy of the US as a weather option embedded in a power contract. The market has expanded manifold since that date but its growth had not been very satisfactory, so the CME introduced electronic trade of weather derivatives through GLOBEX 2 system.

Weather derivatives started after the El Nino winter of 1997, which resulted in heavy damage to crops and property across America. Many companies sensing that the mild winter may affect their earnings potential started trying to hedge the seasonal risks. The weather derivatives development can also be coupled with the introduction of catastrophe bonds which are being traded in the Chicago Board of Trade (CBOT) more or less at the same time period.

What are Weather Derivatives?

Based on the indices of the climate and weather of 10 major American cities (Atlanta, New York, Chicago, Cincinnati, Dallas, DesMoines, Las Vegas, Tucson, Philadelphia and Portland), weather indices are being traded in the Chicago Mercantile Exchange (CME). Based on the indices of climate that measure the rainfall, day or night temperature, humidity, wind speed, etc., two standard indices have been created, namely:

i. Heating Degree Days (HDD)

ii. Cooling Degree Days (CDD)

An investor can buy the weather derivatives with relation to any of the ten cities for which the indices are made, just like buying an insurance product. The value of each of the HDD or CDD is US$100.

HEATING DEGREE DAYS (HDD)

Based on a standard of 65 degrees Fahrenheit, the Heating Day Temperature is calculated as,

i. 0, if the day’s temperature is more than 65 degrees; or

ii. 65 degrees less the actual temperature if the temperature is less than 65 degrees. The HDD can never be negative.

This index is used during the winter months to measure the cold waves. Higher the index, colder the day and vice versa.

HDD = (0 or 65 – Actual Temperature)

COOLING DEGREE DAYS (CDD)

This index is similarly using the same technique as the HDD but is either

i. 0, if the temperature is below 65 degrees; or

ii. Actual temperature less than 65 degrees if the actual temperature is above 65 degrees. The CDD can never be negative.

This index is the opposite of HDD and is used in the summer months to measure the warmth. Higher the index, warmer the day and vice versa.

CDD = (0 or Actual Temperature – 65)

VALUE OF THE WEATHER INDEX

The weather index is nothing but the total of the CDD or HDD for the given period multiplied by US$100. One can accumulate the HDD or CDD and the weather index is written on the cumulative total of the HDDs or CDDs.

Example: For one week of April 2000, the value of the weather index will be $100 x (25 + 26 + 28 + 22 + 21 + 18 + 19) or US$15,900. In other words, the temperature on 1st April was 25^0, 2nd April was 26^0, 3rd April 28^0, and so on. The addition of the index of each of the 7 days will result in a total of 159^0 which when multiplied by $100, will result in a total value of $15,900.

It is to be noted that the CME trades the index for a month or part of a month only and never more than that. This means that the weather derivatives have a specific strike for each month. An investor who wishes to hold the weather derivatives for the entire winter season will have to buy various contracts covering all the months of the season, i.e. one separate contract per month to be covered.

Given the fact that each of the two indices only measures the warmth or the coolness of the weather, it is essential to have both the indices operating together. If only one index was there, it would show an accurate measurement say, for winter while extreme summers would be measured as 0 or near zero, thus not enabling the companies from buying the index even when expected to be affected by the summer conditions.

Trading the Weather Indices (Hedging the Weather Risk): The CME weather indices are mostly used to ensure that there is no loss due to unexpected weather irregularities. Futures or options are used to hedge the weather risks, and of the two, the use of options is more common.

Theoretically, futures would work as follows:

A business may opt to buy or sell a futures contract which is equivalent to a swap contract, in such a way that one counterparty gets paid if the Degree Days (DD) over some period of time are higher than the strike level and the other counterparty gets paid if the DD is lower than the strike level.

Now, taking a simple example:

If a company expects the coming month to be hot, it should either sell CDD indices in summer or buy the HDD indices in winter. In case the summer in the coming month does not turn to be as hot as expected and the company incurs losses, it should square off the indices by buying them at a lower price and thus ensure that the revenue stream is not affected.

Similarly, in winter, a company that expected the days to be very cold should sell the HDD index. If the weather does not perform as per the expectations and the winter nights turn out to be warmer than expected, the HDD index should be lower at that time and the same can be bought, thus ensuring that the profit earned in the difference of sale and purchase offsets the loss made in the lower revenues.

In case of options, the following should be the course of action:

The company above, which is expecting hot days in summer should buy call option of the HDD in winter. If the days turn out to be as hot as expected, the revenues earned will be high and the option should be allowed to expire. Else, if the days are cold and the revenues are not as expected, the put option can be exercised and the gain on the option can offset the loss in the revenues. For example, an air-conditioner company may be expecting to sell 10,000 air-conditioners, in summer if the temperature touches 70^0 F. If the temperature is 50^0 F the sale will reduce to 5,000 units. If it is still cooler, the sale shall be only 2,000 or less units. In order to avoid such a fluctuation in sales the company can buy put options or sell call options of the HDD. If the temperature is 70^0F or above, the option will be allowed to expire. If the temperature is lower, the option can be exercised.

Similarly, the company expecting the winter nights to be cold in future should buy call options of CDD in summer. If the expectation of weather is achieved, the company will obviously earn good revenues and should allow the call option to expire without exercising it. Else if the reverse situation takes place and the company losses as a result of lower turnover, it should exercise its options as the

CDD index will be quite high and the gains from the options will balance the losses in the revenues. For example, let us understand the same with the help of an electricity utility company. If the winter is very cold, people are expected to run their heaters for longer hours, resulting in higher revenues. But if the winter is mild, the heaters will be operated for a shorter period. Based on the past 3 years experience, it is observed that the revenues are at least 30% lower than the forecast because of erratic winters. The electricity company this year can buy call options of CDD. If the winter is mild, the options can be exercised. If the winter is very cold, the utility company will earn high revenues and can afford to let the options expire without exercising.

It is a fact that in any options contract, the longer the out-of-money strike situation, lower the premium on the option. As discussed above, the weather derivatives are for a month or part of a month and in order to cover the entire season one has to acquire a strip of CDD or HDD. This is beneficial as the strips can be broken apart easily as compared to a single contract with a long-term period to maturity.

The strike level is usually set up in relation to the normal climatic conditions of the city for which it is being measured. On average, 10 to 15 years data on climate, city, is taken to decide the strike value. Even such a figure may not be very accurate to give the fact that the weather keeps changing as a result of the greenhouse effect and increasing burning of fossil fuels. Some researchers are of the opinion that instead of an average of 10 to 15 years, 20 or 50 years average should be taken. It is still a matter of debate.

PRICING OF WEATHER RELATED OPTIONS

There are two simple methods generally used for pricing weather options:

i. Simple Probability Distribution Pricing

ii. Gauss’ Distribution Pricing.

While more complex models are in existence, they are beyond the scope of this textbook.

i. **Simple Probability Distribution Pricing:** Based on the collection of CDDs or HDDs historical data for the period, a pricing model can be made which will integrate the product of the probability distribution with the pay-off of the option. The detailed discussion on the formula is beyond the scope of this textbook.

ii. **Gauss’ Distribution Pricing:** Gauss’ method involves the use of the mean and the standard deviation of CDDs or HDDs to calculate the price of the option. The strike price will depend on the number of standard deviations (the distance of the strike from the mean value) and the amount in currency per degree day specified in the contract. The discussion of the formula is beyond the scope of this textbook.

The Significance of Basis Risks

Basis risks are those risks involved with purchasing of weather derivatives for the cities or areas not covered by the CME (remember that CME only covers 10 cities). A basis between any two of the cities covered can also be obtained by taking the difference between the HDDs or CDDs of two different cities at the same period of time. This can be traded in the same way as the stocks of a company can be purchased in one exchange and sold in the other to earn a riskless profit on the price difference.

Specifications of Futures and Options on the Chicago Mercantile Exchange

The following table describes the specifications of the options and futures trading for weather derivatives at the CME:

Table 1: Weather Derivatives at CME

	Futures Contract	Options on Futures Contract
Contract Size	$100 times the CME Degree Day Index	One Futures Contract
Quotation	The CME Degree Day Index (HDD/CDD) Point ($100)	Premium
Minimum Tick Size	1.00 Degree Day Index Point ($100)	1.00 Degree Day Index Point ($100)
Contract Month	12 consecutive calendar months	5-months HDD: (Nov-March), 5-months CDD: (May-Sept)
Termination Day and Final Settlement Day	Futures trading shall terminate and contracts will settle at 9.00 a.m. Chicago time on the first exchange business day which is at least 2 calendar days following the last day of the contract month.	Same as futures
Final Settlement Price	The Exchange will settle the contract to the CME Degree Day Index of the contract month calculated by EarthSat.	N.A.
Position Limits	10,000 futures contracts	(Futures equivalent) 10,000 contracts
Exercise	N.A.	European Style
Regular Strike Interval	N.A.	HDD:50 Index Points CDD:25 Index Points
Initial Strike Range	N.A.	At-the-money and 3 strikes up & 3 strikes down.
Trading Hours GLOBEX(R)	3.45 p.m. to 3.15 p.m. (next day)	Same as futures

Source: CME website

Application of Weather Derivatives in India

India is basically a rural country with a very high dependency on farming for subsistency of almost 70-80% of the population. Farming is not automated and depends mostly on rainfall as irrigation facilities are not there in most of the areas.

Needless to say, the monsoon is very erratic in the country and this entails heavy losses to the farmers and related industries as well. At present, crop insurance is the only way through which farmers can ensure their crops. Crop insurance is a Government of India scheme falling under the purview of the Ministry of Agriculture. The General Insurance Corporation nearly acts as the implementing agency on behalf of the Government. The premiums for 2001-02 are expected to be in the range of Rs.175 crore which shows how low the number of farmers must be who opts for crop insurance. This could be because of lack of awareness among the farmers, illiteracy, poverty or too much reliance on old methods of farming.

Weather related derivatives would be a very good way of ensuring that the agro-industries and related ones do not suffer losses as a result of erratic monsoons. While the meteorological departments calculate the temperature and other related data for the major cities and towns of the country, the concept of weather derivatives is relatively new to the world and has never been implemented in a developing nation like India.

Below we reproduce a few articles that go to show the real situation in India as far as the erratic weather conditions go. Needless to say, the implementation of weather derivatives could save various lives.

Box 1: Center-State Row Over Crop Insurance Hits Ryots

The Center-State dispute over sharing the burden of crop insurance scheme is playing havoc with the fate of about 1.7 lakh farmers in Anantapur district, who are to be paid compensation against crop damage under the scheme. They are being denied the just benefit even as the sowing season is mid-way already.

According to official sources, the Center and State Governments had shared the crop insurance scheme burden in two-thirds and one-third ratio, respectively till last year. However, the Center had changed the guidelines last year and reversed the ratio. But no State Government in the country has given its consent for the change so far.

Sources told ‘The Hindu’ that a stalemate was continuing over the issue as several State Governments had given their mind that they were ready to accept the Center’s proposal provided the Government revenue was also shared in a similar ratio. Currently, the States were being given 29 percent of total Government revenue by the Center.

The dispute is also learnt to be having a telling impact on the banking system, particularly on co-operative and rural banks. As the insurance issue has not they were issued fresh loans so far. The delay in issuing fresh loans is driving the small and marginal been settled so far, crop loans taken by the 1.7 lakh farmers have neither been rescheduled nor they were issued fresh loans so far. The delay in issuing fresh loans is driving the small and marginal farmers to moneylenders.

The sources stated that the total insurance compensation in the state was earlier estimated at about Rs.85 crore but it was learnt to have reduced later to about Rs.65 crore. As per the initial estimates, Anantapur district was to get about Rs.42 crore as insurance compensation with Rs.10,000 as maximum benefit per farmer covered under the scheme.

Adding to the delay is the recently raised variation between the reports of crop loss prepared by the revenue department and the bankers. The officials stated that the extent of crop damage and area covered was not tallying in case of 15 out of 63 mandals in the district.

However, the officials admitted that it was not a problem if the major dispute of sharing the burden was resolved by the Centre and State Governments.

Source: Indiaserver.com, July 05, 2000.

Box 2: Six More Commit Suicide Due to Crop Failure in AP

Six members of three farmer's families committed suicide in drought-hit Anantapur district in southern Andhra Pradesh, due to successive crop failure and mounting debts.

This takes the tally of suicide deaths by farmers in district to 22 since September this year.

Blaming the state administration for failure to prevent the deaths, Communist Party of India State Secretary Suravaram Sudhakar Reddy said on Saturday that the six suicides occurred on Thursday in Anantapur district, witnessed similar suicides of a dozen farmers and four girls during September.

Sudhakar (30) doused himself, his wife Ganga Devi (27) and his one-year daughter Kavya with kerosene and lit the fire at Krishnamreddypalli village on the outskirts of Anantapur town. Sudhakar and Kavya succumbed to burn injuries, while Ganga has been admitted to the government hospital at Anantapur town with critical burns.

Sudhakar had four acres of agricultural land but he resorted to the drastic step following failure of a groundnut crop and huge debts.

In Nachevaripalli village in Chalamathur, 42-year old farmer Shankar Reddy, his mother Nanjamma (70) and his wife Bhagyamma (35) committed suicide by consuming a pesticide. Reddy, who owned four acres, was desperate owing to failure of a groundnut crop and heavy debts.

A farmer's wife, Saraswati, ended her life in Gandlaparthi village due to financial difficulties her family was experiencing.

The CPI State Council has deputed former legislator K Ramakrishna to probe the incidents.

"Those who committed suicide in Anantapur district in recent weeks had similar problems. They all were in despair owing to the groundnut crop failure and huge debts. The State Government could not come to their rescue and the crop insurance scheme failed to mitigate their financial difficulties," the CPI State Secretary pointed out.

"The plight of farmers is very serious. The State government has done nothing. The problem has got aggravated due to successive crop losses over three to four years. The farmers are in heavy debt. We appeal to the farmers not to lose heart or get desperate but to light adversity courageously. Suicide is no solution and they should not resort to this," Sudhakar Reddy observed.

He said that the government announced release of funds for payment of compensation to farmers for crop losses in Anantapur district but no disbursement was made. "The only help that the Chandrababu Naidu regime provided to the farmers has been the free supply of pesticides to fight the pest attack on crops. Ironically, the free pesticide is coming in handy for the farmers to commit suicide," he remarked.

He also appealed to the government to reintroduce the Rural Indebtedness Relief Act, which was repealed 10 years back. This Act, he said, was enacted during the erstwhile Nizam's rule in Hyderabad state and a similar legislation was in force in Andhra during British rule. The Act was continued after formation of Andhra Pradesh as it provided security to poor peasants against vagaries of nature.

Once the Act was invoked in an area following crop failure, the farmers in that area were exempted from repaying loans. The Act, thus provided relief to distressed farmers through waiver of institutional and private loans. However, it was scrapped by the government under pressure from moneylenders and financial institutions, the state secretary alleged.

He said that the crop insurance scheme under implementation in Anantapur failed to provide adequate compensation to the farmers. The insurance companies, he said, fixed the compensation amount based on the average crop yield over the last four years.

"This (crop insurance scheme) may work in areas where there is a good crop for three years and a bad crop one year. But in areas where there is crop failure for four years, the low crop yield will hardly be the right criteria for providing relief," he pointed out and demanded that the government should revamp the crop insurance scheme in consultation with the political parties and farmers' organizations.

The state governments also adopted an indifferent attitude towards families of farmers who committed suicide by refusing to pay them ex-gratia of Rs.1,00,000 each, as it would encourage more farmers to commit suicide. In the absence of government assistance, the victim's families are left in the lurch and driven to more desperation on account of financial hardships. Neither debt relief is provided to them nor adequate compensation paid under the crop insurance scheme.

The suicides in Anantapur district now are symptomatic of the syndrome that was witnessed during 1998 in Warangal and other Telangana districts, wherein 159 cotton growers ended their lives by consuming pesticides following the failure of crops due to unseasonal rains and attacks by pests.

Source: Rediff.com, October, 2000.

The growth that weather derivatives were able to accomplish is very high considering the short period of their existence. Climatic variability occurs on spatial and temporal scales leading to strong correlation among different locations. This correlation exists on a wide range of scales and locations and can only be correlated for a short-term basis. The long-term scale differentials among different locations can lead to imbalance or mismatch of the concept for different regions leading to a drastic decline in the growth of the new technology market. The potential use of weather derivatives to hedge against cross commodity sectors is limited and can be only hedged for volumetric risk. The problem arises with the determination of the fraction of risk to be hedged using weather derivatives.

The weather derivatives that started from utilities companies need to still cater to the need of this sector. Although the importance of weather is felt in different industries, utility, gas and power, energy and insurance sector dominate the market.

The development in number of cities covered under the weather derivatives for the over-the-counter market is large and continues to grow. The CME market includes ten cities in its present state of operations in the US (The cities are Atlanta, New York, Chicago, Cincinnati, Dallas, Des Moines, Las Vegas, Tucson, Philadelphia and Portland). The business, which is spread across the country demographically, will be deprived of what it needs. Buyers or sellers who wish to participate in the weather derivatives trading in the exchange will be facing a basis risk due to the non-availability of an index. This basis risk is due to the fact that the contracts will be written in different cities than the city, which the end user wishes to cover. The relationship between the temperatures of two cities changes over time, and the temperature variability is not accounted for in the weather trading.

The primary form of trading in weather derivatives is so far confined to the temperature alone. But, trading in weather does not mean trading in temperature alone: Although OTC markets trade in the contracts on rain, snowfall, wind etc., the exchange does not trade in any of the other forms. Trading in other forms in the exchange will add to the growth of the weather derivatives market.

The growth achieved by the weather derivatives is phenomenal given the relatively short period. The emerging scenario in the wake of new markets and players will be a crucial factor in deciding their future.

SUMMARY

- Weather derivatives are the derivatives created based on the climate and weather of 10 large American cities.
- There are two indices of weather: Heating Degree Days (HDD) and Cooling Degree Days (CDD).
- HDD is either 0° F if the weather is above 65° F or 65° F less the actual temperature, if the actual temperature is less than 65° F.
- CDD is either 0 degrees F if the weather is below 65° F or 65° F less the actual temperature, if the actual temperature is more than 65° F.
- Both can never be negative and the HDD is used to measure the index in the winter months, while the CDD is used to measure the index in the summer months.
- The value of the weather index is the cumulative total of the CDD or HDD multiplied by $100.
- Weather derivatives could be used in India as the weather tends to be quite erratic and a large majority of the population depends on agriculture for subsistence.

Chapter XV

Accounting for Derivatives

After reading this chapter, you will be conversant with:

- FASB-133
- Necessary Accounting Entries
- Translation of Foreign Currencies
- Application of the Re-measurement Method

FASB-133

FASB-133 specifies recognition of all derivative instruments in the balance sheet as assets or liabilities measured at fair value. Derivatives can be designated as hedges. Derivative Financial Instruments (DFIs) can be either balance sheet or off-balance sheet items and include:

- Option contracts.
- Interest rate caps.
- Interest rate floors.
- Fixed-rate loan commitments.
- Note issuance facilities.
- Letters of credit.
- Forward contracts.
- Forward rate agreements.
- Interest rate collars.
- Futures.
- Swaps.
- Other instruments with similar characteristics.

The DFI exclude:

- Mortgage-backed securities.
- Interest only obligations.
- Principal only obligations.
- Indexed debt.
- Contracts that require exchange for a non-financial commodity or that permit settlement by delivering a non-financial commodity.

A financial instrument has off-balance sheet risk of accounting loss if the risk of accounting loss to the entity exceeds the amount recognized as an asset or if the ultimate obligation exceeds the amount that is recognized as a liability in the statement of financial position. The risk of accounting loss includes the possibility that the loss may be due to credit risk or market risk. The new standard FASB-133 was issued to resolve a number of inconsistencies and inadequacies in the existing guidelines including the following:

i. The effects of derivative instruments were not properly displayed in the financial statements and were not even recognized in the financial statements.

ii. The available accounting guidance was incomplete. Many derivative instruments were carried as off-balance sheet items.

iii. There was different measurement of various instruments and different qualifications for different types of hedging.

iv. The existing guidelines lacked clarity and explanation for various types of hedging techniques adopted. It lacked an integral approach.

FASB-133 was issued in June, 1998 and was originally effective for fiscal periods beginning June, 1999.

Type of Derivative	**Accounting for Changes**
No. Hedge	Included in current income
Fair value hedge	Included in current net income
Cash flow hedge	Included in other comprehensive income
Foreign currency hedge	Included in comprehensive net income (as part of cumulative transaction adjustment)

FASB-133 requires standardized accounting and reporting for all derivative instruments and for hedging activities.

Underlying Principles in the New Standard

Four key principles are:

i. Derivative instruments are assets and liabilities.

ii. For reporting purposes only the fair value of derivative instruments are to be considered.

iii. Only true assets and liabilities are reported as such and not the gains or losses arising from derivative instruments.

iv. For special accounting for hedging, only designated qualifying items that are effectively offset by changes in fair value or cash flows during the term of the hedge should be used.

Derivative instruments represent rights and obligations and these must be reported as assets and liabilities at fair value. Gains and losses on derivative instruments, which are not used for hedging purposes, are recognized in earnings. Hedging accounting is limited to relations involving derivative instruments and certain foreign currency denominated instruments that are designated as hedges and meet the qualifying criteria.

Terminology

The various terminologies used by FASB-133 to describe different derivative instruments and hedging relationships are:

- **Derivative Instruments**

  Derivative instruments are defined as those contracts that have:

  i. One or more underlying and one or more notional amounts.

  ii. No initial net investment or less net investment.

  iii. Terms that allow:

     a. Net settlement.

     b. Net settlement by any means outside the contract.

     c. Delivery of an asset that results in a position substantially the same as net settlement.

- **Fair Value**

  It is defined as the amount at which the asset can be bought or sold. It may be the market price or the net present value of future cash flows associated with the asset or the price determined by the option pricing models or any other techniques.

- **Firm Commitment**

  An agreement legally enforceable, specifying all significant terms including the penalty for non-performance with an unrelated party.

- **Forecasted Transaction**

  A transaction that gives no present rights or obligations since there is no firm commitment.

- **Initial Net Investment**

  A derivative instrument is the one in which the initial net investment is zero or less than the notional amount. Derivative instruments allow the parties to take part in the transaction without actually owning the asset or owing the liability.

- **Net Settlements**

  To qualify as a derivative instrument, one of the following settlement criteria must be met:

  a. No delivery of an asset equal to the notional amount is required. For instance, an interest rate swap does not require the delivery of the instrument in which the notional amount is expressed.

  b. Delivery of an asset equal to the notional amount is required by one of the parties, but an exchange facilitates net settlement.

  c. One of the parties should deliver the asset equal to the notional amount, but the asset should be either readily convertible into cash or any other derivative instrument.

  The convertibility to cash condition requires an active market and consideration of interchangeability or transaction volume. Determining if delivery of a financial asset or liability equal to the notional amount is a derivative instrument may depend on whether it is readily convertible into cash.

- **Notional Amount**

  The notional amount is the unit of measurement associated with the underlying asset or liability such as stock, principal amount, face value, etc. It may be that amount plus premium or discount.

- **Underlyings**

  An underlying is a specified price or rate such as a stock price, interest rate, currency rate, commodity price or a related index.

Contracts not Subject to FASB-133

The contracts that are not subject to the requirements of FASB-133 are:

i. **Regular way Security Trades**

   Delivery of a security readily convertible into cash within the specific time period established by marketplace regulations or conventions where the trade takes place rather than by the usual procedure of an individual enterprise. For instance the trades that are excluded are forward purchases or sales of to-be-announced securities and when issued, as-issued or if-issued securities.

ii. **Normal Purchases and Normal Sales**

   Contracts for future delivery of assets convertible into cash and for that there is no net settlement provision and no market mechanism to ease the net settlement. Terms must be consistent with normal transactions and quantities must be reasonable in relation to needs.

iii. **Certain Insurance Contracts**

   Contracts where the holder is only compensated when an insurable event takes place and the value of the holder's asset or liability is adversely affected or the holder incurs a liability. The contracts that are not considered to be derivative instruments are traditional life insurance and traditional property and casualty insurance policies.

iv. **Certain Financial Guarantee Contracts**

   Contracts that call for payments only to reimburse for a loss from debtor failure to pay when due. But a credit-indexed contract requiring payment for changes in credit ratings would not be an exception.

v. **Certain Contracts that are not Exchange Traded**

   a. Climatic or geologically other physical variable.

   b. Value or price involving a non-financial asset not readily converted into cash or a non-financial liability that does not require delivery of an asset that is readily converted into cash.

   c. Specified volumes of revenue of one of the parties: examples are royalty agreements or contingent rentals based on related sales.

Derivatives that Serve as Impediments to Sales Accounting

A derivative that affects the accounting for the transfer of an asset. For instance, a call option on transferred assets under FASB-125 would prevent accounting for the transfer of a sale. This is because recognizing the call as a derivative instrument would result in double counting.

The other contracts that are not considered as derivative instruments include:

- Contracts issued or held or both:
  - a. Indexed to the enterprise's own stock.
  - b. Classified in shareholder's equity.
- Contracts issued in stock-based compensation arrangements like Embedded Derivative instruments. These are defined as explicit or implicit terms affecting:
  - a. The cash flows or
  - b. The value of other exchanges. An embedded derivative instrument is to be separated from the best contract and accounted for separately as a derivative instrument by both parties if and only if all of the following three criteria are met:
    - i. Risks and economic characteristics are not clearly related to those of the contract.
    - ii. The hybrid instrument is not required to be measured at fair value under GAAP with changes reported in earnings.
    - iii. A separate instrument with the same terms as the embedded derivative instrument would be accounted for as a derivative instrument.

Embedded Derivatives which are Accounted for:

- Interest rate indexes, floors, caps and collars not meeting the criteria for exclusion.
- Leveraged inflation-indexed payments or rentals.
- Calls and puts that do not accelerate repayment of principal but require a cash settlement equal to the option price at the date of exercise.
- Term extending options where there is no reset of interest rates.
- Equity-indexed interest payments.
- Commodity indexed interest or principal payments.
- A convertible debt conversion options if it qualifies as a derivative instrument.
- A convertible preferred stock conversion option if the terms of the preferred stock are more similar to debt than to equity.

The following embedded derivative instruments are not accounted for separately:

i. Interest rate caps, floors and collars if,
   - a. the cap is at above the current market rate, (price) and
   - b. the floor is at or below the current market rate or price.

ii. Non-leveraged inflation-indexed interest payments or rentals.

iii. Credit sensitive payments.

iv. "Plain-vanilla" servicing rights not containing a separate embedded derivative instrument.

v. Calls and puts that can accelerate repayment of principal unless,
   - a. the debt involves substantial premium or discount and
   - b. the call or put is only contingently exercisable and is indexed only to credit risk or interest rates.

vi. Term extending options if the interest rate is concurrently reset to approximately the current market rate for the extended term and the host contract had no significant discount.

vii. Contingent rentals based on a variable interest rate.

Calls and puts embedded in equity instruments are normally accounted for as follows:

- **For an Investor:** Both the call and the put are treated as embedded derivative instruments.
- **For an Issuer:** Only the put could be an embedded instrument. The put and the call would no longer be treated as embedded derivative instruments if they are both,
  a. Indexed to their own stock, and
  b. Classified in shareholder's equity.

A separate instrument with the same terms as the embedded derivative would be accounted for as a derivative instrument. For this condition, the initial net investment of the hybrid instrument is not the same as that for the embedded derivative instrument.

For example, a convertible preferred stock conversion option would not be an embedded instrument if the terms of the preferred stock were more similar to equity than to debt.

Hedging Activities – General Requirements

FASB-133 identifies changes in the fair values of the derivatives as being the result of –

i. Effective hedging

ii. Ineffective hedging

iii. Unrelated to hedging.

The hedging itself can be related to the fair value of an existing asset or liability or of a firm commitment, the cash flow of forecasted transactions or foreign currency exposures.

A qualified derivative can be considered to be a partial or total hedge of:

i. Changes in the fair value of –
   a. A recognized asset or liability or
   b. An unrecognized firm commitment.

ii. Variable cash flows of a forecasted transaction.

iii. Foreign currency exposure of –
   a. A net investment in a foreign operation.
   b. An unrecognized firm commitment.
   c. An available-for-sale security.
   d. A foreign currency denominated forecasted transaction.

Hedge portions that are not effective are reported in earnings immediately.

FAIR VALUE HEDGES

The change in the fair value of a financial asset or liability is computed as at the end of the period, after providing for the following changes in fair value:

i. From payments received or made, and

ii. From the passage of time, minus the fair value at the beginning of the period.

To qualify as a fair value hedge, both the hedged items and the designated hedging instruments must meet the following criteria:

i. At the hedge's origin, formal documents consist of:
   a. Hedging relationship;
   b. Risk management objectives;
   c. Strategy for undertaking the hedge;
   d. Identification of the hedged item, the hedging instrument, the nature of the risk being hedged, the method of assessing effectiveness and the components that are excluded from the effectiveness of assessment; and
   e. Reasonable method to be used in recognizing the earnings on the asset or liability representing the gain or loss in the case of a hedged firm commitment.

ii. The hedging relationship is expected to be highly effective in producing offsetting fair value changes throughout the hedge period. This relationship must be assessed for every three months and each time the earnings have to be reported in the financial instruments.

iii. If hedging is done with a written option, the combination must provide as much potential for gains from positive fair value changes as potential for losses from negative fair value changes.

According to FASB-133, an asset or liability will be eligible for designation as a hedged item in a fair value hedge if the hedged item is specifically identified as all or a specific portion of a recognized asset or liability or an unrecognized firm commitment is exposed to fair value changes that are attributable to the hedged risk such that earnings would be affected; and is not either re-measured at fair value for financial reporting purposes or an equity instrument issued by the entity.

An asset or liability must satisfy the following criteria if it is to be designated as a hedging item:

- The single item (or portfolio of similar items) must be specifically identified as hedging all or a specific portion.
  a. If similar items are aggregated and hedged, each item has to share the risk exposure that is being hedged (i.e., each individual item must respond in a generally proportionate manner to the change in fair value).
  b. A specific portion must be one of the following:
     i. A percentage of the total asset, liability or portfolio.
     ii. One or more selected contractual cash flows: For instance, the present value of the interest payments due in the first two years of a 4-year debt instrument;
     iii. An embedded put, call, cap or floor that does not qualify as an embedded derivative in an existing asset or liability;
     iv. Residual value in a lessor's net investment in a sales-type or direct financing lease.
- The item has an exposure to fair value changes that could affect earnings.
- The item is not:
  a. Re-measured with changes reported currently in earnings, for example, a foreign currency denominated item;
  b. A minority interest;
  c. A firm commitment to enter into a business combination or to acquire or dispose of a subsidiary; a minority interest; an equity method investee; or
  d. An equity method interest classified in stockholder's equity.

- The item is not a held-to-maturity debt security unless the hedged risk is for something other than for fair value changes in market interest rates or foreign exchange rates; examples include hedges of fair value due to changes in the obligor's creditworthiness, and hedges of fair value due to changes in a prepayment option component.
- If the item is a non-financial asset or liability (other than a recognized loan servicing right or a non-financial firm commitment with financial components), the designated hedged risk is the fair value change of the total hedged item (at its actual location, if applicable); FASB-133 stipulates that the price of a different location cannot be used without adjustment.
- If the item is a financial asset or a liability, a recognized loan servicing right or a non-financial firm commitment with financial components, the designated hedge risk arises out of changes in fair value in:

  a. The total hedged item;

  b. Market interest rates;

  c. Related foreign currency rates;

  d. The obligor's credit worthiness; or

  e. Two or more of the above other than 'a'.

Prepayment risk for a financial asset cannot be hedged but an option component of a pre-payable instrument can be designated as the hedged item in a fair value hedge. Embedded derivatives have to be considered also in designating hedges. For instance, in a hedge of interest rates, the effect of an embedded prepayment option must be considered in the designation of the hedge.

Reporting Gains and Losses from Fair Value Hedges

The accounting for qualifying fair value hedges' gains or losses is as follows:

i. On the hedging instrument, gains and losses are recognized in earnings.

ii. On the hedged item, gains and losses are recognized in earnings, even if they would normally be included in other comprehensive income if not hedged. For example, gains and losses on an available-for-sale security would be taken into income, if this is being hedged.

iii. The carrying amount of the hedged item is adjusted by the gains and losses resulting from the hedged risk.

iv. Differences between the gains and losses on the hedged item and the hedging instrument are either due to amounts excluded from the assessment of hedging effectiveness or due to hedging ineffectiveness. These gains and losses are to be recognized currently in the earnings.

Illustration 1

An available-for-sale security carrying amount is adjusted by the amount resulting from the hedged risk, a fair value hedge.

Hedged item: Available-for-sale security.

Hedging instrument: Put option.

Underlying Price of the security.

Notional amount: 100 shares of the security.

MEASURING THE EFFECTIVENESS OF FAIR VALUE HEDGES

Though specific conditions apply to the hedge type (fair value/cash flow) we can assume that a hedging relationship between an interest bearing financial instrument and an interest rate swap is effective if:

i. The principal amount and the notional amount of the swap match.

ii. The fair value of the swap is zero in the beginning of the transaction.

iii. The net settlements under the swap are computed on each settlement date in the same way as they are calculated on an interest-bearing instrument.

iv. There is no prepayment facility in the financial instrument.

v. The terms are typical for both the instruments and they should not invalidate the assumption.

vi. The maturity date of the instrument and the expiration date of the swap match.

vii. There is no ceiling or floor on the variable interest rate of the swap.

viii. The time period between re-pricing is frequent enough to assume that the variable rate is a market rate.

The fixed rate on the hedged item is not required to exactly match the fixed rate on the swap. The fixed and variable rates on the swap can be changed by the same amount.

Discontinuance of a Fair Value Hedge

The accounting for a fair value hedge should not continue if any of the following occurs:

i. The criteria for a fair value hedge are not met.

ii. The derivative instruments expire or are sold, terminated or exercised.

iii. The designation is removed.

If a fair value hedge is discontinued, a new hedging relationship may be designated with a different hedging instrument and/or a different hedging item, as long as the criteria established in FASB-133 are met.

INEFFECTIVENESS OF A FAIR VALUE HEDGE

If the hedge becomes ineffective, no adjustment of the carrying amount of the hedged item should be recognized from the date when effectiveness was last established. If the event that caused the ineffectiveness is identified, then the carrying amount can be normally for the amount of fair value change that occurred prior to that event. If the fair value hedge is discontinued because a firm commitment does not qualify any longer, any recognized associated asset or liability must be de-recognized with the gain or loss recognized in earnings.

Impairment

All assets and liabilities designated as fair value hedges are subject to the normal GAAP requirements for impairment. Those requirements are to be applied, only after the carrying amounts have been adjusted for the periods to hedge accounting. Since the hedging instrument is a separate asset or liability, its fair value is not considered in applying the impairment criteria to the hedged item.

Cash Flow Hedges

A derivative instrument may be designated as a hedge to the exposure of fluctuating expected cash flows produced by a particular risk. The exposure may be connected with an existing asset or liability or with a forecasted transaction. To qualify as a cash flow hedge, both the hedged items and the designated hedging instruments must meet all of the following criteria:

i. At the hedge's origin, formal documentation exists of the:

   a. Hedging relationship;

   b. Risk management objectives;

   c. Strategy for undertaking the hedge;

   d. Identification of the hedged transaction, the hedging instrument and the nature of the risk being hedged, the method of assessing effectiveness and the components that are excluded from the effectiveness assessment.

ii. Documentation must include:

   a. All relevant details;

   b. The specific nature of any asset or liability involved;

   c. The period/date of occurrence of the forecasted transaction;

   d. The expected currency amounts or expected quantity of the forecasted transaction;

   If a price risk is being hedged in a forecasted sale or purchase, the hedged transaction cannot:

   a. Be specified solely in terms of expected currency amounts;

   b. Be specified as a percentage of sales or purchases.

iii. The current price of the transaction should be identified and the transaction should be described so that it is evident that if a given transaction is or is not a hedged transaction.

iv. The hedging relationship is to be highly effective in producing offsetting cash flows throughout the hedge period. The relationship must be assessed at least every three months and each time financial statements or earnings are reported.

v. If hedging with a written option, the combination must provide at least as much potential for positive cash flow changes as exposure to negative cash flow changes. A derivative that results from the combination of a written option and another non-option derivative is also considered as written option.

vi. A link must be used to modify interest payments or receipts of a recognized financial asset or liability from one variable rate to another variable rate. It has to be between a designated asset and a designated liability and it has to be highly effective. A link occurs when the basis of the interest rate receipt of a designated asset and the basis of the other leg of the swap is the same as the basis of the interest payments for a designated liability.

vii. A non-derivative instrument cannot be designated as a hedging instrument for a cash flow hedge.

Gains and Losses from Cash Flow Hedges

The accounting for qualifying cash flow hedges' gains and losses is as follows:

i. The effective portion of a gain or a loss on the derivative instrument is reported in other comprehensive income.

ii. The portion of the gain or loss on the derivative instrument is reported in earnings.

iii. Any component excluded from the computation of the effectiveness of the derivative instrument is reported in earnings.

iv. Accumulated other comprehensive income from the hedged transaction should be adjusted to the lesser of the following:

   a. The cumulative gain or loss on the derivative from the creation of the hedge minus component excluded from the determination of the hedge effectiveness minus any amounts reclassified from accumulated other comprehensive income into earnings.

   b. The portion of the cumulative gain or loss on the derivative needed to offset the cumulative change in expected future cash flow on the transaction from the creation of hedge minus any amount reclassified from accumulated other comprehensive income into earnings.

v. Any remaining gain or loss is reported in earnings.

Illustration 2

Suppose on August 01, 20x1 a firm X borrows $5 million with a fixed maturity (no prepayment option) of July 31, 2004, carrying interest rate at LIBOR + 0.5%. Interest is due semi-annually. At the same time it enters into a swap arrangement, calling for fixed payments at 8% and receipt of LIBOR + 0.5%, on a notional amount of $5million. On that day prime rate is 7.5% and there is no premium due on the swap arrangement.

This swap qualifies as a cash flow hedge under SFAS 133 and it is an effective hedge since the criteria set forth in the standard are all met. Accordingly, as rates change over the term of the debt and of the swap arrangement, changes in the value of the swap are reflected in other comprehensive income and the swap will appear on the balance sheet as an asset or a liability at fair value. As the maturity of the debt approaches, the swap value converges to zero. Periodic interest expense will be shown in the income statement at an effective rate of 8%.

Assume that the prime rate over the 4-year term of the loan, as of each interest payment date, is as follows, along with the fair value of the remaining term of the interest swap at those dates.

Date	Libor Rate	Fair Value of Swap
Jan. 31, 20x1	6.5	$(150,051)
July 31, 20x1	6.0	$(196,580)
Jan. 31, 20x2	6.5	$(111,296)
July 31, 20x2	7.0	$(45,374)
Jan. 31, 20x3	7.5	0
July 31, 20x3	8.0	$23,576
Jan. 31, 20x4	8.5	$24,038
July 31, 20x4	8.0	0

(Fair values are determined as the present value of future cash flows resulting from expected interest rate differentials, based on current LIBOR rate discounted at 8%).

For example, the fair value of the swap on Jan. 31,20x1 will be calculated as follows:

The present value of seven semi-annual payments due of $25,000 each to be made to the swap counterparty, discounted at 8% (annual) i.e., 25,000 $PVIFA_{(4,7)}$ = 150,051. This is a liability to be reported by the entity on that date. The offset is debited to other comprehensive income since the hedge is assumed to be 100% effective in this case. Pass the semi-annual accounting entries.

Semi-annual accounting entries will be as follows:

Jan. 31, 20x1	Interest expense	a/c	1,75,000	
	To Accrued interest/cash	a/c		1,75,000
	(To accrue or pay semi-annual interest on the debt at the variable rate of LIBOR + 0.5% (6.5 + 0.5)			
	Interest expense	a/c	25,000	
	To Accrued interest/cash	a/c		25,000
	(To record net settlement on swap arrangement (8-7%))			
	Other comprehensive income	a/c	1,50,051	
	To Swap contract	a/c		1,50,051
	(To record the fair value of the swap contract as on this date (a net liability is recorded)			

July 31, 20x1	Interest expense	a/c	1,62,500	
	To Accrued interest	a/c		1,62,500
	(To accrue or pay semi-annual interest on the debt at the variable rate of LIBOR + 0.5%(6 + 0.5%))			
	Interest expense	a/c	37,500	
	To Accrued interest/cash	a/c		37,500
	(To record net settlement on swap arrangement (8-6.5%)			
	Other comprehensive income	a/c	46,529	
	To Swap contract	a/c		46,529
	(To record the fair value of the swap contract as on this date (a net liability is recorded)).			
Jan. 31, 20x2	Interest expense	a/c	1,75,000	
	To Accrued interest	a/c		1,75,000
	(To accrue or pay semi-annual interest on the debt at the variable rate of LIBOR + 0.5%(6.5 + 0.5%))			
	Interest expense	a/c	25,000	
	To Accrued interest/cash	a/c		25,000
	(To record net settlement on swap arrangement (8-7.0%))			
	Swap contract	a/c	85,284	
	To Other comprehensive income	a/c		85,284
	(To record the fair value of the swap contract as on this date (decrease in obligation due to increase in prime rate))			
July 31, 20x2	Interest expense	a/c	1,87,500	
	To Accrued interest	a/c		1,87,500
	(To accrue or pay semi-annual interest on the debt at the variable rate of LIBOR + 0.5%(7 + 0.5%))			
	Interest expense	a/c	12,500	
	To Accrued interest/cash	a/c		12,500
	(To record net settlement on swap arrangement (8-7.5%))			
	Swap contract	a/c	65,922	
	To Other comprehensive income	a/c		65,922
	(To record the fair value of the swap contract as on this date (decrease in obligation due to further increase in prime rate))			
Jan. 31, 20x3	Interest expense	a/c	2,00,000	
	To Accrued interest	a/c		2,00,000
	(To accrue or pay semi-annual interest on the debt at the variable rate of LIBOR + 0.5%(7.5 + 0.5%))			
	Interest expense	a/c	0	
	To Accrued interest/cash	a/c		0
	(To record net settlement on swap arrangement (8-8%))			

	Swap contract	a/c	45,374	
	To Other comprehensive income	a/c		45,374
	(To record the fair value of the swap contract as on this date (further increase in prime rate to original rate of inception of the hedge eliminates fair value of the derivative))			
July 31, 20x3	Interest expense	a/c	2,12,500	
	To Accrued interest	a/c		2,12,500
	(To accrue or pay semi-annual interest on the debt at the variable rate of LIBOR + 0.5%(7.5 + 0.5%))			
	Interest expense	a/c	12,500	
	To Accrued interest/cash	a/c		12,500
	(To record net settlement on swap arrangement (8-8.5%))			
	Swap contract	a/c	23,576	
	To Other comprehensive income	a/c		23,576
	(To record the fair value of the swap contract as on this date (increase in prime rate creates a net asset position for derivative))			
Jan. 31, 20x4	Interest expense	a/c	2,25,000	
	To Accrued interest	a/c		2,25,000
	(To accrue or pay semi-annual interest on the debt at the variable rate of LIBOR + 0.5%(8.5 + 0.5%))			
	Interest expense	a/c	25,000	
	To Accrued interest/cash	a/c		25,000
	(To record net settlement on swap arrangement (8-9%))			
	Swap contract	a/c	462	
	To Other comprehensive income	a/c		462
	(To record the fair value of the swap contract as on this date (increase in asset value due to further increase in prime rate))			
July 31, 20x4	Interest expense	a/c	2,12,500	
	To Accrued interest	a/c		2,12,500
	(To accrue or pay semi-annual interest on the debt at the variable rate of LIBOR + 0.5%(8 + 0.5%))			
	Interest expense	a/c	12,500	
	To Accrued interest/cash	a/c		12,500
	(To record net settlement on swap arrangement (8-8.5%))			
	Swap contract	a/c	24,038	
	To Other comprehensive income	a/c		24,038
	(To record the fair value of the swap contract as on this date (value declines to zero as expiration approaches)).			

FOREIGN CURRENCY HEDGES

The FASB's basic objective in hedge accounting for foreign currency exposure is

i. To continue to permit the hedge accounting required under FASB-52, and

ii. To increase the consistency of accounting guidance by broadening the scope of hedges that are eligible for this treatment.

FASB-133 allows hedges of forecasted foreign currency transactions including some inter-company transactions. Though hedging foreign currency inter-company cash flows with foreign currency options is a common practice FASB-133 permits use of other derivative instruments such as forward contracts since the accounting for all derivative instruments is the same.

Foreign Currency Denominated Forecasted Transaction

Only a derivative instrument can be designated as a cash flow hedge of a foreign currency denominated forecasted transaction. The parties to this transaction can either be external or inter-company. To qualify for hedge accounting, all of the following criteria must be met.

Option on an Interest Rate Swap

The facts of this example are a variation on the previous example.

Illustration 3

Abbott Corp. anticipates as of June 30, 20x0, that as of June 30, 20x2, it will become a borrower of $5 million with a fixed maturity 4 years hence (June 30, 20x6) based on its current credit rating, it expects to be able to borrow at prime + 1/2%. As of June 30, 20x0, it is able to purchase, for a single payment of $25,000, a so-called “swaption” (an option on an interest rate swap), calling for fixed pay at 8% and variable receipt at prime + 1/2%, on a notional amount of $5 million, for a term of 4 years. The option will expire in 2 years. At June 30, 20x0, prime is 7.5%.

Note: The interest rate behavior in this example differs somewhat from the prior example, to better illustrate the “one-sideness” of options, versus the obligation under a swap arrangement or other futures and forwards.

It will assume that the value of the swaption expires ratably over the 2 years.

This swaption qualifies as a cash flow hedge under FASB-133. However, while the change in the fair value of the contract is an effective hedge of the cash flow variability of the prospective debt issuance, the premium paid is a reflection of the time value of money and is thus to be expensed ratably over the period that the swaption is outstanding.

The table below give the prime rate at semi-annual intervals including the 2-year period prior to the debt issuance, plus the 4 years during which the forecasted debt (and the swap, if the option is exercised) will be outstanding, as well as the fair value of the swaption (and later, the swap itself) at these points in time.

Date	Prime Rate (%)	Fair Value of Swaption/Swap*
December 31, 20x0	7.5	0
June 30, 20x1	8.0	77,925
December 31, 20x1	6.5	0
June 30, 20x2	7.0	–84,159
December 31, 20x2	7.5	0
June 30, 20x3	8.0	0
December 31, 20x3	8.5	111,296
June 30, 20x4	8.0	34,689
June 30, 20x5	7.5	0
December 31, 20x5	7.5	0
June 30, 20x6	7.0	0

* Fair value is determined as the present value of future expected interest rate differentials, based on current prime rate, discounted at 8%. An “out-of-the-money” swaption is valued at zero, since the option does not have to be exercised. Since the option is exercised on June 30, 20x2, the value at that date is recorded, although negative.

The value of the swaption contract is only recorded (unless and until exercised, of course, at which point it becomes a contractually binding swap) if it is positive, since if "out-of-the-money" the holder would forego exercise in most instances and thus there is no liability by the holder to be reported. (This example is an illustration of the opposite, however, as despite having a negative value the option holder determines that exercise is advisable.) At June 30, 20x1, for example, the swaption is an asset, since the reference variable rate (prime + 1/2 % or 8.5%) is greater than the fixed swap rate of 8% and thus the expectation is that the option will be exercised at expiration. This would, if present rates hold steady, which is the native assumption, result in a series of eight semi-annual payments from the swap counterparty in the amount of $12,500. Discounting this at a nominal 8%, the present value as the debt origination date (to be June 30, 20x2) would be $84,159, which, when further discounted to June 30, 20x1, yields a fair value of $77,925.

Note that the following period (December 31, 20x1) prime drops to such an extent that the value of the swaption evaporates entirely (actually goes negative, which will not be reported since the holder is under no obligation to exercise it), and the carrying value is therefore eliminated. At expiration, the holder does (for this example) exercise, not withstanding a negative fair value, and from that point forward the fair value of the swap will be reported, whether positive (an asset) or negative (a liability).

As noted above, assume that, at the option expiration date, despite the fact that prime + 1/2% is below the fixed pay rate on the swap, the management of Abbott Corp, is convinced that rates will climb over the 4-year term of the loan, and thus exercises the swaption at that date. Accounting journal entries over the 6 years are as follows:

June 30, 20x0	Swaption contract	a/c	25,000	
	To Cash	a/c		25,000
	(To record purchase premium on swaption contract)			
Dec. 31, 20x0	Loss on hedging transaction	a/c	6,250	
	To Swaption contract	a/c		6,250
	(To record change in time value of swaption contract-charge premium to income since this represents payment for time value of money, which expires ratably over 2 year term.)			
June 30, 20x1	Swaption contract	a/c	77,925	
	To Other comprehensive income	a/c		77,925
	(To record the fair value of the swaption contract as of this date)			
	Loss on hedging transaction	a/c	6,250	
	To Swaption contract	a/c		6,250
	(To record change in time value of swaption contract-charge premium to income since this represents payment for time value of money, which expires ratably over 2-year term.)			
Dec. 31, 20x1	Other comprehensive income	a/c	77,925	
	To Swaption contract	a/c		77,925
	(To record the change in fair value of the swaption contract as of this date; since contract is "out-of-the-money", it is not written down below zero (i.e., a net liability is not reported))			

	Loss on hedging transaction a/c	6,250	
	To Swaption contract a/c		6,250
	(To record change in time value of swaption contract-charge premium to income since this represents payment for time value of money, which expires ratably over 2-year terms)		
June 30, 20x2	Other comprehensive income a/c	84,159	
	To Swap contract a/c		84,159
	(To record the fair value of the swap contract as of this date a net liability is reported since swap option was exercised.)		
	Loss on hedging transaction a/c	6,250	
	To Swaption contract a/c		6,250
	(To record change in time value of swaption contract-charge premium to income since this represents payment for time value of money, which expires ratably over 2-year term.)		
Dec. 31, 20x2	Interest expense a/c	2,00,000	
	To Accrued interest (or cash) a/c		2,00,000
	(To accrue or pay interest on the debt at the variable rate of prime + 1/2% (8.0%)).		
	Interest expense a/c	0	
	To Accrued interest (or cash) a/c		0
	(To record net settlement on swap arrangement [8.0-8.0%])		
	Swap contract a/c	84,159	
	To Other comprehensive income a/c		84,159
	(To record the change in the fair value of the swap contracts as of this date)		
June 30, 20x3	Interest expense	2,12,500	
	To Accrued interest (or cash)		2,12,500
	(To accrue or pay interest on the debt at the variable rate of prime + 1/2% (8.5%)).		
	Receivable from Counterparty (or cash) a/c	12,500	
	To Interest expense a/c		12,500
	(To record net settlement on swap arrangement [8.0-8.5%].)		
	Swap contract a/c	65,527	
	To Other comprehensive income a/c		65,527
	(To record the fair value of the swap contract as of this date)		
Dec. 31, 20x3	Interest expense a/c	2,25,000	
	To Accrued interest (or cash) a/c		2,25,000
	(To accrue or pay interest on the debt at the variable rate of prime + 1/2% (9.0%)).		

	Receivable from counterparty (or cash)	a/c	25,000	
	To Interest expense	a/c		25,000
	(To record net settlement on swap arrangement [8.0-9.0%]).			
	Swap contract	a/c	45,769	
	To Other comprehensive income	a/c		45,769
	(To record the fair value of the swap contract as of this date)			
June 30, 20x4	Interest expense	a/c	2,12,500	
	To Accrued interest (or cash)	a/c		2,12,500
	(To accrue or pay interest on the debt at the variable rate of prime + 1/2% (8.5%)).			
	Receivable from counterparty (or cash)	a/c	12,500	
	To Interest expense	a/c		12,500
	(To record net settlement on swap arrangement [8.0-8.5%]).			
	Other comprehensive income	a/c	65,922	
	To Swap contract	a/c		65,922
	(To record the change in the fair value of the swap contract as of this date (declining prime rate causes swap to lose value)).			
Dec. 31, 20x4	Interest expense	a/c	2,12,500	
	To Accrued interest (or cash)	a/c		2,12,500
	(To accrue or pay interest on the debt at the variable rate of prime + 1/2% (8.5%))			
	Receivable from counterparty (or cash)	a/c	12,500	12,500
	To Interest expense	a/c		
	(To record net settlement on swap arrangement [8.0-8.5%]).			
	Other comprehensive income	a/c	10,685	
	To Swap contract	a/c		10,685
	(To record the fair value of the swap contract as of this date (decline is due to passage of time, as the prime rate expectations have not changed from the earlier period))			
June 30, 20x5	Interest expense	a/c	2,00,000	
	To Accrued interest (or cash)	a/c		2,00,000
	(To accrue or pay interest on the debt at the variable rate of prime + 1/2 % (8.0%)).			
	Receivable from counterparty (or cash)	a/c	0	0
	To Interest expense	a/c		

	(To record net settlement on swap arrangement [8.0-8.0%]).			
	Other comprehensive income	a/c	34,689	
	To Swap contract	a/c		34,689
	(To record the decline in the fair value of the swap contract to zero as of this date)			
Dec. 31, 20x5	Interest expense	a/c	2,00,000	
	To Accrued interest (or cash)	a/c		2,00,000
	(To accrue or pay interest on the debt at the variable rate of prime + 1/2% (8.0%)).			
	Receivable from counterparty (or cash)	a/c	0	0
	To Interest expense	a/c		
	(No change to the zero fair value of the swap contract as of this date)			
June 30, 20x6 (Maturity)	Interest expense	a/c	1,87,500	
	To Accrued interest (or cash)	a/c		1,87,500
	(To accrue or pay interest on the debt at the variable rate of Prime + 1/2% (7.5%)).			
	Interest expense	a/c	12,500	
	To Accrued interest (or cash)	a/c		12,500
	(To record net settlement on swap arrangement [8.0-7.5%])			
	Other comprehensive income	a/c	0	
	To Swap contract	a/c		0

No change to the zero fair value of the swap contract, which expires as of this date.

Effectiveness of Cash Flow Hedges: The assumption of no ineffectiveness in a cash flow hedge between an interest-bearing financial instrument and an interest rate swap can be assumed if all of the following conditions are met:

i. The principal amount and the notional amount of the swap match;

ii. The fair value of the swap is zero at origin;

iii. The net settlements under the swap are computed the same way on each settlement date;

iv. The financial instrument is not pre-payable;

v. The terms are typical for those instruments and do not invalidate the assumption of effectiveness.

vi. All variable rate of interest payments or receipts on the instrument during the swap term are designated as hedged and none beyond that term;

vii. No floor or cap on the variable rate of the swap exists unless the variable rate instrument has one. If the instrument does, the swap must have a comparable (not necessarily equal) one;

viii. Re-pricing dates match; and

ix. The index base for the variable rates match.

The variable rate on the instrument is not required to exactly match the variable rate on the swap. The fixed and variable rates on the swap can be changed by the same amount.

Illustration 4

Using Options to Hedge Future Purchase of Inventory: Friendly Chemicals Corp. uses petroleum as a feedstock from which it produces a range of chemicals for sale to producers of synthetic fabrics and other consumer goods. It is concerned about the rising price of oil and decides to hedge a major purchase it plans to make in mid-20x1. Oil futures and options are traded on the New York Mercantile exchange and other markets; Friendly decides to use options rather than futures because it is only interested in protecting itself from a price increase; if prices decline, it wishes to reap that benefit rather than suffer the loss which would result from holding a futures contract in a declining market environment.

At December 31, 20x0, Friendly projects a need for 10 million barrels of crude oil of a defined grade to be purchased by mid-20x1; this will suffice for production through mid-20x2. The current world price for this grade of crude is $14.50 per barrel, but prices have been rising recently. Management desires to limit its crude oil costs to no higher than $15.75 per barrel, and accordingly purchases, at a cost of $2 million, an option to purchase upto 10 million barrels at a cost of $15.55 per barrel (which, when added to the option premium, would make the total cost $15.75 per barrel if the full 10 million barrels are acquired), at any time through December 20x1.

Management has studied the behavior of option prices and has concluded that changes in option prices, which relate to time value, are not correlated to price changes and hence is ineffective in hedging price changes. On the other hand, changes in option prices which pertain to pricing changes (so-called "intrinsic value changes") are highly effective as hedging vehicles. The table below reports the value of these options, analyzed in terms of time and intrinsic value, over the period from December 20x0 through December 20x1.

Fair Value of Option Relating To

Date	Price of Oil/Barrel	Time Value*	Intrisinc Value
December 31, $14.50	$2,000,000	$0	
January 31, 20x1	14.90	1,900,000	0
February 28, 20x1	15.30	1,800,000	0
March 31, 20x1	15.80	1,700,000	2,500,000
April 30, 20x1	16.00	1,600,000	4,500,000
May 31, 20x1	15.85	1,500,000	3,000,000
June 30, 20x1	16.00	700,000	2,250,000
July 31, 20x1	15.60	650,000	250,000
August 31, 20x1	15.50	600,000	0
September 30, 20x1	15.75	550,000	1,000,000
October 31, 20x1	15.80	500,000	1,250,000
November 30, 20x1	15.85	450,000	1,500,000
December 31, 20x1	15.90	400,000	1,750,000

* This example does not address how the time value of options would be computed in practice.

At the end of June 20x0, Friendly Chemicals exercised options for 5 million barrels, paying $15.55 per barrel for oil selling on the world markets for $16.00 each. It holds the remaining options until December, when it sells these for an aggregate price of $2.1 million, a slight discount to the nominal fair value at that date.

The inventory acquired in mid-20x0 is processed and included in goods available for sale. Sales of these goods, in terms of the 5 million barrels of crude oil which were consumed in their production, are as follows:

Date	Equivalent Barrels Sold in Month	Equivalent Barrels on Hand At Month End
June 30, 20x1	300,000	4,700,000
July 31, 20x1	250,000	4,450,000
August 31, 20x1	400,000	4,050,000
September 30, 20x1	350,000	3,700,000
October 31, 20x1	550,000	3,150,000
November 30, 20x1	500,000	2,650,000
December 31, 20x1	650,000	2,000,000

Based on the foregoing facts, the journal entries prepared on a monthly basis (for illustrative purposes) for the period December 20x0 through December 20x1 are as follows:

Dec. 31, 20x0	Option contract	a/c	2,000,000	
	Cash	a/c		2,000,000
	(To record purchase premium on option contract for up to 10 million barrels of oil at a price of $15.55 per barrel.)			
Jan. 31, 20x1	Loss on hedging transaction	a/c	100,000	
	To Option contract	a/c		100,000
	(To record change in time value of option contract-charge premium to income since this represents payment for time value of money, which expires ratably over 2-year term and does not qualify for hedge accounting treatment.)			
	Option contract	a/c	0	
	To Other comprehensive income	a/c		0
	(To reflect change in intrinsic value of option contracts (no value at this date)).			
Feb. 28, 20x1	Loss on hedging transaction	a/c	100,000	
	To Option contract	a/c		100,000
	(To record change in the time value of option contract-charge premium to income since this represents payment for time value of money, which expires ratably over 2-year term and does not qualify for hedge accounting treatment).			
	Option contract	a/c	0	
	To Other comprehensive income	a/c		0
	(To reflect change in intrinsic value of option contracts (no value at this date).			
March 31, 20x1	Loss on hedging transaction	a/c	100,000	
	To Option contract	a/c		100,000

	(To record change in the time value of option contract-charge premium to income since this represents payment for time value of money, which expires ratably over 2-year term and does not qualify for hedge accounting treatment.)			
	Option contract	a/c	2,500,000	
	To Other comprehensive income	a/c		2,500,000
	(To reflect change in intrinsic value of option contracts)			
April 30, 20x1	Loss on hedging transaction	a/c	100,000	
	To Option contract	a/c		100,000
	(To record change in time value of option contract-charge premium to income since this represents payment for time value of money, which expires ratably over 2-year term and does not qualify for hedge accounting treatment).			
	Option contract	a/c	2,000,000	
	To Other comprehensive income	a/c		2,000,000
	(To reflect change in intrinsic value of option contracts (further increase in value)).			
May 31, 20x1	Loss on hedging transaction	a/c	100,000	
	To Option contract	a/c		100,000
	(To record change in time value of option-charge premium to income since this represents payments for time value of money, which expires ratably over 2-year term and does not qualify for hedge accounting treatment).			
	Other comprehensive income	a/c	1,500,000	
	To Option contract	a/c		1,500,000
	(To reflect change in intrinsic value of option contracts (decline in value)).			
June 30, 20x1	Loss on hedging transaction	a/c	800,000	
	To Option contract	a/c		800,000
	(To record change in time value of option contract-charge premium to income since this represents payment for time value of money, which expires ratably over 2-year term and does not qualify for hedge accounting treatment; since one-half of the options were exercised in June, the remaining un-expensed time value of that portion is also entirely written off at this time).			
	Option contract	a/c	1,500,000	
	To Other comprehensive income	a/c		1,500,000

	(To reflect change in intrinsic value of option contracts (further increase in value) before accounting for exercise on 5 million barrels).			
June 30 intrinsic value of options before exercise 4,500,000				
	Allocation to oil purchased at $15.55 To Remaining intrinsic value of option	a/c a/c	2,250,000	2,250,000
	(The allocation to exercised options will be maintained in other comprehensive income until transferred to cost of goods sold as a contra cost, as the 5 million barrels are sold, at the rate of 45% per equivalent barrel ($16.00 – $15.55)).			
	Inventory To Cash (or accounts payable)	a/c a/c	77,750,000	77,750,000
	(To record purchase of 5 million barrels of oil at option price of $15.55/barrel)			
	Inventory To Option contract	a/c a/c	2,250,000	2,250,000
	(To increase the recorded value of the inventory to include the fair value of options given up (exercised) in acquiring the oil (taken together, the cash purchase price and the fair value of options surrendered add to $16 per barrel, the world market price at date of purchase))			
	Cost of goods sold To Inventory	a/c a/c	4,800,000	4,800,000
	(To record cost of goods sold (300,000 barrels at $16) before amortizing deferred hedging gain in other comprehensive income)			
	Other comprehensive income To Cost of goods sold	a/c a/c	135,000	135,000
	(To amortize deferred hedging gain at rate of 45% per barrel sold)			
July 31, 20x1	Loss on hedging transaction To Option contract	a/c a/c	50,000	50,000
	(To record change in time value of option contract-charge premium to income since this represents payment for time value of money, which expires ratably over 2-year term, and does not qualify for hedge accounting treatment)			
	Other comprehensive income To Option contract	a/c a/c	2,000,000	2,000,000

	(To reflect change in intrinsic value of remaining option contracts (decline in value))			
	Cost of goods sold	a/c	4,000,000	
	To Inventory	a/c		4,000,000
	(To record cost of goods sold (250,000 barrels at $ 16) before amortizing deferred hedging gain in other comprehensive income).			
	Other comprehensive income	a/c	112,500	
	To Cost of goods sold	a/c		112,500
	(To amortize deferred hedging gain at rate of 45% per barrel sold).			
Aug. 31, 20x1	Loss on hedging transaction	a/c	50,000	
	To Option contract	a/c		50,000
	(To record change in time value of option contract – charge premium to income since this represents payment for time value of money, which expires ratably over 2-year term, and does not qualify for hedge accounting treatment).			
	Other comprehensive income	a/c	250,000	
	To Option contract	a/c		250,000
	(To reflect change in intrinsic value of remaining option contracts (decline in value of zero).			
	Cost of goods sold	a/c	6,400,000	
	To Inventory	a/c		6,400,000
	(To record cost of goods sold (400,000 barrels at $16) before amortizing deferred hedging gain in other comprehensive income).			
	Other comprehensive income	a/c	180,000	
	To Cost of goods sold	a/c		180,000
	(To amortize deferred hedging gain at rate of 45% per barrel sold).			
Sept. 30, 20x1	Loss on hedging transaction	a/c	50,000	
	To Option contract	a/c		50,000
	(To record change in time value of option contract-charge premium to income since this represents payment for time value of money, which expires ratably over 2-year term, and does not qualify for hedge accounting treatment).			
	Option contract	a/c	1,000,000	
	To Other comprehensive income	a/c		1,000,000

	(To reflect change in intrinsic value of remaining option contracts (increase in value)			
	Cost of goods sold To Inventory	a/c a/c	5,600,000	 5,600,000
	(To record cost of goods sold before amortizing deferred hedging gain in other comprehensive income).			
	Other comprehensive income To Cost of goods sold	a/c a/c	1,57,500	 1,57,500
	(To amortize deferred hedging gain at rate of 45% per barrel sold)			
Oct. 31, 20x1	Loss on hedging transaction To Option contract	a/c a/c	50,000	 50,000
	(To record change in time value of option contract-charge premium to income since this represents payment for time value of money, which expires ratably over 2-year term, and does not qualify for hedge accounting treatment).			
	Option contract To Other comprehensive income	a/c a/c	2,50,000	 2,50,000
	(To reflect change in intrinsic value of remaining option contracts (further increase in value)).			
	Cost of goods sold To Inventory	a/c a/c	8,800,000	 8,800,000
	(To record cost of goods sold (550,000 barrels at $16) before amortizing deferred hedging gain in other comprehensive income)			
	Other comprehensive income To Cost of goods sold	a/c a/c	2,47,500	 2,47,500
	(To amortize deferred hedging gain at rate of 45% per barrel sold)			
Nov. 30, 20x1	Loss on hedging transaction To Option contract	a/c a/c	50,000	 50,000
	(To record change in time value of option contract-charge premium to income since this represents payment for time value of money, which expires ratably over 2-year term, and does not qualify for hedge accounting treatment).			
	Option contract To Other comprehensive income	a/c a/c	2,50,000	 2,50,000

	To reflect change in intrinsic value of remaining option contracts (further increase in value).			
	Cost of goods sold	a/c	8,00,000	
	To Inventory	a/c		8,00,000
	(To record cost of goods sold (500,000 barrels at $16) before amortizing deferred hedging gain in other comprehensive income).			
	Other comprehensive income	a/c	2,25,000	
	To Cost of goods sold	a/c		2,25,000
	(To amortize deferred hedging gain at rate of 45% per barrel sold)			
Dec. 31, 20x1	Loss on hedging transaction	a/c	50,000	
	To Option contract	a/c		50,000
	(To record change in time value of option contract-charge premium to incomes since this represents payment for time value of money, which expires ratably over 2-year term, and does not qualify for hedge accounting treatment).			
	Option contract	a/c	250,000	
	To Other comprehensive income	a/c		250,000
	(To reflect change in intrinsic value of remaining option contracts (further increase in value) before sale of options).			
	Cost of goods sold	a/c	10,400,000	
	To Inventory	a/c		10,400,000
	(To record cost of goods sold (650,000 barrels at $16) before amortizing deferred hedging gain in other comprehensive income).			
	Other comprehensive income	a/c	292,500	
	To Cost of goods sold	a/c		292,500
	(To amortize deferred hedging gain at rate of 45% per barrel sold).			
	Cash	a/c	2,100,000	
	Loss on sale of options	a/c	50,000	
	To Option contract	a/c		2,150,000
	Other comprehensive income	a/c	1,750,000	
	To Gain on sale of options	a/c		1,750,000

To record sale of remaining option contracts; the cash price was $50,000 lower than carrying value of asset sold (options having unexpired time value of $400,000 plus intrinsic value of $1,750,000), but transfer of other comprehensive income to income recognize formerly deferred gain; since no further inventory purchases are planned in connection with this hedging activity, the unrealized gain is taken into income.

Note that at December 31, 20x1, other comprehensive income has a remaining credit balance of $900,000, which represents the deferred gain pertaining to the 2 million equivalent barrels of oil in inventory. As this is sold, the other comprehensive income will be transferred to cost of goods sold as a reduction of cost of sales.

TRANSLATION OF FOREIGN CURRENCY TRANSACTIONS

The principles stated in FASB-52 apply to the translation of:

i. Foreign currency transactions (example, exports, imports, and loans), which are denominated in a currency other than a company's functional currency.

ii. Foreign currency financial statements of branches, divisions, subsidiaries, and other investments.

The objectives of translation are to provide:

i. Information relative to the expected economic effects of rate changes on an enterprise's cash flows and equity.

ii. Information of each individual foreign consolidated entity as reflected by functional currency of each reporting entity in consolidated financial statements.

Terminologies

Foreign currency translation: The process of expressing (in the reporting currency of the enterprise) the amounts that are denominated or measured in a different currency.

Forward exchange contract: An agreement to exchange at a specified future date currencies of different countries at a specified rate (forward rate).

Functional currency: An entity's functional currency is the currency of the primary economic environment in which the entity operates; normally, that is the currency of the environment in which an entity primarily generates and expends cash.

Local currency: The currency of a particular country being referred to.

Monetary items: Cash, claims to receive a fixed amount of cash and obligations to pay a fixed amount of cash.

Non-monetary items: All balance sheet items other than cash claims to cash, and cash obligations.

Re-measurement: If an entity's books and records are not kept in its functional currency, re-measurement into the functional currency is required. Monetary balances are translated by using the current exchange rate, and non-monetary balances are translated by using historical exchange rates. If the US dollar is the functional currency, re-measurement into the reporting currency (the US dollar) obviates translation.

Reporting currency: The currency in which an enterprise prepares its financial statements.

Reporting enterprise: An entity or group whose financial statements are being referred to. In this statement, those financial statements reflect (a) the financial statements of one or more foreign operations by combination, consolidation, or equity accounting; (b) foreign currency transactions; or (c) both of the foregoing.

Transaction gain or loss: Transaction gains or losses result from a change in exchange rates between the functional currency and the currency in which a foreign currency transaction is denominated. They represent an increase or decrease in (i) the actual functional currency cash flows realized upon settlement of foreign currency transactions and (ii) the expected functional currency flows on unsettled foreign currency transactions.

Translation adjustments: Translation adjustments result from the process of translating financial statements from the entity's functional currency into the reporting currency.

TRANSLATION OF FOREIGN CURRENCY FINANCIAL STATEMENTS

Selection of the Functional Currency: Before the financial statements of a foreign branch, division, or subsidiary are translated into US dollars, the management of the US company must make a decision as to which currency is the functional currency of the foreign entity. Once chosen, the functional currency cannot be changed unless it is clear that economic facts and circumstances have changed. Additionally, previously issued financial statements are not restated for any changes in the functional currency. The functional currency decision is crucial because different translation methods are applied which may have a material effect on the US Company's financial statements.

The factors to be considered in selection of a foreign currency are:

i. The impact of the foreign entity's cash flows on the parent's cash flows and their immediate availability for remittance to the parent.

ii. The responsiveness of the foreign entities sales prices to exchange rate changes and to international competition.

iii. The currency in which the foreign entities sales market is denominated.

iv. The expenses incurred by the foreign entity.

v. The source of financing of the foreign entity.

vi. The volume of inter-company transactions between the parent and the foreign entity.

Translation Methods: The first method is known as the current rate method and is the approach mandated by FASB-52 when the functional currency is the foreign currency. All assets and liabilities are translated at the current rate and those revenues and expenses that occur evenly over the year may be translated at the weighted-average rate for the year.

Under this approach, the reasoning follows that foreign-denominated debt is used to purchase assets, which create foreign-denominated revenues. These assets act as a hedge against the debt from changes in the exchanges rate. The excess (net) assets will, however, be affected by this foreign exchange risk, and this is the effect which is recognized by the parent.

The second method is the re-measurement method, which is sometimes referred to as the monetary/non-monetary method. This is the approach required by FASB-52 when the foreign entity's books and records are not maintained in the functional currency. This method translates monetary assets (cash and other assets and liabilities that will be settled in cash) at the current rate. Non-monetary assets, liabilities, and the stockholders' equity accounts are translated at the appropriate historical rate. The appropriate historical rate would be the exchange rate at the date the transaction in the non-monetary account originated. Also, the income statement accounts related to non-monetary assets and liabilities, such as cost of goods sold (inventory), depreciation (property, plant, and equipment), and goodwill amortization (goodwill) are translated at the same rate as used for the balance sheet translation. Other revenues and expenses occurring evenly over the year may be translated at the weighted-average exchange rate for the period.

Application of the Current Rate Method

Assume that a US company has a 100% owned subsidiary in Germany that commenced operations in 20x0. The subsidiary's operations consist of leasing space in an office building. This building, which cost 500 Deutsche Marks (DM), was financed primarily by a German bank. All revenues and cash expenses are received and paid in DM. The subsidiary also maintains its books and records in DM. As a result, management of the US Company has decided that the DM is the functional currency.

The subsidiary's balance sheets at December 31, 20x0, and its combined statement of income and retained earnings for the year ended December 31, 20x0, are presented below in DM.

German Company Balance Sheet at December 31, 20x0

Assets			Liabilities and Stockholders' Equity		
Cash	DM	50	Accounts payable	DM	30
Not receivable		20	Unearned rent		10
Land		100	Mortgage payable		400
Building		500	Common stock		40
Accumulated depreciation		(10)	Additional paid-in capital		160
			Retained earnings		20
Total assets	DM	660	Total liabilities and stockholders' equity	DM	660

German Company Combined Statement of Income and Retained Earnings for the Year Ended December 31, 20x0

Revenues	DM	200
Operating expenses (including depreciation expense of 10)		170
Net income	DM	30
Add: Retained earnings	January 1, 20x0	–
Deduct dividends declared		(10)
Retained earnings	December 31, 20x0	20

Various exchange rates for 20x0 are as follows:

DM 1 = 0.54 at the beginning of 20x1 (when the common stock was issued and the land and building were financed through the mortgage)

DM 1 = 0.50 Weighted-average for 20x1

DM 1 = 0.49 at the date the dividends were declared and the unearned rent was received

DM 1 = 0.46 at the end of 20x1

Since the DM is the functional currency, the German Company's financial statements must be translated into US dollars by the current rate method. This translation process is illustrated below:

German Company Balance Sheet Translation (DM is the functional currency) at December 31, 20x0

Assets	DM		Exchange Rate	US dollars
Cash	DM	50	0.46	$ 23
Accounts receivable		20	0.46	9.2
Land		100	0.46	46.00
Building (net)		490	0.46	25.40
Total assets	DM	660		$ 03.60

Liabilities and Stockholder's Equity

Accounts payable	DM	30	0.46	$	13.50
Unearned rent		10	0.46		4.50
Mortgage payable		400	0.46	$	180.00
Common stock		40	0.54	$	16.00
Additional paid-in capital		160	0.54		64.00
Retained earnings		20	See income statement		8.70
Translation adjustments		—	—		10.30
Total liabilities and stockholders' DM equity		660		$	297.00

German Company Combined Income and Retained Earnings Statement Translation for the Year Ended December 31, 20x0

	DM		Exchange Rate	US dollars
Revenues	DM	200	0.50	100
Expenses (including DM 10 Depreciation expense)		170	0.50	15
Net income	DM	30	0.50	15
Add retained earnings	January 1		—	—
Deduct dividends declared		(10)	0.49	(4.9)
Retained earnings				
December 31	DM	20		10.1

German Company Statement of Cash Flows for the Year ended December 31, 20x0

Operating Activities	DM		Exchange Rate		US dollars
Net income	DM	30	0.50	$	15.0
Adjustments to reconcile net income to net cash provided by operating activities:					
Depreciation		10	0.50		5.0
Increase in accounts receivable		(20)	0.50		(10.0)
Increase in accounts payable		30	0.50		15.0
Increase in unearned rent		10	0.49		4.9
Net cash provided by operating activities	DM	60		$	29.9
Investing activities					
Purchase of land		(100)	0.54		(54.00)
Purchase of building		(500)	0.54		(270.00)
Net cash used by investing activities	DM	(600)		$	(324.0)
Financing activities					
Common stock issue		200	0.54		108.0
Mortgage payable		400	0.54		216.0
Dividends		(10)	0.49		(4.9)
Net cash provided by financing	DM	590		$	319.1
Effect on exchange rate changes on cash		N/A			1.00
Increase in cash and equivalents	DM	50		$	23.0
Cash at beginning of year		-0-			-0-
Cash at end of year	DM	50	0.46	$	23.0

The following points should be noted concerning the current rate method:

i. All assets and liabilities are translated using the current exchange rate at the balance sheet date (DM 1 = $.45). All revenues and expenses should be translated at the rates in effect when these items are recognized during the period. Due to practical considerations, however, weighted-average rates can be used to translate revenues and expenses (DM 1 = $.43).

ii. Stockholders' equity accounts are translated by using historical exchange rates. Common stock was issued at the beginning of 20x0 when the exchange rate was DM 1 = $.40. The translated balance of retained earnings is the result of the weighted-average rate applied to revenues and expenses and the specific rate in effect when the dividends were declared (DM 1 = $.42).

iii. Translation adjustments result from translating all assets and liabilities at the current rate, while stockholders' equity is translated by using historical and weighted-average rates. The adjustments have no direct effect on cash flows. Also, the translation adjustment is due to the net investment rather than the subsidiary's operations. For these reasons, the cumulative translation adjustments balance is reported as a component of Accumulated Other Comprehensive Income (AOCI) in the stockholders' equity section of the US parent company's consolidated balance sheet. This balance essentially equates the total debits of the subsidiary (now expressed in US dollars) with the total credits (also in US dollars). It also may be determined directly, as shown next, to verify the translation process.

iv. The translation adjustments credit of $10.30 is calculated as follows for the differences between the exchange rate of $0.45 at the end of the year and the applicable exchange rate at the time of the change in net assets:

   Net assets at the beginning of 20x0

   (after common stock was issued and the land and building were acquired through mortgage financing) DM 200

   ($0.46 – $0.54) = $10.00 credit

   Net income DM 30 ($0.46 – $0.5) = .60 credit

   Dividends declared DM 10 ($0.46 – $0.49) = .30 debit

   Translation adjustment $16.9 credit.

v. The translation adjustments balance that appears as a component of AOCI in the stockholders' equity section is cumulative in nature. Consequently, the change in this balance during the year should be disclosed as Other Comprehensive Income (OCI) for the period. In the illustration, this balance went from zero to $10.30 at the end of 20x0. In addition, assume the following occurred during 20x1:

German Company Balance Sheet December 31, 20x1

Assets	20x1		20x0		Increase/ Decrease	
Cash	DM	100	DM	50	DM	50
Accounts receivable		-0-		20		(20)
Land		150		100		50
Building (net)		480		490		(10)
Total assets	DM	730	DM	660	DM	70
Liabilities and Stockholders' Equity						
Accounts payable	DM	50	DM	30	DM	20
Unearned rent		-0-		10		(10)
Mortgage payable		450		400		50
Common stock		40		40		-0-
Additional paid-in capital		160		160		-0-
Retained earnings		30		20		10
Total liabilities and stockholders' equity	DM	730	DM	660	DM	70

German Company Combined Statement of Income and Retained Earnings for the Year Ended December 31, 20x1

Revenues	DM	220
Operating expenses (including depreciation exp. of DM 10)		170
Net income	DM	50
Add: Retained earnings	Jan. 1	2000
Less: Dividends declared		(40)
Retained earnings	Dec.31	2000
Exchange rates were:		
DM 1 = \$.45 at the beginning of 20x1		
DM 1 = \$.48 weighted-average for 20x1		
DM 1 = \$.50 at the end of 20x1		
DM 1 = \$.49 when dividends were declared in 20x1 and additional land bought by incurring mortgage		

The translation process for 20x1 is illustrated below.

German Company Balance Sheet Translation (DM is the functional currency) at December 31, 20x1

Assets	DM		Exchange Rate	US dollars
Cash	DM	100	.50	\$50.00
Land		150	.50	75.00
Building		480	.50	240.00
Total assets	DM	730		\$365.00
Liabilities and Stockholders' Equity				
Accounts payable	DM	50	.50	\$25.00
Mortgage payable		450	.50	225.00
Common stock		40	.40	16.00
Addl. Paid-in capital		160	.40	64.00
Retained earnings		30	(see income statement)	13.10
Translation adjustments		—		21.90
Total liabilities and stockholders' equity	DM	730		\$365.00

German Company Combined Income and Retained Earnings Statement Translation for the Year Ended December 31, 20x1

	DM		Exchange Rate	US dollars
Revenues	DM	220	.48	\$105.60
Operating expenses (including depreciation of DM 10)		170	.48	81.60
Net income	DM	50	.48	\$24.00
Add: Retained earnings	1/1/00		20	—
Less: Dividends declared		(40)	.49	(19.60)
Retained earnings	12/31/20x1	DM	30	0.49

German Company Statement of Cash Flows for the Year Ended December 31, 20x1

	DM		Exchange Rate	US dollars
Operating activities				
Net income	DM	50	.48	$24.00
Adjustments to reconcile net income to net cash provided by operating activities:				
Depreciation		10	.48	4.80
Decrease in accounts receivable		20	.48	9.60
Increase in accounts payable		20	.48	9.60
Decrease in unearned rent		(10)	.48	(4.80)
Net cash provided by operating activities	DM	90		(24.50)
Investing activities				
Purchase of land		(50)	.49	(24.50)
Net cash provided by operating activities		50	(24.50)	
Financing activities				
Mortgage payable		50	.49	(24.50)
Dividends		(40)	.49	(19.60)
Net cash provided by financing		10		4.90
Effect of exchange rate changes on cash		NA		3.90
Increase in cash and equivalents	DM	50		$27.50
Cash at beginning of year		50		22.50
Cash at end of year	DM	100	.50	$50.00

Using the analysis that was presented before, the change in the translation adjustment attributable to 20x1 would be computed as follows:

Net assets at January 1, 20x1	DM 220 ($.50 – $.45) =	$11.00 credit
Net income for 20x1	DM 50 ($.50 – $.48) =	1.00 credit
Less: Dividends for 20x1	DM 40 ($.50 – $.49) =	.40 credit
Total		$11.60 credit

The balance in the cumulative translation adjustment account at the end of 20x1 would be $21.90 ($10.30 from 20x0 and $11.60 from 20x1).

vi. The use of the equity method by the US company in accounting for the subsidiary would result in the following journal entries (in '000s), based upon the information presented above:

	20x0		20x1	
Original investment				
Investment in German subsidiary	80*		–	
Cash		80.00		–
*$.40 x common stock of DM 40 plus additional paid-in capital of DM 160				
Earnings pickup				
Investment in German subsidiary	12.90		24**	
Equity in subsidiary income		12.90		24
**$.48 x net income of DM 50				

Dividends received				
Cash	4.20		19.60	
Investment in German subsidiary		4.20		19.60
Translation adjustments				
Investment in German subsidiary	10.30		11.60	
OCI–Translation adjustments		10.30		11.60

Note that the stockholders' equity of the US parent company should be the same whether or not the German subsidiary is consolidated (APB 18, para 19). Since the subsidiary does not report the translation adjustments on its financial statements, care should be exercised so that it is not forgotten in the application of the equity method.

vii. If the US Company disposes of its investment in the German subsidiary, the cumulative translation adjustments balance becomes part of the gain or loss that results from the transaction and must be eliminated. For example, assume that on January 2, 20x2, the US Company sells its entire investment for DM 300. The exchange rate at this date is DM 1 = $.50. The balance in the investment account at December 31, 20x2, is $115 as a result of the entries made previously.

The following entries would be made by the US parent company to reflect the sale of the investment:

Cash (DM 300 x $.50)	150.00	
Investment in German subsidiary		115.00
Gain from sale of subsidiary		35.00
AOCI-Translation adjustments	21.90	
Gain from sale of subsidiary		21.90

If the US company had sold a portion of its investment in the German subsidiary, only a pro rata portion of the accumulated translation adjustments balance would have become part of the gain or loss from the transaction (FASB Interpretation 37). To illustrate, if 80% of the German subsidiary was sold for DM 250 on January 2, 20x2, the following journal entries would be made:

Cash	125.00	
Investment in German subsidiary(.8x$115)		92.00
Gain from sale of subsidiary		33.00
AOCI-Translation adjustments (.8 x $21.90)	17.52	
Gain from sale of subsidiary		17.52

APPLICATION OF THE RE-MEASUREMENT METHOD

In the previous situation, the DM was the functional currency because the German subsidiary's cash flows were primarily in DM. Assume, however, that the financing of the land and building was in US dollars instead of DM and that the mortgage payable is denominated in US dollars (i.e., must be paid in US dollars). Although the rents collected and the majority of the cash flows for expenses are in DM, management has decided that, due to the manner of financing, the US dollar is the functional currency. The books and records, however, are maintained in DM.

The re-measurement of the German Financial statements is accomplished by use of the re-measurement method (also known as the monetary/non-monetary method). This method is illustrated below using the same information that was presented before for the German subsidiary.

German Company Balance Sheet (Re-measurement) (US dollar is the functional currency) at December 31, 20x0

Assets	DM		Exchange Rate		US dollars
Cash	DM	50	.45	$	22.50
Note receivable		20	.45		9.00
Land		100	.40		40.00
Building (net)		490	.40		196.00
Total assets	DM	660		$	267.50
Liabilities and Stockholders' Equity					
Accounts payable	DM	30	.45	$	13.50
Unearned rent		10	.42		4.20
Mortgage payable		400	.45		180.00
Common stock		40	.40	16.00	
Additional paid-in capital		160	.40	64.00	
Retained earnings		20	See income statement	(10.20)	
Total liabilities and stockholders' equity	DM	660		$	267.50

German Company Combined Income and Retained Earnings Statement Remeasurement (US dollar is the functional currency) for the Year ended December 31, 20x0

	DM		Exchange Rate	US dollars
Revenues	DM	200	.43	$ 86.00
Expenses (not including depreciation)		(160)	.43	(68.80)
Depreciation expense		(10)	.40	(4.00)
Re-measurement loss		—	See analysis below	(19.20)
Net income (loss)	DM	30	—	$(6.00)
Retained earnings January 1		—	—	—
Dividends declared		(10)	.42	(4.20)
Retained earnings December 31		DM	20	$(10.20)

German Company Re-measurement Loss for the Year Ended December 31, 20x0

	DM					US dollars			
		Debit		Credit	Exchange Rate		Debit		Credit
Cash	DM	50			.45	$	22.50		
Note receivable		20			.45		9.00		
Land		100			.40		40.00		
Buildings (net)		490			.40		196.00		
Accounts payable			DM	30	.45			$	13.50
Unearned rent				10	.42				4.20
Mortgage payable				400	.45				180.00
Common stock				40	.40				16.00
Additional paid-in capital				160	.40				64.00

	DM Debit	DM Credit	Exchange Rate	US dollars Debit	US dollars Credit
Retained earnings		—	—		—
Dividends declared	10		.42	4.20	
Revenues		200	.43		86.00
Operating expenses	160		.43	68.80	
Depreciation expenses	10		.40	4.00	
Totals	DM 840	DM 840		$ 344.50	$ 363.70
Re-measurements loss				19.20	
Totals				$ 363.70	$ 363.70

The following observations should be noted about the re-measurement method:

i. Assets and liabilities which have historical cost balances (non-monetary assets and liabilities) are re-measured by using historical exchange rates (i.e., the rates in effect when the transactions occurred). Monetary assets and monetary liabilities, cash and those items that will be settled in cash, are re-measured by using the current exchange rate at the balance sheet date. In 20x1, the unearned rent of DM 10 from 20x0 would be re-measured at the rate of DM 1 = $.42. The unearned rent at the end of 20x1 is not considered a monetary liability. Therefore, the $.42 historical exchange rate should be used for all applicable future years.

ii. Revenues and expenses that occur frequently during a period are re-measured, for practical purposes, by using the weighted-average exchange rate for the period. Revenues and expenses that represent allocations of historical balances (example, depreciation, cost of goods sold, and amortization of any intangibles) are re-measured by using historical exchange rates. Note that this is a different treatment as compared to the current rate method.

iii. If the functional currency is the US dollar rather than the local foreign currency, the amounts of specific line items presented in the reconciliation of net income to net cash flow from operating activities will be different for non-monetary items (example, depreciation). Note, however, that the net cash flow from operating activities will be the same in the reporting currency regardless of the applicable functional currency.

iv. The calculation of the re-measurement gain (loss), in a purely mechanical sense, is the amount needed to make the dollar debits equal the dollar credits in the German company's trial balance.

v. The re-measurement loss of $19.20 is reported on the US Company's consolidated income statement because the US dollar is the functional currency. When the reporting currency is the functional currency, as it is in this example, it is assumed that all of the foreign entity's transactions occurred in US dollars. Accordingly, re-measurement gains and losses are taken immediately to the income statement in the year in which they occur as they can be expected to have direct cash flow effects. They are not deferred in a translation adjustments account as they were when the functional currency was the DM (current rate method).

vi. The use of the equity method of accounting for the subsidiary would result in the following entries by the US parent company during 20x0:

Original investment		
Investment in German subsidiary	80.00	
Cash		80.00
Earnings (loss) pickup		
Equity in subsidiary loss	6.00	
Investment in German subsidiary		6.00
Dividends received		
Cash	4.20	
Investment in German subsidiary		4.20

Note that re-measurement gains and losses are included in the subsidiary's net income (net loss) as determined in US dollars before the equity pickup is made by the US company.

vii. In highly inflationary economies, those in which cumulative inflation is greater than 100% over a 3-year period, the FASB requires that the functional currency be the reporting currency, that is, the US dollar (FASB-52, para 11). The re-measurement method must be used in this situation even though the factors indicate the local currency is the functional currency. The Board made this decision in order to prevent the evaporation of the foreign entity's fixed assets, a result that would occur if the local currency was the functional currency.

Translation of Foreign Currency Transactions

According to FASB-52, a foreign currency transaction is a transaction "...denominated in a currency other than the entity's functional currency." Denominated means that the amount to be received or paid is fixed in terms of the number of units of a particular foreign currency regardless of changes in the exchange rate. From the viewpoint of a US company, a foreign currency transaction results when it imports or exports goods or services to a foreign entity or makes a loan involving a foreign entity and agrees to settle the transaction in currency other than the US dollar (the functional currency of the US company). In these situations, the US company has "crossed currencies" and directly assumes the risk of fluctuating exchange rates of the foreign currency in which the transaction is denominated, This risk may lead to recognition of foreign exchange transaction gains or losses in the income statement of the US company. Note that transaction gains or losses can result only when the foreign currency transactions are denominated in a foreign currency. When a US company imports or exports goods or services and the transaction is to be settled in US dollars, the US company will incur neither gain nor loss because it bears no risk due to exchange rate fluctuations.

The following example will illustrate the terminology and procedures applicable to the translation of foreign currency transactions. Assume that US Company, an exporter, sells merchandise to a customer in Germany on December 1, 20x0, for DM 10,000. Receipt is due on January 31, 20x1, and the US Company prepares financial statements on December 31, 20x0. At the transaction date (December 1, 20x0), the spot rate for immediate exchange of foreign currencies indicates that DM 1 is equivalent to $.50. To find the US dollar equivalent of this transaction, the foreign currency amount, DM 10,000 is multiplied by $.50 to get $5,000. At December 1, 20x0, the foreign currency transaction should be recorded by US Company in the following manner:

Accounts receivable-Germany (DM)	5,000	
Sales		5,000

The accounts receivable and sales are measured in US dollars at the transaction date using the spot rate at the time of the transaction. While the accounts receivable is measured and reported in US dollars, the receivable is denominated or fixed in DM. This characteristic may result in foreign exchange transaction gains or losses if the spot rate for DM changes between the transaction date and the date the transaction is settled (January 31, 20x1).

If financial statements are prepared between the transaction date and the settlement date, all receivables and liabilities which are denominated in a currency other than the functional currency (the US dollar) must be restated to reflect the spot rates in existence at the balance sheet date. Assume that, on December 31, 20x0, the spot rate for DM is DM 1 = $.52. This means that the DM 10,000 are now worth $5,200 and that the accounts receivable denominated in DM should be increased by $200. The following adjusting journal entry would be recorded as of December 31, 20x0:

Accounts receivable-Germany (DM)	200	
Foreign currency transaction gain		200

Note that the sales account, which was credited on the transaction date for $5,000, is not affected by changes in the spot rate. This treatment exemplifies the two-transaction viewpoint adopted by the FASB. In other words, making the sale is the result of an operating decision, while bearing the risk of fluctuating spot rates is the result of a financing decision. Therefore, the amount determined as sales revenue at the transaction date should not be altered because of a financing decision to wait until January 31, 20x1, for payment of the account. The risk of a foreign exchange transaction loss can be avoided either by demanding immediate payment on December 1 or by entering into a forward exchange contract to hedge the exposed asset (accounts receivable). The fact that the US Company, in the example, did not act in either of these two ways is reflected by requiring the recognition of foreign currency transaction gains or losses in its income statement (reported as financial or non-operating items) in the period during which the exchange rates changed. This treatment has been criticized, however, because both the unrealized gain and/or loss are recognized in the financial statements, a practice which is at variance with traditional GAAP. Furthermore, earnings will fluctuate because of changes in exchange rates and not because of changes in the economic activities of the enterprise.

On the settlement date (January 31, 20x1), assume the spot rate is DM 1 = $.51. The receipt of DM 10,000 and their conversion into the US dollars would be journalized in the following manner:

Foreign currency (DM)	5,100	
Foreign currency transaction loss	100	
Accounts receivable-Germany (DM)		5,200
Cash	5,100	
Foreign currency (DM)		5,100

The net effect of this foreign currency transaction was to receive $5,100 from a sale, which was measured originally at $5,000. This realized net foreign currency transaction gain of $100 is reported on two income statements, a $200 gain in 20x0 and a $100 loss in 20x1. The reporting of the gain in two income statements causes a temporary difference between pretax accounting and taxable income. This results because the transaction gain of $100 is not taxable until 20x1, the year the transaction was completed or settled. Accordingly, inter-period tax allocation is required for foreign currency transaction gains or losses.

Inter-company Transactions and Elimination of Inter-company Profits

Gains or losses from inter-company transactions should be reported on the US Company's consolidated income statement unless settlement of the transaction is not planned or anticipated in the foreseeable future. In this case, gains and losses arising from inter-company transactions should be reflected in the accumulated translation adjustments component of the US entity's stockholders' equity. In the typical situation (i.e., gains and losses reported on the US entity's income statement) note that gains and losses result whether the functional currency is the US dollar or the foreign entity's local currency.

When the US dollar is the functional currency, foreign currency transaction gains and losses result because of one of the two situations below.

i. The inter-company foreign currency transaction is denominated in US dollars. In this case, the foreign subsidiary has a payable or receivable denominated in US dollars. This may result in a foreign currency transaction gain or loss, which would appear on the foreign subsidiary's income statement. This gain or loss would be translated into US dollars and would appear on the US entity's consolidated income statement.

ii. The inter-company foreign currency transaction is denominated in the foreign subsidiary's local currency. In this situation, the US entity has payable or receivable denominated in a foreign currency. Such a situation may result in a foreign currency transaction gain or loss that should be reported on the US entity's income statement.

The above two cases can be easily altered to reflect what happens when the foreign entity's local currency is the functional currency.

The elimination of inter-company profits due to sales and other transfers between related entities should be based upon exchange rates in effect when the sale or transfer occurred. Reasonable approximations and averages are allowed to be used if inter-company transactions occur frequently during the year.

International Taxation

International tax involves the taxation of cross-border transactions. Such transactions are subject to taxation by two or more tax systems and hence they give rise to tax problems which have to be dealt with circumspection.

Double Taxation

If a payment is made from one country to another the originating country would like to tax the payment before it leaves the country. At the same time, the country where the recipient resides also imposes tax on the inflow under its domestic legislation. Thus, the two countries target the same payment for tax purposes. This kind of double taxation will definitely have a detrimental effect on international trade and therefore the world economy.

To alleviate the problem of double taxation, many countries have come to mutual agreements and passed regulations to give some form of relief. The two main forms of relief available are:

i. Some countries provide relief in the form of tax exemption for income, which has been taxed already in another country.

ii. The recipient country taxes the income but gives a credit for the taxes incurred in the source country. The effect is that the taxpayer pays the higher of the two tax rates.

Taxation of Trading Income

When a firm wishes to enter another country for trading purposes, it can do so in many ways. It may establish a representative office outside the home country to market its business or it may establish a sales office or a branch or a subsidiary company overseas. The choice of the firm will have an impact on its tax liability.

The first step in finding out the tax exposure of a firm in another country other than the home country is to consider if the firm is "trading in" or "trading with" that territory.

If the firm is merely offering its services to the residents of a foreign country, then these firms are not taxed for the income they receive for their service.

The majority of treaties are formed in such a way that the trading profits of an enterprise will not be subject to taxation in a particular state unless the enterprise is trading in that state through a permanent establishment. The term "permanent establishment" means a fixed place of business though which the trade of the enterprise is partly or wholly carried on. The following types of business are excluded from the classification of "permanent establishment".

a. When a stock is held in a country solely for the purpose of storage, display or delivery.

b. When an office is opened purely for purchasing or gathering information.

A person who exercises authority to conclude contracts in an enterprise's name will be treated as a permanent establishment unless he acts for a number of third parties as an agent in the ordinary course of his behavior.

Branch vs. Subsidiary

In many countries, the tax treatment of a branch of a foreign entity in the host country and of a locally incorporated subsidiary differs. The tax liability of a subsidiary will be higher than that of a branch. The reason is that branch profits are remitted to the head office and will not be charged a tax whereas dividends paid by a subsidiary to a foreign parent will be subject to a withholding tax.

One should also know whether the host country taxes the profits of a branch of a foreign company at a higher than normal rate and if it is so whether treaty protection is available. It is more common that the firms willing to set-up an international trade initially establish a branch in a foreign country to offset the losses if any in the branch against the head office profits for home country tax purposes and then set up a subsidiary at a later date when it starts earning profits. You should note that the parent company may have to pay tax charge on the disposal of the branch assets to the subsidiary.

The other factors that are to be considered before taking a decision on trading through a subsidiary or a branch are:

i. The audit and accounting requirements of a branch are less tedious than that for a subsidiary.

ii. A subsidiary may enjoy some benefits in terms of local incentives and grants, which may not be available to a branch.

iii. There may be commercial advantages in trading through a subsidiary.

Dividend Income

When a firm is considering setting up an operation in a jurisdiction which is not a tax haven, its profits will be subject to corporate taxes in that country. On payment of the dividend from the net profits, the subsidiary will be required to deduct withholding tax under the local laws of the country in which it is a resident.

The parent receiving the dividend may be exempted from paying withholding tax against its tax liability on the dividend. But it may or may not be true that the parent will have tax liability on the dividends received. If the dividend is not taxable income under the domestic laws of the parent company’s jurisdiction, then the parent does not have any tax liability.

The withholding tax could act as a detrimental factor for the firms who wish to establish a subsidiary in another country. To encourage these firms, the dividends paid to shareholders should satisfy certain conditions. These rates will be different for individuals and corporates in the other country who hold specified percentage of shares.

When a dividend is paid, advance corporation tax at an appropriate rate is accounted for to the Inland Revenue. This should not be confused with withholding tax. UK’s domestic law permits non-resident individuals or companies to claim relief for this tax.

However, many of the treaties, which have been negotiated by the UK, permit at least a partial refund of advance corporation tax to shareholders that satisfy some specified conditions.

HOLDING COMPANIES

When a firm decides to establish a subsidiary, there are three options:

i. The parent firm holds the subsidiary resident in the same jurisdiction as the parent.

ii. A holding company, which is resident in the same jurisdiction as the subsidiary, is extended for taxation purposes.

iii. An offshore holding company which is resident in a third state is interposed.

If external financing is required to fund the acquisition of the subsidiary, a local holding company may allow efficient utilization of interest against the profits of the subsidiary especially if the host jurisdiction allows pooling of profits and losses of companies within a group.

Benefits of an Offshore Holding Company

i. Depending on the choice of the country, the gains realized on the sale of a subsidiary by a holding company can be avoided from tax totally.

ii. The aggregate withholding tax burden can be reduced when profits are repatriated from the subsidiary to the parent.

iii. In the case of UK parent companies, an offshore holding company can increase double tax relief on dividends from high and low taxed subsidiaries.

Taxation of Foreign Exchange Gains and Losses

The tax treatment of exchange gains and losses varies from country to country. In many countries, exchange differences from normal trading will be taken into account in the overall trading profit but that arising from a capital transaction may or may not be accounted for.

Tax Havens

These are jurisdictions, which offer a reduced or zero rate of taxation. There are two kinds of tax havens:

i. Pure tax havens which impose a nil or low rate of tax.

ii. Hybrid tax havens which offer specific tax incentives.

In international tax planning, when profits are arranged to accrue to a firm or trust located in a tax haven, there is an advantage since the tax imposed in a tax haven will be less than that imposed of revenue to those countries where taxes are being avoided and hence tax authorities in these countries have begun to tax certain un-remitted income of tax haven companies where the company is controlled by residents. The factors that are to be considered in the selection of a tax haven include:

i. The political and economic stability of the country.

ii. The taxes that exist.

iii. Tax treaties between the tax haven and other countries.

iv. Exchange controls.

v. The nature of the legal, banking and accounting systems.

vi. Transportation of communication facilities.

vii. The cost of forming a company, the length of time it takes and the annual cost of maintenance.

SUMMARY

- FASB requires the accounting of all derivatives in the balance sheet as assets or liabilities and as either balance sheet items or off-balance sheet items.
- SFAS was introduced to resolve inconsistencies in proper display of the derivative instruments in the financial statements, uniformity in disclosure as on and off-balance sheet items, uniformity in measurement and to give more clarity to the disclosure of derivatives.
- There are pure tax havens and hybrid tax havens. The factors to be considered while selecting the tax haven are political and economic stability of the country, the tax structure, treaties that exist on tax, exchange controls, nature of legal, banking and accounting systems, communication facilities and the cost of forming a company.

Chapter XVI

Value at Risk

After reading this chapter, you will be conversant with:

- The Concept of Value at Risk
- How VaR is Calculated?
- Uses and Limitations of VaR
- RiskMetrics^{TM}

CONCEPT AND APPLICATION

Every type of business involves some extent of risk. Risk can be minimized but cannot be totally eliminated. The only way to totally eliminate risk is by stopping the business itself. Given this fact, a question which comes to the mind of a businessman is “How risky is the business I am undertaking and how can the risk be measured?” or “How bad can the affairs get in the course of business?”

Banks and investment houses have balance sheets made up almost exclusively of financial assets whose value is subject to changes at any point of time. These changes are mostly as a result of changes in the interest rates. Historically, these risks can be managed by matching them with similar risks on the liability side of the balance sheet, or in other words, matching the duration of the assets and liabilities. If done correctly and accurately, a change in interest rates would be nullified by a change in the corresponding asset and liability.

About ten to fifteen years ago, this was an ideal concept known as Asset/Liability Management (ALM). For the last few years, the balance sheets of banks have become too complex for simple matching of assets and liabilities and even for other hedging techniques like derivatives, without a proper measurement of risk.

In the 1990s, a concept called Value at Risk (VaR) became popular. It is the latest concept in the field of risk management. Till then, derivative based Delta, Gamma and Vega as well as Interest Rate measures like Gap, Dollar Value on Basis Points and Convexity measures were used. While these measures were quite accurate, they could not sum up different types of risk, did not allow for preventive control measures and could not measure capital or earnings at risk with precision.

Value at Risk is a statistical measure of the maximum potential loss from uncertain events in the normal business over a particular time horizon. It is measured in units of currency through a probability level. It is the loss measurement consistent with a confidence limit such as 99%, on a probability distribution (usually a normal distribution), implying that this is the measurement of a loss which has a chance of only 1% of being exceeded.

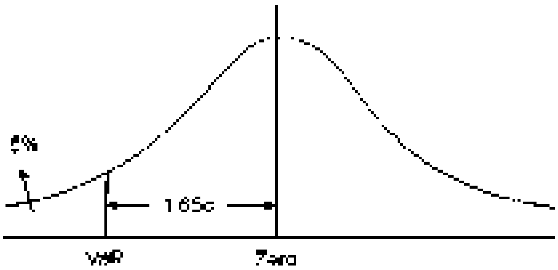
In simple words, if a trader mis-hedges a deal, it is a must to know the chances of loss before they occur. VaR is one such technique that allows the management to do so.

Value-at-risk can be defined as the maximum loss a portfolio of securities can face over a specified time period, with a specified level of probability. For example, a VaR of $1 million for one day at a probability of 5% means that the portfolio of traded securities would expect to lose at least $1 million in one day with a probability of 5%. Alternatively, there is 95% probability that loss from the portfolio in one day should not exceed $1 million. From the probability statement we can interpret that 5% indicates that it is expected to occur once in every 20 trading days.

One of the most important aspects of VaR is that – VaR actually assigns a probability to a dollar amount of happening of the loss. This probability and its corresponding loss amount (5% and $1 million in the above example) are not associated with any particular event, but it could cover any event that could cause such a loss. For example, a VaR that only measures losses due to market risk will not able to capture credit losses. It is important to remember that VaR is not the maximum loss that could occur, but only a loss amount that could expect to exceed only at some percentage of the time. The actual loss that may occur could be much higher than the VaR.

The basic idea behind VaR is to determine the probability distribution of the underlying source of risk and to identify the worst given percentage of outcomes. The figure (1) illustrates the principle behind computing VaR when the distribution of the change in portfolio value is continuous. The normal curve is widely used for computing VaR, though not necessarily appropriate in all the cases. The biggest attraction of normality is that if the portfolio return is normal, the VaR is the multiple of portfolio standard deviation and the normal value of the confidence level.

Figure 1



Choice of VaR Parameters

Once the complexity of the portfolio is analyzed, the users have to make decisions about the following important parameters for calculation of VaR: (i) time horizon, (ii) confidence interval, (iii) data series, and (iv) mapping/selecting relevant risk factors. Utmost care is taken in considering each, as choices made can change not only the actual number, but also the uses and meaning of the VaR number itself.

TIME HORIZON

The choice of time horizon depends upon the objectives of the portfolio and its liquidity positions. The shortest feasible holding period is one day, although it is theoretically possible for institutions to have time horizon less than a day. Institutions can also calculate VaR based on longer holding periods for example, one quarter or even one year.

The liquidity of the markets in which the institution operates has significant impact on the choice of holding period. The holding period appropriate in any market is, ideally, the length of time it takes to ensure orderly liquidation of positions in that market. However, the time it takes to liquidate a position in an orderly manner generally varies from one market to the next. A securities firm that trades actively in the stock markets would prefer a daily holding period, but a bank that trade in less liquid securities prefer a longer holding period, such as a month.

CONFIDENCE INTERVAL

The confidence interval defines the percentage of time the firm should not lose more than the VaR amount. Commonly used confidence interval range from 90% to 99%. However, we should avoid VaR calculated based on high confidence interval. The problem with high confidence interval is that losses in excess of VaR become relatively rare. Different VaR confidence levels are appropriate for different purposes: a low one for validation of VaR system, a high one for risk management and capital requirements. However, there is no compelling reason for an institution to work with one confidence level alone. The Bank for International Settlement and the Derivatives Policy Group recommend a confidence level of 99%, while various studies shows that 95% performs best under back-testing due to ‘fat-tails’. The term ‘fat-tails’ refers to the fact that large market moves occur more frequently than what would occur if market returns was normally distributed. Despite this fact, many market practitioners and academics assume that returns are normally distributed. This assumption, although usually insignificant, can cause problems in VaR calculations on some asset classes.

DATA SERIES

VaR is fairly data intensive. The choice of historical, implied or other types of data to determine various relationships is important, but typically there is very little choice. Some argue that using implied correlations and volatilities results in a better predictor of risk than historical correlations and volatilities, but very little implied data are usually available. As a result, historical data sets have occupied commonplace in VaR calculations, thereby driving the need for additional data.

The questions arises is how old historical data should be used? Longer periods of data have rich return distribution while shorter periods allow the VaR to react more quickly to changing market events. Three to five years of historical data are typically taken. In addition, the role of some extraordinary events in the data set needs to be considered. Should the Gulf War effects on the oil market be excluded when looking at historical data? Some market participants believe that it should not be excluded because this event reflects real history and adds to the ‘fat tail’ of a data series. Others argue that it should be excluded because the inclusion versus exclusion could imply very different VaRs. For instance, consider if a firm using 10 years of historical data to calculate VaR on an equity portfolio. For a stock market crash in that period, a risk manager will most likely see a decrease in VaR that has nothing to do with the firm’s actual risk.

One method that solves both of the above issues is to use exponentially weighted data. Exponential weighting gives more recent data more weight, allowing the VaR to react to changing market conditions quickly.

Mapping/Selecting Relevant Risk Factors

For calculating simple VaR we assume that every instrument in the portfolio have readily available risk and correlation data. However, in practice it is very difficult to have such information for every instrument in our portfolio. The representative approach for such instruments known as mapping selects a set of core instruments that can be regarded as the representative of the broad types of instruments held. The best-known mapping – that is used by RiskMetrics – maps individual positions to the following set of core instruments:

- Foreign exchange positions are broken in terms of respective currencies, and forward positions are mapped as equivalent fixed-income positions in their respective currencies.
- Equity positions are represented by equivalent amounts in terms of equity indices in each of the core currencies.
- Fixed-income positions are represented by combinations of cash flows in a given currency of a limited number of specified maturities.

APPROACHES TO COMPUTING VAR

There are various approaches exist for computing VaR, the most important of which are considered to be:

- The variance-covariance approach,
- Historical simulation approach, and
- Monte Carlo simulation approach.

VARIANCE-COVARIANCE APPROACH

This approach allows an estimate to be made of the potential future losses of a portfolio through using statistics on volatility of risk factors in the past and correlations between changes in their values. Volatilities and correlation of risk factors are calculated for a selected period of holding the portfolio using historical data. VaR is computed as multiplying expected volatility of the portfolio by a factor that is selected based on the desired confidence level.

The variance-covariance approach is based on the assumption that the underlying market factors follow a multivariate normal distribution. As the portfolio return is a linear combination of normal variables, it is also normally distributed.

This normal VaR is easy to handle because the VaR is a multiple of the portfolio standard deviation, and the portfolio standard deviation is the linear functions of individual volatilities and covariances. In using this approach it is necessary to take into consideration the following facts:

- Movements in market prices do not always follow a normal distribution – they sometime exhibit heavy tails, which means a tendency to have a relatively more frequent occurrence of extreme values than following a normal distribution,
- Models may not appropriately depict market risk arising from extraordinary events,
- The past is not always a good guide to the future, for example correlation forecast may not hold true.

HISTORICAL SIMULATION APPROACH

This approach does not depend on calculation of correlations and volatilities. Instead it uses historical data of actual price movements to determine the actual portfolio distribution. In this way, the correlations and volatilities are implicitly handled. In fact the most important advantage of this approach is that the 'fat-tailed' nature of security's distribution is preserved since there is no abstraction to a correlation and volatility matrix.

The first step of calculating VaR using historical simulation approach is that the changes that have been seen in relevant market prices and the risk factors are analyzed over a specified historical period, say, one to five years. The portfolio under examination is then valued, using changes in the risk factors derived from the historical data, to create the distribution of the portfolio returns. We then assume that this historical distribution of returns is also a good proxy for the distribution of returns of the portfolio over the next holding period. The relevant percentile from the distribution of historical returns leads to the expected VaR for the current portfolio. Of course, if asset returns are normally distributed, the VaR, obtained under the historical simulation approach should be the same as that under variance-covariance approach.

One important consideration for computing historical simulation VaR is the length of the historical period. The historical period should be long enough to form a reliable estimate of the distribution, but short enough to avoid 'paradigm shifts'.

MONTE CARLO SIMULATION APPROACH

To apply this approach, first we have to calculate the correlation and volatility matrix for the risk factors. Then these correlations and volatilities are used to drive a random number generator to compute changes in the underlying risk factors. The resulting values are used to re-price each portfolio position and determine trial gain or loss. This process is repeated for each random number generation and re-priced for each trail. The results are then ordered such that the loss corresponding to the desired confidence level can be determined.

Monte Carlo simulation can be viewed as a hybrid of the variance-covariance approach and the historical simulation approach. It uses the variance-covariance matrix to drive a simulation. The simulation works similar to the historical simulation, but rather than simply using history, Monte Carlo creates the history (known as path) based on the variance/covariance matrix derived from the actual historic market data.

The greatest benefit of Monte Carlo simulation VaR is the ability to use pricing models to revalue non-linear securities for each trial. In this way, the non-linear effects of option that were missed in the variance-covariance VaR can be captured in this approach.

Monte Carlo simulation, having its roots in random number generation is exposed to sampling error. There is the risk of running too few simulations to adequately capture the distribution and this could result in an inferior answer. However, methods exist to estimate how far off a simulation is so that we can decide whether or not to run more trials.

Hybrid Method

This is the method developed by Boudoukh, Whitelaw and Richardson, which combines the Historical Simulation as well as J P Morgan's RiskMetrics^{TM} approach. According to the proponents of this approach, the results obtained are more precise as compared to the other three methods.

Returns are assigned a weightage based on their time, starting with the most recent ones and going back to the older ones. The returns will thus be

$$\frac{1-\lambda}{1-\lambda^k}, \frac{(1-\lambda)\lambda}{1-\lambda^k} \quad \ldots\ldots\ldots.. \quad \frac{(1-\lambda)\lambda^{k-1}}{1-\lambda^k}$$

The returns are to be ordered in ascending order and then the weightage assigned to each one of them is to be added in order to obtain the required VaR percentage. Linear interpolation method may have to be used for this.

Pros and Cons of VaR Approach

Table 1

Approach	Pros	Cons
Variance-Covariance	• Easy to understand • Least computationally intensive • Industry standard	• May mis-state non-linear risks • Fat-tails problem
Historical Simulation	• Naturally addresses the fat-tails problem • Performs well under back-testing • Can fully capture non-linear risks	• Relies on history • Computationally intensive • Data intensive
Monte Carlo Simulation	• Accommodates any statistical assumptions about risk factors • Can fully capture non-linear risks	• Sampling error

Source: Capital Market Risk Advisers.

Choice of Method

The different approaches of calculating VaR have varying abilities to handle optionality (non-linear relations), stress testing, complex fixed income and derivative structures, risk causality, fat-tails, non-symmetrical distributions, aggregation of risk from multiple systems, etc. Furthermore, some of the solutions are more difficult to understand and explain.

When VaR was first developed the variance-covariance approach was the standard because it was computationally extremely efficient. The efficiency results from the fact that this is an "analytic" approach, which directly calculates a solution, rather than the alternative approaches that determine a solution by iteratively simulating potential scenarios. It remains an excellent approach for a portfolio that contains minimal optionality and holdings in highly efficient markets where returns can be expected to be normally distributed. The variance-covariance methodology evaluates options with linear approximations (delta equivalent).

The historical simulation approach repeatedly values current holdings based on the market conditions that existed over a specific historical period of time. This has the advantage of being very intuitive. Unlike the variance-covariance and Monte Carlo simulation approaches, no assumption on the distribution of changes in market factors is required. The other two approaches assume normally distributed market returns and therefore historical simulation better handles fat tails (kurtosis), i.e., extreme event risk, and asymmetric distributions (skewness), as are experienced in relatively illiquid markets such as emerging markets. Furthermore, the historical simulation methodology explicitly understands the characteristics of instruments with non-linear behavior and analyzes based on historic market performance.

For linear instruments, the results of the Monte Carlo will be almost exactly the same as those of the historical simulation if the variance/covariance matrix driving the Monte Carlo was created from the same historical period that is used in the historical simulation. However, for instruments that display non-linear behavior (optionality), the Monte Carlo approach will be appropriate to measure the imbedded risk while the variance-covariance approach will not. We would generally favor the historical simulation methodology over the Monte Carlo simulation (because it is simple and intuitive) for the basic calculation of VaR. However, when you are performing stress tests, Monte Carlo simulation has the advantage that the parameterized history is significantly easier to modify (example, a 10% decline in the S&P with all other risks moving based on their historical correlation to the S&P) than the actual price and rate histories used in historical simulation.

In addition to which VaR methodology to use, for equities there is a question of whether the VaR analysis should be performed at the "security" or "risk factor" level. Even in a data-rich market such as the US, equity factor models can explain only 40% of the performance of individual equities (according to Barra research). The debate is whether the equity factor model should drive the calculation of the risk of equities and all other behavior should be viewed as non-structural specific risk or whether the risk analysis should be performed at the security level and, subsequently, attributed to the equity risk factors.

Supporters of driving the analysis based on risk factors will argue that using actual history is "data mining", a statistician's term for looking for statistical relationships where there is no reason for a relationship to exist, resulting in the misinterpretation of spurious relationships as structural ones. Proponents of security level VaR would counter that the equity factor models are too rigid and limited and that restricting the analysis of risk to these relationships misses important "signal". The debate is a classic one in any information processing system between "signal" and "noise" – if you filter out noise you end up losing signal. There is no "right" answer – each user should decide based on the unique characteristics of their portfolio.

Applications of Value at Risk

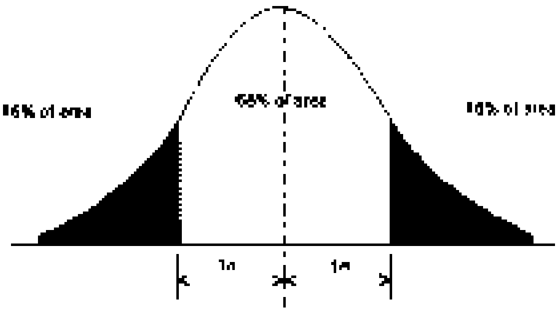
In order to understand the applications of VaR, it is necessary to understand the concept of normal distribution first. The normal distribution is a bell-shaped perfectly symmetrical distribution and has the following characteristics:

Standard Deviation from Mean	Confidence Level
1.00	68.3%
1.65	90.0%
2.00	95.5%
3.00	99.7%

The same is being illustrated in the following diagrams:

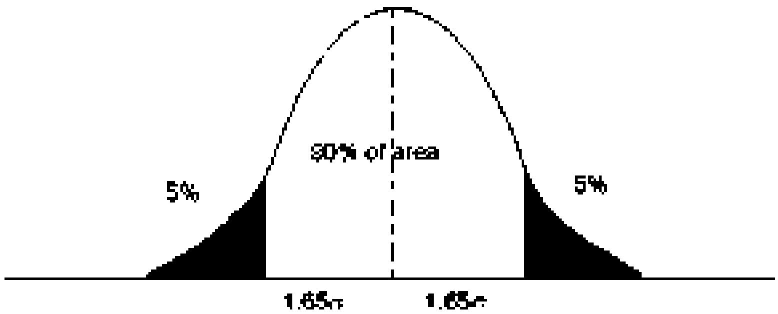
i. 68% of the values are contained within plus or minus 1 standard deviation of mean.

Figure 3: Standard Normal Distribution



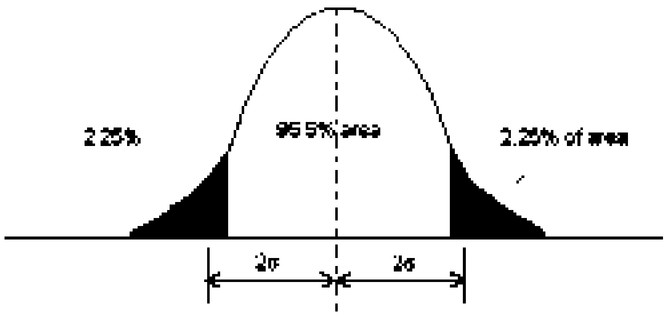
ii. 90% of the values are contained within plus or minus 1.65 standard deviations of mean.

Figure 4: Standard Normal Distribution



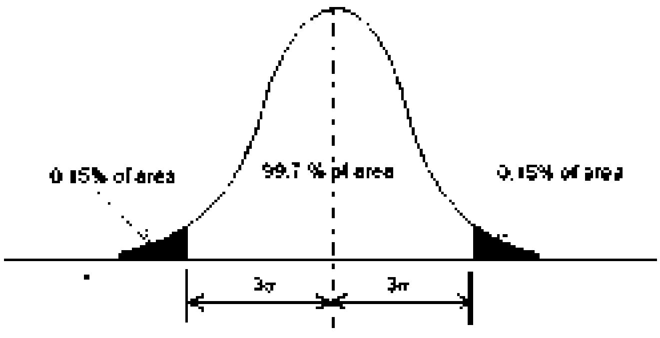
iii. 95.5% of the values are contained within plus or minus 2 standard deviations of mean.

Figure 5: Standard Normal Distribution



iv. 99.7% of the values are contained within plus or minus 3 standard deviations of mean.

Figure 6: Standard Normal Distribution



(For the sake of simplicity of calculations, we can also assume here that 95% of the values lie within 2 standard deviations from the mean and 99% of the values lie within 3 standard deviations from the mean, instead of 95.5% and 99.7% respectively).

Volatility of an asset is always shown as a percentage and the standard deviation of mean in the same unit of measurement of the underlying data, i.e., if the asset is a portfolio, the standard deviation will be measured in $, if the portfolio is in $. The VaR measurement for different types of assets is discussed below:

VALUE AT RISK FOR FOREIGN CURRENCY (SPOT)

ABC Bank Inc. of the US would like you to measure the risk of its long position of French Francs 500 million on the spot market. The volatility is assumed at 10% annualized and the exchange rate is US$ 1 = FFr 5.

Position value in US$ = 1 FFr = 0.20 US$, so the total comes to US$ 100 million.

Daily volatility = Annual volatility/square root of 250 (assuming 250 working days in the US)

Daily volatility = 10/15.81

Daily volatility = 0.6325%

Now, the potential fluctuation of the US$/FFr (with 99% confidence level) will be:

$$0.20\,(1 + 3 \times 0.006325) = 0.20 \times 1.018975 = \text{US\$ } 0.203795$$

or

$$0.20\,(1 - 3 \times 0.006325) = 0.20 \times 0.981025 = \text{US\$ } 0.196205$$

The potential gains or losses on the position at 99% confidence level (99th percentile) will be:

500 million FFr = 100 million US$

VaR = 100 x (1.8975/100) = US$ 1.8975 million.

VALUE AT RISK FOR FOREIGN CURRENCY (OPTIONS)

Taking the same example of ABC Bank Inc. of the US, let us assume that the bank has paid an option premium of FFr 5 million and the delta[1] of the option is 0.4.

Option premium paid in US$ = 1 million.

The call position delta = FFr 500 million x 0.4 = FFr 200 million, which is equivalent to a spot position of FFr 200 million. We know that the daily volatility is 0.6325% (from the previous problem).

The potential gains or losses on the position at 99% confidence level (99th percentile) will be:

200 x 0.20 x (1.8975/100) = US$ 0.759 million.

VALUE AT RISK FOR FOREIGN CURRENCY FORWARD

Let us assume that the investment company has a one-year forward currency contract to purchase FFr 200 million at the forward rate of FFr 5.50 per US$.

Find out the VaR for this position, assuming that the spot rate is FFr 5.45/US$, the interest rate for US$ is 5.50% and the interest rate on FFr is 6.50%. The FFr/US$ volatility is 0.965% and the yield volatility on i_{FFr} = 1.42% and the yield volatility on = $i_{US\$}$ 1.98%.

$$F = S(1 + i_{FFr}) / (1 + i_{US\$})$$

$$F = 5.45 \times (1.065) / (1.055) = 5.50$$

As there is equilibrium between the spot and forward rates and interest rates, there is no opportunity for arbitrage.

1 The concept of delta has been discussed at length in the chapter "Sensitivity of Option Premiums".

The forward position can be explained as under:

i. Borrow US$ 94,786,730 at 5.50%. The maturity of this loan will be US$ 100 million.

ii. Purchase FFr in the spot rate of FFr 5.45/US$. You will get FFr 5,165,877,678.50.

iii. Invest FFr 5,165,877,678.50 at 6.50% for one year. You will earn FFr 55,0165,877.60 as interest.

iv. Calculate the price volatility of FFr and US$, which is as follows:

For FFr, yield volatility	= 1.42%
Duration	= 1
Yield	= 6.50%
Modified duration = 1/1.065	= 0.939
Delta yield = 6.50 x 1.42%	= 0.0923%

Price volatility = Modified duration x Delta yield
= 0.939 x 0.0923 = 0.0866%

Similarly, the price volatility of US$ is calculated:

For US$, yield volatility	= 1.98%
Duration	= 1
Yield	= 5.50%
Modified Duration	= 1/ 1.055 = 0.948
Delta yield	= 5.50 x 1.98% = 0.1089%
Price volatility	= Modified duration x Delta yield
	= 0.948 x 0.1089 = 0.1032%

Now, the VaR calculation:

i. Short Forex position between FFr/US$
= $94,786,730 x 0.965% = $914,692

ii. Long i_{FFr} position = FFr 516,587,678.50 x 0.0866%
= FFr 4,473,650
= FFr 4,473,650/5.50
= US$820,853

iii. Short $i_{US\$}$ position = $94,786,730 x 0.1089%
= $103,223

Final potential gain/loss of positions is

i. FFr/US$ = –$914,692 (Short position)

ii. i_{FFr} = +$820,853 (Long position)

iii. $i_{US\$}$ = –$103,223 (Short position).

Please note that this problem is based on the 95% confidence level used by RiskMetrics™.

VALUE AT RISK FOR EQUITY STOCK

An investment company has a portfolio of shares of XYZ Inc. purchased recently at US$ 500 per share. Assuming the volatility is 20% p.a., calculate the VaR at 95% level of confidence.

Share price	=	US$ 500
Volatility	=	20% annualized
Daily volatility	=	$20/\sqrt{250}$ (assuming 250 working days in a year)
Daily volatility	=	20/15.81 = 1.265%

Possible gains or losses at 95% level confidence can be measured as follows:

VaR = 500 (1 + 2 x 0.01265) = US$ 512.65

or

VaR = 500 (1 – 2 x 0.01265) = US$ 487.35

This implies that for each and every share of XYZ Inc., a potential gain or loss of US$12.65 can be made each day.

VALUE AT RISK FOR EQUITY STOCK CALL OPTIONS

Based on the previous example, let us assume that the investment company has a call option of the shares of XYZ Inc. The option value is US$ 10 and the delta of the option is 0.6. Assume that the total portfolio is of 1 million shares of stock.

Possible gains or losses at 95% confidence level can be measured as follows:

Call option position delta = $500 x 1 million x 0.6 = $300 million

This call option has the same risk as $300 million position in equity stock.

Position value = 1 million x $10 = $10 million

VaR = $300 million x 2 x 1.265% = $7.59 million which implies that a gain or loss of $7.59 million on the position can be expected.

VALUE AT RISK FOR FIXED INCOME SECURITIES

The volatility of fixed income securities is measured as yield volatility and not price volatility as in the case of equity securities. The application of the VaR can be understood with a simple example:

What is the Value at Risk for a fixed income bond with a price of US$ 100, yield of 5.8% and coupon of 5.8% and annual standard deviation of 1.25%? The bond is held for a period of three months.

Deviation for a period of 3 months = $1.25/\sqrt{4}$

(there are 4 quarters in a year) = 0.625%

The yields for the three months period at 95% level of confidence will be

5.8 + 2 x 0.625 = 7.05

or

5.8 – 2 x 0.625 = 4.55

and the corresponding prices will be $99.58 or $100.31.

VALUE AT RISK IN ASSET/LIABILITY MANAGEMENT (ALM)

VaR is used to estimate the net interest income and net portfolio value in ALM. This is done by estimating the net interest income and the economic value of the portfolio equity.

Let us assume that a financial services company has interest income of US$ 500 million and its EVPE (Economic Value of Portfolio Equity) is US$ 2 billion. Assuming that the volatility of the interest income is expected to be 10% annualized. Within 99% level of confidence, the interest income will be

Volatility = 10% p.a.

Daily volatility = $10/\sqrt{250}$ days = 0.6325%

The maximum reduction expected in the interest income is

$500 million x (1 – 3 x 0.006325) = $490.51 million and the EVPE will be $2000 million – $9.49 million (loss) = $1990.51 million.

USES OF VALUE AT RISK

The uses of value at risk are:

i. Initially, Value at Risk was used as an information tool to communicate to the management a feeling of the exposure to changes in the market prices or rates. After market risk started being implemented in the actual risk control structure, VaR is being used to calculated and measure the risk adjusted performance and compensation, in addition to remaining a very powerful management information system as far as the risks of investment are concerned.

ii. Value at Risk is also important in identifying the effects caused by substantial future movements to the value of the portfolio. Based on the measurement made by VaR, the portfolio manager can compare it with the maximum acceptable risk and take appropriate measures either by using derivatives to hedge the position or by changing the portfolio components to reduce the risk in Trading Risk Management.

iii. Position limits can also be established as a function of risk and a comparison of the positions and risk in different markets can be made on a common scale in Investment Management.

iv. Firms with market risk measurement systems which apply portfolio diversification theory can lower their project risks.

v. In 1995, 10 major central banks realized the use of VaR in order to assess the capital adequacy ratio for market risk and started their own in-house VaR modeling. Of course, now this has become a regular practice with most central banks in developed countries.

vi. As discussed above, VaR can be used in ALM to estimate the changes in the net interest income and economic value of portfolio equity.

vii. In addition, VaR can be used in Corporate Applications to measure the risk of foreign exchange exposures, interest rate changes, effectiveness of hedging and derivatives portfolio, management of credit risks of each counterparty, evaluation of complex transactions to be undertaken and investment management in overall.

LIMITATIONS OF VALUE AT RISK

While VaR has proved to be a superior method of measuring risk, it has some limitations:

i. It cannot measure risk accurately in extreme market conditions, because it is difficult to model risk under such conditions. Suppose that the correlation between the US$ and the French Franc falls from 90% to 30%, VaR analysis will not immediately recognize this. It will perhaps take 50 or more days before sufficient daily price data is collected to reveal that the correlation has shifted.

ii. It focuses on a single arbitrary point. Also, it relies on simplified assumptions which may not be applicable to complex situations like options pricing.

iii. It uses many models with a wide variety of assumptions and methods of calculation, producing different results under different models.

iv. It is basically a statistical measure and not a managerial one.

v. There is no theory to show that VaR is the appropriate measure upon which to build optimal decision rules.

vi. It cannot capture model risks, thus requiring the use of model reserves also.

vii. Volatility also keeps varying with time and is not stable.

viii. Prices may not respond in a linear fashion to changes in the market variables, resulting in erroneous measurement by VaR.

ix. The distribution may not be normal distributions in all the given circumstances.

x. Correlations may not be stable in all the given circusmtances.

xi. RiskMetrics™ is not able to fully capture spread risks, option risks and yield curve changes, resulting in inaccuracy in the risk measurement.

xii. It is based on the past data which may not always prove true in future.

xiii. Intra-day positions are not considered in VaR, which usually takes only the closing position into consideration.

Given these limitations, VaR is often supplemented by Stress Testing, which is explained in the next paragraph.

Stress Testing

Stress testing can be defined as a one time risk measure which is used complementarily with VaR to analyze market risk. Risk is assumed to be stable under statistical measurement, due to the assumption of stability of the market. The assumption of VaR that variables will continue to behave according to the volatility changes in the past may not prove true in case of extreme movements. With the help of stress testing, these unexpected movements can be measured.

Let us Understand this with an Example

Let us assume that the Sterling Pound and the Australian Dollar may have been historically correlated and the fluctuations in their value are more or less uniform to each other at 5%. A VaR model that incorporates historical correlation into its analysis would ignore the possibility of wild fluctuations between both the currencies in future. With stress testing, the portfolio manager could also study the effects of a wild fluctuation of more than, say 25% appreciation of the Sterling Pound against the Australian Dollar. This study can be done without affecting the historical pattern generated by VaR and can determine what the market value impact would be. This would cover the limitation of VaR not being able to perform under extreme volatility conditions. This means that while still taking the measurement obtained by VaR, the extreme movements have also been measured.

RISKMETRICS™

RiskMetrics™ is a set of methodologies developed by J P Morgan in 1994 to estimate the market risk based on the concept of Value at Risk approach. The concept measures the market risk of the firm in terms of currency units. It was developed as a result of the demand of Sir Dennis Weatherstone, Chairman of J P Morgan, who wanted to know the amount of risk that his company's investments were subject to, on a daily basis.

RiskMetrics™ was spun-off as a separate company in 1998 and is today one of the leading risk management expertise providers.

RiskMetrics™ employs a comprehensive set of daily reestimated volatilities and correlations across a broad range of instruments as input to estimate market risks. It consists of three parts:

i. A methodology to estimate the market risk based on VaR approach, which has been developed as a software. The software is available in different versions namely, RiskManager (which measures the VaR based on the industry standard RiskMetrics™ approach), Credit Manager (which measures portfolio risks due to credit events volatility) and Pension Manager (which measures the risk of pension plan funds).

ii. A set of consistently calculated volatilities and correlation forecasts for use as inputs to estimate market risks, knows as DataMetrics, which is developed jointly by J P Morgan and Reuters.

iii. A data engine for risk management developed by J P Morgan, knows as RiskGrades.

All these applications are available at the website of the company 'www.riskmetrics.com.'

Methodology

RiskMetrics^{TM} maps all the cash flows based on the assets of the portfolio and works backwards to measure the returns on each of the assets. The risks to which each set of cash flows is subjected to are to be decided by the company. From this point, there are choices as to which method to use to measure the potential change in return related to these cash flows. It will attempt to determine correlations between asset classes in order to ascertain the cumulative effect of market changes on the institution. The overall risk rather than the risk of each of the positions is measured.

Let us know briefly discuss the software and its uses:

i. **RiskManager:** It is a software to measure the VaR that is based on the industry standard RiskMetrics^{TM} methodology. It is mainly used for the requirements of banks, asset management companies, hedge funds and financial institutions that require to know the level of risk in their portfolios. The software uses the Historical, Monte Carlo and Parametric (Variance/Co-variance) models discussed above. The data is obtained from DataMetrics.

The Software Works with Two Types of Data: Position data and market data. While position data is related to the holdings of the firm's portfolio and is to be input for calculation, market data is obtained from DataMetrics and could be either foreign exchange rates, equity prices, interest rates or commodity prices or a combination of two or more of them.

Position information can be input by the user through his PC or imported through the Riskmanager interface. The software can store current as well as historical positions, with options to choose whether the position is externally hedged or not. Various types of combinations of portfolios, asset types, maturities, currencies, etc., are possible.

The software currently can be used for the following types of instruments:

- Bonds, including futures, options, forwards, calls and puts.
- Convertible bonds.
- Zero coupon bonds.
- Money market instruments.
- Caps, floors, collars.
- FRNs and FRAs.
- Interest rate options and futures.
- Swaps and swaptions.
- Foreign exchange, including its options and futures.
- Commodities and its options, forwards and futures.
- Equity and its options, forwards and futures.
- Daily average options.
- American and European options.

Data can be stored for up to two years, while the times series are updated on daily basis through a satellite link. Users have a facility to input their own data and the software will plot the missing data in order to create the required time series. Various facilities like inputting the data of one stock to plot the time series of another is possible, making this software a very good risk measurement tool, in which various kinds of reports can be generated.

ii. **Credit Manager:** It is a software to measure the portfolio risks due to creditworthiness events like upgrades, downgrades and defaults. The software is based on J P Morgan's CreditMetrics™ and mostly used by banks and financial institutions to measure the entire exposure to credit risk. It is very helpful for asset allocation decisions.

Credit Manager currently supports the following asset types:

- Loans and receivable, both vanilla and step down options
- Letters of credit
- Commitments
- Fixed and variable coupon bonds
- Credit derivatives
- Swaps
- Forwards
- Generic assets.

The data for analysis, which includes forex rates, macroeconomic data and other equity indices is provided by the software. Here, too, the data is updated regularly via e-mail or satellite link. Monte Carlo simulations are used to simulate events that test the quality of credit of clients.

The software analysis is in the form of expected returns, marginal or incremental risk, risk vs. return analysis, Credit VaR and risk based asset allocation.

In addition, stress testing is also possible on the software.

J P Morgan has come out with another application for Credit Manager, known as CDO Manager, which analysis the risk of cash flows or Cash Flow VaR. The application works on the same lines as Credit Manager.

iii. **Pension Manager:** This is another version of the software for the use of pension funds and plan sponsors to measure the risk of the fund portfolio. For this, J P Morgan has developed PensionMetrics™ which is a methodology which uses the forecasted expected returns instead of the zero-mean assumption of the sell-side VaR. With the help of this software, the downside risk of pension funds can be minimized. This is the first software in the market which answers the needs of buy-side clients, as compared to the previous ones which were catered to the needs of the sell-side clients.

PensionMetrics monitors the fluctuations in the fund's assets, liabilities and surplus (alpha or excess returns), tracking errors and correlations. The software uses the historical and parametric simulation methodologies to perform VaR analysis of multiple portfolios. Advanced stress testing and scenario analysis is also possible.

New Developments

RiskMetrics^{TM} was one of the first VaR softwares to be developed and get widely distributed. Seeing the success of J P Morgan, various companies developed more advanced softwares for VaR calculation. A few of the most famous ones are described here:

i. **RAROC 2020:** A very popular software developed by Bankers Trust, another leading banker in the US RAROC stands for Risk Adjusted Return On Capital and 2020 is the accuracy of vision in time that they foresee. The charges for use of this software start at US$1 million, but it is known to be very accurate in the measurements of risk.

ii. **NUMERIX:** This software uses quantum mechanics and fluid dynamics related scientific techniques for derivatives analysis and risk measurement. It is developed in real time systems.

With the development of newer softwares in the market, we can expect to have much faster and accurate softwares for risk management in future.

SUMMARY

- Value at Risk (VaR) is a statistical measure of the maximum potential loss from uncertain events over a particular time horizon measured in a probabilistic scale in units of currency. It is the probability of loss exceeding 1% on one of the days of the time period.
- There are four ways of measuring VaR: Historical pattern of observations, Monte Carlo simulations, Variance/co-variance methods and Hybrid methods.
- Risk Metrics is a methodology created as software to estimate the market risk based on the concept of VaR. It employs a comprehensive set of daily re-estimated volatilities and correlations across a broad range of instruments as input to estimate market risk.

Chapter XVII

Introduction to Insurance: Life and Non-Life

After reading this chapter, you will be conversant with:

- Meaning and Nature of Insurance
- Classification of Insurance
- Elements of an Insurance Contract
- Various Types of Life and Non-Life Insurance
- Main Types of Life Insurance Policies

Definition

The term 'Insurance' means differently to different people. Webster's explains Insurance as a guarantee against risk of loss or harm, to secure indemnity to or on, damage or death. For those who see risks and the loss occurring in such events, Insurance is a hedge against risks. It involves redistributing of costs of unexpected losses to an insurance pool where the pool will assume the responsibility of compensating in the event of any loss. The losses suffered due to such compensation are again redistributed among the members of the pool. Legally speaking, Insurance is a *uberrimae fides* contract where one party agrees to compensate the other in consideration for a certain smaller sum. Such compensation is contingent upon happening or non-happening of a certain event. That is, an insurance provides monetary compensation for the loss suffered. The occurrence of loss must be within the framework as envisaged on the specified terms of the insurance contract.

MEANING AND CONCEPT

The amount of compensation of the loss through insurance will be based on various factors such as the perceived value of the insured object, the value of benefit that is being and that will be accrued on the insured object and of course the value for which the object is insured for. Therefore, only an entity with a value and which provides a basis evaluation to determine its value can be insured. All General Insurance contracts, are those contracts that insure non-life properties, and are entered into only after a careful evaluation of the value based on the prevailing market price and on the revenue generating capacity of such an asset. But to value a life in case of Life Insurance contract has been a difficult proposition.

The difficulty is because of two reasons:

- Unlike general insurance, there cannot be any compensation for loss of life. It is only the loss of income due to the death of the individual that may be compensated; and
- Loss of income to the family of the insured itself depends on factors like longevity and earning capacity of the individual.

Once these two parameters are reasonably determinable, a value can be assigned to that particular life. On the basis of such value, a 'policy' can be taken to 'insure' that life. Determination of the value of the subject matter in case of general insurance is based on its present value at the time of taking up insurance, while it is the future streams of cash inflows of the insured that is considered for valuing life in case of life insurance.

The following interesting passage helps in understanding the meaning of insurance: "Insurance, apart from its special features is a contract between the person seeking to be insured and the insurer, is in its nature – aleatory, voluntary, executory, synallagmatic, conditional and personal and except as to life and accident that is one of indemnity."

Terminology

A meaningful discussion on Insurance will have generous sprinkling of words that are unique to this subject. Therefore, a brief introduction for each of the unique words that make up the subject of insurance are discussed below.

An insurance contract sold by the insurance companies is named as a **Policy**. The policy may mean any type of contract of insurance that is liable to be paid by the insurance company on falling due. A policy is said to have fallen due if the insured risk translates in causing losses.

The contribution that is to be paid by the insured in order to maintain the continuity of the policy is termed as the **Premium**. The amount of premium that is paid for the continuation of the policy depends on the various factors which will be dwelt in detail later in the discussion.

Sum Insured is the amount that is promised by the insurance company in case of a claim either by maturity (in case of life insurance policies) or by loss to the insured subject matter.

Surrender Value is the amount which the insurer is prepared to pay to the assured if the insured discontinues the policy. Paid up value is the amount accrued under a Life insurance policy and payable on maturity of policy term. No surrender value can be given to the policyholder with in first few years of the existence of the policy. This is due to the fact that certain expenses that are incurred in issuing and renewing the policy in the initial period cannot be amortized unless the policy runs for a certain period of time. It is to be noted that the surrender value will not be equal to the return of premiums paid but will be lesser than that, as life has been covered during the period – the policy has been in force.

Life of the Policy is the time period wherein the insurance policy is in vogue. Coverage under the policy ceases on expiry of policy term.

Hazards are conditions that increase the frequency/severity of losses. Based on the attitude of the insured, hazards are classified into Moral Hazard and Morale Hazard. **Moral Hazard** refers to the mala fide intentions of either of the parties of the contract in fulfilling their obligations with respect to the performance of the contract. For example, when the insured burns down a building to claim insurance, though the damage is caused by fire, the frequency of loss is increased making it a moral hazard. A **Morale Hazard** in insurance terminology refers to the "indifference to the loss created by the purchase of insurance contract". For example, when the repairing costs for a damaged insured automobile increased, there is an increased severity of loss leading to morale hazard.

The terms of assurance and insurance have been used interchangeably throughout. However, there exists a subtle difference. While insurance refers to protection against loss due to an event that may or may not happen, the term assurance refers to the protection against the loss due to occurring of an event that will definitely happen sooner or later. Therefore, we may have Life assurance but never 'Fire Assurance', as fire may or may not happen.

CLASSIFICATION OF INSURANCE

Classification of Insurance is based on coverages provided under insurance contracts. Primarily, Insurance is categorized as Life Insurance or General Insurance. Life Insurance covers insurance of life, and covers risks related to the death of a person for whom insurance is bought. In case of loss of life of the person who has bought insurance (the insured), the insurance company (insurer) will pay an amount to the deceased's family and estate. General Insurance encompasses all those kinds of insurance contracts that cover non-life subjects. It has to be noted that insurance of health or insurance against the personal disability is also classified under General Insurance.

While the primary classification of insurance remains as Life and General, there are various sub-classifications in General Insurance based on the peril against which the general insurance is sought against. Insurance may be sought against loss by fire (fire insurance), water (marine insurance), earthquake, theft, infidelity and fraud. Insurance industry around the world has, in fact, been able to offer insurance to any kind of losses provided it is predictable and quantifiable. We have insurance against delays in movie production,[1] that covers the loss to the company in case of change of law, insurance against weather related damages such as crop-hail damage, rained out concerts, and so on.

1 It is reported that National Assurance, a subsidiary of General Insurance Company, has for the first time insured a movie – Shikar, produced by Subhash Ghai.

ELEMENTS OF AN INSURANCE CONTRACT

For a valid insurance contract, presence of certain vital elements is necessary. Though some of these elements of insurance are not unique to the insurance contract alone, any mention of an insurance contract should have these essential elements imbibed in it.

In all, there are 8 (eight) elements of insurance contract. They are:

i. Insurable Interest

ii. Utmost Good Faith

iii. Indemnity

iv. Subrogation

v. Warranties

vi. Proximate Cause

vii. Assignment, and

viii. Nomination

We will discuss each of these elements below:

i. **Insurable Interest**

A valid contract of insurance should have an 'insurable interest' by the person who is buying insurance (the policyholder) in the existence of the subject matter that is being insured. That is, the policyholder should be able to establish a monetary relationship between him and the subject matter of the insurance. Any loss of subject matter should directly lead to monetary loss to the policyholder. All insurance contracts should compulsorily have an insurable interest by the policyholder. An insurance contract without any insurable interest is in the nature of wagering contracts[2] and as per Section 30 of the Indian Contract Act, 1872, all wagering contracts are null and void.

Normally, it is the owner or the person who uses the subject matter (in case of leased assets), who is said to have insurable interest in the subject matter. However, a person who is employed due to the existence of the subject matter, or a person who gains from its existence cannot directly establish an insurable interest.[3] That is, the ticket collector of a bus cannot take up the insurance of bus, though his employment is directly affected by damage to the bus. Ownership of physical assets normally determine the existence of insurable interest in the property. However, in certain circumstances, there might be insurable interest without existence of complete or partial ownership. Also, a person who has partial ownership of an asset is allowed to insure to the complete value of the physical asset, rather than just to the extent of his actual partial interest. Any monies received by the partial owner in excess of his interest in the property subsequent to payment of claim by insurance company after the loss, is held as his, as an agent for other owners. The instances where there may be existence of insurable interest with or without complete ownership of physical assets are:

a. Mortgagees and Mortgagors

b. Agents

c. Executors and trustees, and

d. Bailees.

2 Wagering Contract: Section 30 of the Indian Contract Act, 1872 describes a wager as an "agreement between two parties by which one promises to pay money or money's worth on the happening of some uncertain event in consideration of the other party's promise to pay if the event does not happen."

3 Did we not hear of a miniature maker trying to insure the Leaning Tower of Pisa and the angle at which it leans?

The Marine Insurance Act, 1963 specifically provides that a contract of marine insurance is deemed to be a wagering contract where the assured does not have an insurable interest as defined by the Act and the contract is entered into with no expectation of acquiring such an interest. What is interesting is that the Marine Insurance Act defines a person to be of having insurable interest when he is interested in a marine adventure.

Section 7 of the Marine Insurance Act says that a person is said to be interested in marine adventure where he stands in any legal or equitable relation to the adventure or to any insurable property at risk therein, in consequence of which he may benefit by the safety or due arrival of the insurable property, or may be prejudiced by its loss, or by damage thereto, or by the detention thereof, or may incur liability in respect thereof. Note that the element of insurable interest is applicable in case of marine insurance, at the time of loss, though the policyholder need not be interested when the insurance is effected.

Other than Life Insurance and Marine Insurance, in other insurances, there must be insurable interest at the time of loss and also when the insurance is effected.

Also, insurable interest cannot be proved on the mere basis of emotional or sentimental reasons due to on attachment with subject matter.

Now, we know that the need of insurable interest for a policyholder to take up an insurance contract. But then, we may extend this logic to mean that any subject matter that leads to a financial loss can be of direct relationship of loss of subject matter and its translation into financial loss to the policyholder, begins by assuming that there is no other route to the policyholder than to insure the subject matter to avoid financial loss. That is, there cannot be any other alternative to the policyholder than to take up insurance to avoid financial loss.

The element of insurance interest cannot be carried forward to speculative transactions. These speculative transactions, cannot be insured as the policyholder may suffer from the lack of incentive in proper management of the subject matter, though an insurable interest as per our definition exists. Therefore, no insurance companies in the world offer insurance on stock market investments, business profits and other speculative transactions. Also, there cannot be any insurance on Speculative Risks, where there is a chance of a direct 'profit' that can be made. In this context, we may take note that hedging against risks by way of futures, forwards and swaps does not connote taking of insurance as per our discussion.

If there is a subject matter where there is an existence of insurable interest but which cannot be insured, there are other subject matters that are insurable, but for which, there need not be any establishment of relationship of insurable interest. Life insurance contracts taken by some, need not have to prove an insurable interest. Accident Insurance and a few of the Life Insurance contracts do not need to establish insurable interest. Insurance Act, 1938 does not define insurable interest nor does it give any rules for interpretation of this element. As per the Doctrine of Stare Decisis[4], the following can be said to be applicable to insurable interests.

a. **Life Insurance contracts where insurable interest need not be proved:**

   There are certain life insurance contracts where the existence of relationship itself is sufficient to prove the existence of insurable interest. The life insurance company cannot dispute the insurable interest in any of the relationships mentioned below.

   - **Own Life:** One need not prove insurable interest in his/her own life. There cannot be any limit on the amount to which the person may insure his/her life. The amount of insurance, however, should be proportional to the means of living. This is because of Moral Hazard, which mean to convey the mala fide intentions on part of the policyholder to make 'profit' to his family and estate on the basis of his/her death.

4 Refers to the practice of precedence in determining the interpretation of legal statutes.

Lack of insurable interest is a defense which the insuring company may plead in resisting the claim. There may be also cases where insurance on one's own life is surreptitiously financed and held by another for his/her benefit, which if detected by the insurance company, may be declared void.

- **Spouse's Life:** Normally, it is assumed that the service and help rendered by the spouse cannot be just enumerated on pecuniary grounds. Such insurable interest on the spouse may always be assumed on broader grounds.

  Here we may recall that in case of life insurance, insurable interest has to exist at the time of buying the insurance whereas in case of marine insurance, the insurable interest has to be proved at the time of claim. Then what will happen when an insurance is taken on a spouse and subsequently they legally separate?

  As mentioned above, insurable interest has to exist at the time of taking an insurance contract in case of life insurance. Once the insurance contract commences, any subsequent development is not going to affect the performance of such contract. However, just as the court of law while ruling on the legal separation decides the individual ownership of various assets that are jointly held, insurance contract is also seen as a cash asset which has been built during matrimony.

- **No Insurable Interests between a Parent and a Child:** A parent does not have an insurable interest on her child though a child is legally obligated by the Hindu Adoption and Maintenance Act to support the parents at time of being aged or infirm. This is because of the fact that "pecuniary interest is not a present interest unless the parent is unable to maintain himself or herself at the time when the insurance is effected". Similarly, a son or a daughter does not have insurable interest in the parent.

b. **Life Insurance contracts where insurable interests are to be proved**

Except for those relationships that are mentioned above, in case of other relationships, insurable interests have to be proved. In each of these relationships, a pecuniary gain has to be established from the insurance claim and it must be founded on a right or obligations capable of being enforced by Courts of law. Some of the cases where there can be an insurable interest and where there cannot be such an interest are given below.

- **Employer-Employee:** Loss of life to the employee translates directly as loss to the employer. The loss is more pronounced in cases of employees with high expertise. Key man insurance policies that are taken by the corporates to insure the resignation or death of its 'key man' are on these lines. Also, an employer can create insurable interest in the lives of his employees by undertaking to provide monetary benefit to the family or estate of the employees in the event of death. Group insurance effected by companies on the lives of their employees are on the basis of such an insurable interest.

- **Creditor-Debtor:** It is obvious that the creditor will lose money that is lent to an individual in a personal capacity in case of death of the debtor. However, this does not give sufficient insurable interest to the creditor as even after the debtor clears his/her dues, the creditor will have a pecuniary gain on the death of the debtor. However, the debtor may take out a policy for the required amount and mortgage the policy to the creditor to recover the amount.

- **Partners:** A partnership firm cannot undertake the usual responsibilities of its operations without the existence of partners of the firm. Loss of one partner in a partnership firm will, therefore, cause pecuniary loss to the partnership firm, thereby to the other partners in the firm.

  Hence, a partner has an insurable interest in the life of his co-partner to the extent of the capital to be brought by the latter.

- **Surety:** In case of a Contract of Guarantee a surety is a person who gives the guarantee to perform the promise or discharge the liability of a third person in case of his/her default. That is, a surety is obligated to pay the amount equivalent to the amount to which he/she has undertaken surety for, in case the principal debtor fails to repay the amount. Therefore, the death of the principal debtor will lead to a pecuniary loss to the surety, thereby giving him/her an insurable interest in the life of the principal debtor.

  In case there is more than one surety for a principal debtor, one surety may have an insurable interest in the life of his/her co-surety.

ii. **Utmost Good Faith**

As mentioned above, contracts of an insurance are *Uberrimae Fides* contracts. That is, these contracts require utmost good faith on both of these parties which ask for voluntary disclosure of all material facts relevant to the subject matter of the contract. Any material facts that are not disclosed to the other party having a direct or indirect relationship to the contract will make it null and void.

In an insurance contract, both the person who is buying insurance and the insurance company should disclose all material facts at the time of entering into the contract. Explaining the characteristics of this type of contract, it was observed in *Daglish vs. Jarvie (1850)* that “the assured must disclose material facts which he/she knows or ought to know, at the time when he/she is making or is under the duty to make disclosure. The assured is under such duty until there is a binding contract of insurance made. The question is to whether certain facts are or are not material is not for the assured to decide but it is to be determined by the views of a reasonable and prudent insurer. Thus, materiality is a question of fact to be decided in the circumstances of each case and may be generally taken to embrace every circumstance which would influence the judgement of a prudent insurer in fixing the premium or determining whether he will take the risk and if so, at what premium and on what conditions”.

Does that mean that the person who is buying insurance should disclose all material facts to the insurance company, and it is for the insurance company to determine the relevance of each material fact? Legally speaking, yes. But in general practice, the prospective assured is given a proposal form upon which certain questions relating to the risk to be insured are asked. This has considerable bearing upon the question of materiality involved in the non-disclosure and misrepresentation. The express terms that are contained in the proposal form as a rule are called warranties, by which “the truth of the answers to the proposal form is made on the basis of (or conditon present) the liability of insurers under the contract”. Apart from this, the insurance company is obligated to explain the implication of the clauses in the agreement and “further to explain each of the questions of which the answers are sought in the personal statement”.

iii. **Indemnity**

Indemnity refers to the assurance given by one to put the person who obtained assurance, in the event of loss, in the same position that he/she occupied immediately before the happening of the event for which indemnity is sought for. Indian Contract Act, 1872, defines Contract of Indemnity as a contract where one party agrees to save the other from loss caused either by the conduct of the promisor herself, or by the conduct of any other person. Though insurance contracts do not fall within the indemnity contracts as per the Indian Contract Act, the very principle of insurance is considered to be the principle of indemnity. Therefore, all insurance contracts except for life insurance, are considered as contracts of indemnity. The principle of indemnity ensures that the insured is not entitled to make a profit from the contract of insurance. That is, by putting the insured in the same place as he/she was before the occurrence of the loss, the insurer will ensure that there is no profit that is made from the contract.

The principles of indemnity and the principle of insurable interest are considered complementary to each other as the insured has to prove that he/she is the person who will suffer a loss (approximately) to the extent of sum assured. However, what would be the scenario when the loss caused to the insured is due to the negligence or act of a third party and when the insured is in a position to recover the amount equivalent to the loss suffered?

iv. **Doctrine of Subrogation**

As per Section 140 of the Indian Contract Act, 1872, where a guaranteed debt has become due and the surety has all that he is liable for, he is invested with all rights which the creditor had against the principal debtor. Rights may exist irrespective of the fact whether the surety knows of the existence of such securities or not. Doctrine of Subrogation is said to be applicable when such rights are conferred to the surety. Here, Doctrine of Subrogation refers to “the right of the insurer to stand in the place of the insured, after settlement of a claim, so far as the insured’s right of recovery from an alternative source is involved”.

If the insured is in a position to be compensated for the loss suffered on account of a third party, the compensation that is paid is subrogated to the insurer after the insurer indemnifies the loss. Subrogation ensures that all rights of the ‘insured subject matter’ are transferred to the insured on indemnification.

When the value of compensation that is recovered from the third party is more than the indemnified value, then the insurer has to pay this excess to the insured though the insurer may charge the appropriate share of any expense incurred in recovering or collecting the money. As Contract of Indemnity is not applicable to life insurance contracts, its collorary – the Doctrine of Subrogation – is also not applicable to these types of contracts. That is, when the legal heirs of the insured have a right to recover the perceived loss from a third party, it cannot be subrogated irrespective of the status of the policy amount that has to be paid by the insurer. No amount of the policy would be subrogated by the insurer.

v. **Warranties**

Section 12(3) of the Indian Contract Act, 1872 defines a warranty as a stipulation which is collateral to the main purpose of the contract. Its breach gives rise to a claim for damages but not a right to reject the goods and treat the contract as repudiated.

As mentioned previously (in II. Utmost Good Faith), warranties are conditions that are written by the insured in the insurance contracts that state the truth by affirming or denying the existence of a particular state of facts. Warranties that are mentioned in the policy are called express warranties and those which are not written in the policy are implied warranties. Also, there are warranties which are answers to the questions (called affirmative warranties) and some warranties fulfilling certain conditions or promises (called promissory warranties).

The following are the significant aspects concerning warranties:

a. Warranties are stated (either explicitly or implicitly through either affirmation or promise) by the insured in the utmost good faith.

b. If the warranties stated are wrong or the ones that are promised are not fulfilled, the contract may be canceled by the other party, whether the risk has occurred or not or the loss has been covered due to other reason than the waiving of warranties.

   In Marine Insurance, the term warranty is explicitly defined in the Marine Insurance Act, 1953. As per the Act, a warranty means that "the assured undertakes that some particular thing shall or shall not be done, or that some stipulation shall be fulfilled, or that a particular state of facts does or does not exist". "It is immaterial for what purpose a warranty is introduced and whether it is material to risk or not, but being inserted it must be strictly complied with." Section 35(3) of the Marine Insurance Act, 1953 discharges the insurer from the liability as from the date of breach of warranty.

In marine insurance, an express warranty might be generally included as:

a. that the ship is seaworthy on a particular day;

b. the ship will sail on a particular day;

c. the ship will proceed to the destination without any deviation;

d. the ship is neutral and will remain so during the voyage.

Implied warranties in marine insurance can be:

a. that the ship is properly constructed;

b. that its machinery is in proper working order;

c. that it has sufficient and efficient crew master;

d. that is sufficiently provided with the necessities of the voyage;

e. that is not overloaded or badly loaded;

f. that it is sound as regards to his/her hull and that it is properly stowed.

Also, the warranty of seaworthiness attaches only up to the time of the sailing of the ship. There is always an implied warranty that the ship shall not deviate from its prescribed or the usual customary route. If it does, the insurer shall not be liable unless the deviation is lawfully excused.

vi. **Proximate Cause**

Proximate cause refers to the immediate cause that resulted in the loss. For example, when there is loss of property due to fire caused by a short circuit, the proximate cause will be short circuit (even if the short circuit occurs due to some other cause, say, the malfunctioning of an electric equipment). It is the cause without which the loss would not have occurred. An insurer is liable for any loss proximately caused by a peril insured against. It is important to identify the proximate cause of the loss that occurred so that it can be known whether the insured can collect the policy amount or not.

If an insurance is taken on a machine against its loss due to fire or floods, and the machine is damaged due to the collapse of the building in which the machine was kept due to floods, then the insurer is not liable to pay as the proximate cause is the collapse, which is not an insured peril.

vii. **Assignment**

Assignment refers to the situation in which one party transfers its rights and duties under a contract to another party. Assignment of a contract means transfer of contractual rights and liabilities under the contract to a third party with or without the concurrence of the other party to the contract.

Both life insurance policies as well as general insurance policies can be assigned. Many of the loan companies and housing finance companies grant loan to the individuals on assignment of life insurance policies.

viii. **Nomination**

Nomination refers to the procedure which enables the nominee (in whose favor nomination is given) to get the policy proceeds without the necessity of producing any legal representation to the estate of the deceased life assured. There need not be any reason for nomination of a policy, a policy may be assigned for a legal consideration or love and affection. The nomination may be changed during the course of the life of the assured. However, once the assignment is made, it cannot be revoked by the assignor because he ceases to be the owner of the policy unless re-assignment is made by the assignee in favor of the assignor.

It should be noted that unlike Assignment, Nomination is for the convenience of the institution (may be a bank, insurance company, finance company or a mutual fund) to give away the monies without having to ask and check for the veracity of the succession documents. That is, though through nomination the person who is nominated may obtain money, there might be a possibility that the ownership of such money be disputed by the legal heirs.

LIFE INSURANCE

Insurance provided for the payment of a sum of money on the death of the insured person due to natural causes (such as disease, old age, debility, etc.) or on the expiry of a certain number of years if the insured person is then alive, fall within the purview of life insurance. Life insurance involves a contract between the insured and the insurer in terms of which the insurer pays a certain sum of money at the end of term of the policy or upon the death of the insured. The insured undertakes to pay a certain sum to the insurer during the life of the policy or as long as the insured is alive. The insured periodically pays some amount on insuring his life (Premium), depending on his age and health status, during his life time. On his death or expiry of certain period of time whichever is earlier, the amount together with a bonus in case of profit policies will be given back by the insurance company. It must be noted that there is an element of certainty in the death of the insured person, sooner or later. It is the timing of the death that would be a risk for the insured person, which is insured against. Therefore, logically speaking, the premium that is paid for continuance of such insurance increases with the age of the insured person. Premium is also dependent on the value that is attached to life and tenure of the insurance contract called Policy.

Primarily, there are two types of life insurance policies. They are (i) Whole Life Policy (amount payable in the event of death) (ii) Endowment Policy (amount payable at the end of certain period of time or death whichever is earlier).

Payments that are payable by the Life Insurance Corporation of India (LIC) are guaranteed by none other than Government of India. Incidentally, payments payable by LIC are the only disbursements of any organization guaranteed by the Government of India.

Various Policies

A person intending to take up life insurance has two basic kinds of policies to choose from (as stated previously): (i) Whole Life Policies and (ii) Endowment Policies.

There are term assurance plans, plans for children, pension plans, Survival Annuity-cum Assurance Plan (Jeevan Sarita) and special plans to meet specific needs of the people. Money back policies cover the individual paying premium and promises to payback the amount at regular intervals instead of waiting for maturity, if the insured is alive. Most of the policies that are offered by this corporation are essentially variances of these kind of policies.

Apart from these schemes, LIC offers life insurance protection under group policies to various groups as employer-employee, professionals, co-operatives, weaker sections of the society, etc. It also provides insurance coverage to people under certain approved occupations at subsidized rates under Social Security Group Schemes. Besides providing insurance coverage, the corporation also offers group schemes to employers which provide funding of gratuity and pension liabilities of the employers. The main features of the schemes are low premium and simple insurability. Premiums are based upon age composition of members, occupations and working conditions of the group. However, there are certain conditions as to the minimum group size and the minimum participation to make the scheme viable. These variations and parameters are too broad to be discussed in our study.

Key Man Insurance Policy, offered by LIC, aims at insuring the loss suffered by the company/organization from the resignation or death of the person insured (the ‘key man’ to the company). This type of insurance recognizes that profits depend on the key man of the company. Every successful business has one or two key men who possess the managerial skill and the experience to direct the efficient use of material resources of the business, whose loss would be a severe shock to the continued success of the business concern.

The following factors are taken into consideration for the key man insurance:[5]

i. Special qualifications of the Key Man.

ii. Experience *vis-á-vis* exposure in the different positions.

iii. Number of years of service in the present company – if the executive is new entrant in this company then the previous employer, previous designation, salary drawn and the product of the earlier company.

iv. Whether the company has given him unconditional authority in production/sales/market fields, etc. for specific product.

v. Total salary with perks.

vi. Whether he is the only key man in the particular product area of the company.

The amount insured for the key man varies from 10 times of his 3 years average annual salary and perks. Total sum assured for company under key man may reach 5 times of the net profits of the company.

Premium paid for the key man insurance is a deductible expenditure as per the Income Tax Act.

Different methods are used for arriving at the sum assured.

Key man insurance protects the company from the loss of the key man. However, it does not protect the key man for the death of the company and if the key man’s services are not required/needed by the successor firm, the policy gets sold to the life assured for cost, obviously for lower cost and he may hold it for the benefit of his family.

Annuities

An annuity is an investment that you make, either in a single lump sum or through installments paid over a certain number of years, for which in return you receive back a specific sum every year, every half-year or every month, either for life or for a fixed number of years.

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5 *Source: Manual for Agents: Life Insurance Corporation Publication*.

Upon the death of the annuitant, or at the expiry of the period fixed for annuity payments, the invested annuity fund is refunded, perhaps along with a small addition, which are calculated arithmetically at that time.

Annuities differ from all the other forms of life insurance discussed so far in one fundamental way – an annuity does not provide any life insurance cover but, instead, offers a guaranteed income either for life or a certain period.

Typically annuities are bought to generate income during one's retired life, which is why they are also called pension plans.

Annuity premiums and payments are fixed with reference to the duration of human life. Annuities are an investment, which can offer an income you cannot outlive and provide a solution to one of the biggest financial insecurities of old age; namely, of outliving one's income.

Apart from Whole Life, Endowment, Group and Key man insurance policies, LIC also offers annuities to the people who want to hedge the 'risk' of living longer. Annuities provide for a continuous stream of income in return for initial lump sum capital (which may also be paid in installments) thereby providing comfort till death, to the person who has taken such annuity contract. The Annuity is a 'upside down' application of life insurance. While in a typical life insurance, an insurer starts paying upon the death of the insured, in an annuity contract, the insurer stops paying upon the death of the insured.

Various types of annuities are available. Immediate Annuity, for example, is purchased with a single premium and the first installment of the annuity payment will be paid within a specified period of time. The payment of annuities is stopped on death of the annuitant. While in Immediate Annuity Certain, annuities are paid for certain specified period of time in return of lump sum payment, and may continue even after the expiry of said time-frame as long as the annuitant lives. In case of death of the annuitant in the specified period, the remainder of the guaranteed payments will be made to the beneficiary. And in case of Deferred Annuity, the annuitant gets back the annuities after expiry of certain time period, from the capital paid in installments over some years. Deferred Annuity contracts may also be for a guaranteed certain periods and life thereafter. This way, some of the annuity contracts may be structured as pension plans. Also, annuity plans may be structured such that an annuity is paid yearly to the annuitant (which may be equal to the interest on the lump sum paid initially), the initial lump sum being paid back on the death of the annuitant. Life Insurance corporation offers various combination of such annuity plans. Jeevan Dhara, Jeevan Saritha and Jeevan Akshay are some of the popular annuity plans offered by LIC.

GENERAL INSURANCE

Insurances other than life insurance fall within the purview of General Insurance. General insurance covers loss of every other physical or non-physical assets. The loss may be due to fire, theft, accident, and etc. General insurance policies are for one year and renewable every year. Even here, the owner or the possessor of such assets insures with the insurance company by paying certain premium. In case of any subsequent loss of the asset, then such loss will be made good to certain extent depending on the conditions in which loss has occurred. A general insurance policy may be termed as a contract of indemnity, as the insurer normally makes good the loss suffered. Also, note that there is no certainty in the loss of the asset (in contrast to life insurance), which is insured against and hence the premium paid would be proportional to the probability of such loss and value of such asset.

General insurance may not always mean that there is an insurance against loss of physical asset. The following kinds of general insurance involves policies against non-physical 'assets'.

General Insurance is handled by GIC (General Insurance Corporation) through its four subsidiaries, viz., United India Insurance, Oriental Insurance, National Insurance and New India Insurance. Premia under General Insurance is tariffed and hence uniform rates and terms prevail. Separate tariffs are in force for material damage policies and consequential loss policies. The tariffs and claims on GIC are regulated by the Tariff Advisory Committee (TAC) formed under the Insurance Regulatory Authority. TAC is playing active role in determining of premium that may be paid on each kind of insurance in an attempt to harmonize the risk undertaken by the insurer and premium paid on such insurance. Recently, TAC had advised GIC to jack the premium rates by 200-600 percent depending on policy taken. Apart from providing the relevant humanization due to increased risks, the rise will provide much-hyped level playing field for GIC with the imminent entry of foreign players into the industry. General Insurance has three major classifications:

Insurances of Interest: This classification comprises mainly the fidelity guarantee insurance and other guarantee insurance. Fidelity insurance covers loss by fidelity of an employee in the company. Guarantee insurance covers loss by providing of garnet on a product offered by the company that is getting such insurance.

Insurances of Liability: Public (third party) liability insurance, products liability insurance and professional indemnities fall under this classification. All risks arising out of performance of one’s own duty or mistake and the effect of such mistake to others and damage thereof is insured as a liability insurance. That is, any unforeseen liabilities arising out of damage to others (including or excluding those persons not directly involved) in the process of usage of the product or service offered by the company is insured under this category.

‘Insurances of Person’ and ‘Insurances of Property’ are topics of our interest. This section and the 'subsequent section dwell upon these topics. Before any meaningful discussion could be taken up on any kind of insurance schemes, it is necessary to understand certain principles of insurance which form the basis for any insurance contract.

Fire Insurance

The Fire Insurance policy is available to cover any movable and immovable property having monetary value. The cover under the policy relates to the loss of or damage to insured property by specified perils. This is the ‘material damage’ policy, and is known as the standard fire policy. Damage by fire to property in manufacturing premises may result in total or partial stoppage of production leading to loss of profits. Such loss of profits can be covered under loss of profits (fire) insurance policy (also known as a fire consequential loss policy).

KINDS OF POLICIES

There are three different kinds of policies. They are

i. Declaration Policy.

ii. Floating Policy.

iii. Reinstatement Value Policy.

Declaration policy and floating policy are issued in respect of stocks while reinstatement value policy is issued in respect of building, plant and machinery, furniture and fixtures.

Declaration Policy: Declaration policy is evolved on the principle that variation in the value of insured stock of merchandize results in under-insurance or over-insurance. Under-insurance refers to decrease in the value of the insured interest after insurance has been bought, resulting in prejudiced operation of conditions.

Over-insurance means increase in the value of stock that would increase the cost of insurance for the insured with no benefits in return. Under declaration policy, adjustments are sought to be made by periodical declarations by the insured on the changing value of the goods.

In this policy, the maximum value of stock likely to be reached during the course of the policy period will be taken as the sum insured under this policy. Depending upon the range within which the fluctuations take place and also their frequency, the number of declarations to be made under the policy will be fixed. The insured is required to declare values of stock periodically, which may be once in a month, week or fortnight.

The value at risk is to be determined on one of the following basis to be agreed before the policy is issued:

i. The average of the values at risk on each day of the month.

ii. The average of the highest value at risk in each week of the month.

iii. The average of the highest value at risk in each fortnight of the month.

iv. The highest value at risk during the month.

v. Value of stocks on the last day of each month.

vi. Average of the values on a fixed day of each week or each fortnight.

vii. Value on a fixed day of each month.

viii. The average of the values at risk on each day of the quarter.

The following conditions are applicable in declaration policy[6]:

i. The policy covers loss only over and above other policies whether effected by the insured or by any other person or persons covering the stocks hereby insured.

ii. If after occurrence of loss, it is found that the amount of the last declaration previous to loss is less than the amount that ought to have been declared, then the amount which would have been recoverable by the insured shall be reduced in such proportion as the amount of the said last declaration bears to the amount that ought to have been declared.

iii. Notwithstanding the occurrence of a loss it is understood that the sum insured will be maintained at all times during the currency of the policy and the insured, therefore, undertakes to pay extra premium on the amount of any loss pro rata from the date of such loss to the expiry of the period of insurance.

iv. In the event of the policy being canceled by the insured, the premium will be retained by the company to the extent of appropriate short period premium calculated on the average amount insured up to the date of cancellation or 35 percent of the provisional premium whichever is greater.

Floating Policy: Floating policy covers insurance of all the stocks and goods at more than one location such that fluctuation of value of stocks at all the locations will be covered. The value of the policy would be highest of the rates taken for each of the locations calculated as if the policy is taken separately.

Reinstatement Value Policy: Where the insurer is satisfied about the bona fides of the insured and the subject matter to be insured is only building and/or machinery, the modern practice is to issue a policy on the reinstatement and not on the standard basis. The reinstatement policy is not insured when the property to be insured is stock, merchandise or materials. The basis of settlement in the event of destruction is the cost of rebuilding of the building or for the plant and machinery,

6 *Source: New India Assurance Fire Manual.*

the cost of recreation of similar machinery in a condition equal to but not better or more extensive than its condition when new. In other words, the settlement is on the new for old basis. The reinstatement policy, therefore, seeks to place the insured in a position better than the one which he enjoyed immediately before the fire. To this extent, therefore there is a deviation from the principle of strict indemnity.

Policy Cover: For the purposes of this policy, the term 'fire' means accidental ignition. Mere scorching is not a loss by fire. The example of scorching is clothes burnt by an iron which is too hot. There is no accidental ignition, and hence no fire. The examples of property that can be covered by the policy are buildings, furniture, fixtures and fittings, electrical installation, household contents, plant, equipment, machinery and stocks.

The perils covered by the policy are as under:

i. Fire;

ii. Fire resulting from explosion;

iii. Lightning;

iv. Explosion of boiler used for domestic purposes only; and

v. Explosion of gas used for domestic purposes or for lighting or heating.

Fire damage resulting from explosion is covered under the policy but not any other kind of damage (example, conclussion damage) caused by explosion. The latter risk is to be covered by an endorsement on payment of additional premium. However, full explosion cover, that is, fire damage as well as conclussion damage is provided in respect of explosion of boilers or gas, used for domestic purposes. Lightning may result in fire damage or in other types of damage, such as, roof broken by a falling chimney struck by lightning. Both fire and other types of losses are covered by the policy.

Loss or damage by the following perils is specifically excluded from the cover of this policy:

i. Earthquake;

ii. Typhoon, Cyclone, Flood, etc.;

iii. Riots, Strikes; and

iv. War and other kinds of perils.

The following losses are excluded from the policy:

a. Loss by theft during or after the fire;

b. Loss or damage to property due to its own spontaneous combustion or its undergoing any heating or drying process;

c. Loss due to the burning of property by order of any public authority, or subterranean fire;

d. Loss due to nuclear risks;

e. Loss or damage to any electrical machines, fixtures, apparatus, etc. due to short circuiting or other electrical risks.

If short-circuit results in fire and causes damage to other electrical machines, apparatus, etc., subsequent loss is payable. In other words, damage to electrical machines in which the short circuit occurs is excluded, but not fire damage caused to other electrical machines, etc.

Insurance policies indemnify only those losses which are proximately caused by insured perils. However, under the standard life policy, the insurers indemnify the following losses although they are not proximately caused by fire or any other insured peril:

a. Damage caused by water used by fire brigade in putting out the fire;

b. Damage caused by blowing up of the property by the fire brigade, to prevent spreading of fire;

c. Damage caused by smoke, or collapse of walls; and

d. Damage to property removed from a burning building due to rain.

This is the relaxation of the principle of proximate cause.

If the sum insured under the policy is less than the value of the property at the time of loss, the insurers will pay only a ratable proportion of the loss. This provision is known as the pro rata condition of average, and is made to discourage under-insurance.

During the policy period, the policy may be canceled by the insurers or by the insured. If the policy is canceled by the insurers, the refund of premium is made on a pro rata basis. If, however, the policy is canceled by the insured, the refund of premium is made on the basis of the short period scale of rates.

The cover ceases under the following circumstances:

a. Material alteration in the property covered;

b. Building being vacant for more than 30 days;

c. Removal of insured property to another location; and

d. Transfer of insurable interest, except by will or operation of law.

If, however, these alterations are notified to the insurers and the policy endorsed, the cover continues to operate. On the death of the insured, the policy is automatically transferred to his legal heirs.

In the event of loss or damage under the policy,

a. The insured is required to give

    i. immediate notice of loss;

    ii. written statement of particulars of property lost or damaged; and

    iii. proof of loss, at his expense.

b. The insurers have a right to

    i. enter the insured premises;

    ii. take possession of the insured property;

    iii. salvage the insured property; and

    iv. sell the property on behalf of the concerned parties.

The standard fire policy excludes several perils like ‘riot and strikes’, earthquake, fire, shock, etc. These perils known as ‘special perils’ or ‘extraneous perils’ can also be covered on payment of additional premium.

Marine Insurance

Marine insurance is one of the oldest branches of insurance. It has developed over many centuries. It plays a significant role in both internal and international trade. A marine cargo insurance policy is an important document in international trade and provides collateral security to the banks. The Marine Insurance Act, 1963, is the basis for the transaction of marine insurance in India. This Act is based on the Marine Insurance Act, 1906 of UK.

Marine insurance business is divided into the following two broad classes:

– Marine hull insurance business, and

– Marine cargo insurance business.

Marine hull insurance is concerned with the insurance of hulls (i.e. ships, launches, barges, etc.) and their machinery.

All the basic principles of insurance apply to this class of business as much as to any other class. However, the principle of indemnity is applied to marine cargo insurance policies only ‘in the manner and to the extent agreed’. In view of the difficulties involved in determining the market value of the insured property on the day and at the time of loss, and the fact that market value of certain commodities differ widely from one country to another, almost all marine insurance policies are issued as *valued policies* (also known as ‘agreed value’ policies).

Besides, in contrast to the other insurance policies which can be assigned only with the prior consent of the insurers, the marine cargo insurance policies are freely assignable, by endorsing them in blank. Such a blank endorsement by the insured makes the policy negotiable, and subsequently the assignment is effected by mere delivery of the policy.

UNDERWRITING

In view of high incidence of claims, the proposals for this class of business need to be underwritten with great care. The underwriting of this class of business requires a sound knowledge of the nature of the various types of cargo, the types of damage to which such cargo is easily susceptible and the conditions obtaining at different ports of the world.

All the items of information obtained on the declaration form are relevant for underwriting purposes. However, the nature of cargo and the method of packing are very important factors.

POLICY COVER

The policy form may differ slightly from one insurer to another, but it basically follows the pattern of the S & G form of policy (also known as ship and goods policy). This form of policy is also known as the plain form of marine insurance policy. This form was devised by Lloyds (a group of underwriters in London) over 200 years ago. The form is still in use (no doubt with appropriate alterations to suit the present-day conditions) because most of the terms used in this policy form have been interpreted by the courts of law and everyone concerned with the transaction of this business, knows for certain the meaning of the various terms used therein.

The policy form referred above provides only the basic cover, which is perhaps not adequate in the present-day conditions. To suit the present-day conditions, the cover granted by the above policy form is required to be modified. This modification is effected by attaching to the policy form, various clauses. For oversea transits, the clauses attached are known as Institute of London Underwriters. For other transits, appropriate clauses (such as Rail Risk Clause) are attached.

The policy provides cover only against total losses arising from marine perils. The marine perils covered are as under:

i. **Perils of the seas:** Accidents occurring in sea e.g. by sea water, by storm, collision, stranding, foundering, etc. The peril must be maritime in nature. Inevitable losses such as wear and tear caused by the ordinary action of the winds and waves are not covered.

ii. **Fire:** Apart from the actual loss or damage due to fire, smoke damage and damage caused by water used in extinguishing fire is also covered.

iii. **Acts of thieves and pirates:** Loss or damage caused by "assailing" thieves and not clandestine theft or pilferage.

iv. **Jettison**

v. **Barratry**

vi. **All other Perils:** Perils which are similar to the above perils.

With the development of trade and commerce, the above cover was not considered adequate, and demand for wider protection resulted in the granting of cover on comprehensive basis. Under this basis, the basic policy was further extended to cover the following extraneous risks:

i. Theft, pilferage and/or non-delivery;

ii. Fresh water and rain water damage;

iii. Hook and/or oil damage;

iv. Heating and sweating damage;

v. Damage by mud, acid and other extraneous substances;

vi. Breakage;

vii. Leakage; and

viii. Country damage.

The above policies can be extended to cover war, strike, riot and civil commotion risks by use of clauses drafted for these risks.

Cargo policies are normally voyage policies which cover the goods during a specified voyage or transit whatever the time taken. It is necessary to be clear as to when exactly risk commences and terminates under a voyage policy. Whatever may be the scope of cover granted, the duration of cover is the same for all marine cargo policies. The cover granted is from warehouse to warehouse. The risk starts when the goods leave the warehouse for commencement of transit and terminates when they arrive at the final warehouse at destination. This is, however, subject to the proviso that the period of cover after completion of discharge of the goods from the vessel at the port of discharge should not exceed 60 days. If it does, the cover will terminate on the expiry of the period of 60 days. The warehouse-to-warehouse cover applies for marine perils, extraneous risks, strike, riot and civil commotion risks. As for war risks, cover is restricted under the waterborne agreement to apply only when the cargo is on water (not on land).

Transit Insurance Policies

The brief particulars of the cover available under the various inland transit insurance policies are given below:

Transit by Rail

In respect of inland transit by rail, cover is granted in terms of the Rail Risk Clause. Risks covered are fire, collision, breakage of bridge, derailments or accidents of alike nature, and losses are payable irrespective of percentage. Extraneous risks can be covered by specific inclusion in the policy on payment of an extra premium. The risk commences with the loading of each bale or package into the railway wagon and ceases 7 days after arrival of the train at destination or on delivery by the railway, whichever may first occur. Warehouse-to-warehouse cover can be granted on payment of an extra premium by attaching a special clause.

Transit by Road

Road transit policies cover the risks of fire, collision, overturning of vehicles or accidents of alike nature. The risk of trans-shipment is also included. The insurance commences with the loading of each package into the vehicle and ceases 7 days after arrival of the lorry at the destination named in the policy.

Via Registered Post

Consignments sent by registered post are generally covered against all risks of physical loss or damage from any external cause, but sometimes the cover is restricted to total loss only. The policy does not cover claims for delay, deterioration, and/or loss of market. It also excludes the infidelity of the insured's and/or consignee's own messenger. The cover commences from the time of issue of the registered post receipt and terminates on the delivery of the parcel to the consignees or their representatives and their signature to the post office.

Via Air

These can also be insured either against total loss or All Risks, as in the case of registered postal sendings.

OPEN COVER

Large export and import firms make numerous regular shipments. It is inconvenient for such firms to obtain separate cover for each shipment. Besides, there is a possibility that through an oversight, some shipment/s may remain uncovered and in the event of a loss arising in respect of the said shipment/s, the said firm will be required to bear the loss itself. In order to avoid such situations, a permanent form of insurance protection by means of an open cover is obtained by large firms required to make numerous regular shipments.

An open cover describes the cargo, voyage and cover in general terms and takes care automatically of all shipments which fall within its scope. It is usually for a period of 12 months and is renewable annually. There is no limit to the total number or value of shipments that can be declared under the open cover.

Miscellaneous Insurance

All insurances which do not fall under the categories of life insurance, fire insurance and marine insurance are covered under the category of accident insurance. Several of these insurances have no relation with an accident, and hence this branch of insurance is now more appropriately referred to as miscellaneous insurance.

Miscellaneous insurance covers several classes of insurance. Important classes are listed below:

- Motor insurance
- Burglary insurance
- Engineering insurance
- Cattle insurance
- Crop insurance
- Aviation insurance
- Personal accident insurance
- Fidelity guarantee insurance
- Liability insurance
- Catastrophe/Calamity insurance.

The method of computing premium amount in respect of miscellaneous insurance policies has been a subject of much discussion, as no single method has been found to apply to all policies because of a variety of risks underwritten. The methods generally used in some classes are indicated below:

Table 1

Class of Business	Basis of Charging Premium
Motor insurance	A flat premium, according to the risk covered.
Burglary insurance	A rate percent of the sum insured.
Fidelity guarantee insurance	A rate percent of the sum insured and where applicable, a per capita charge also.
Personal accident insurance	A rate per mille (i.e. Rs.1,000) of the capital sum insured.
Liability insurance	i. Rate percent of turnover or output or ii. A rate per mille of the wages, or iii. A per capita charge according to the seating capacity, or according to the number of rooms, or iv. A flat premium, according to the risk covered

Motor Insurance

Motor insurance is one of the widely known classes of miscellaneous insurance. This class of insurance has two major aspects. One is the loss of or damage to the motor vehicle and the other is the liability that may be created by the owner/driver of the motor vehicle, to third parties for the bodily injuries sustained by them or for damage to their property. Motor Vehicles Act, 1939 as amended from time to time, has made it compulsory for the vehicle owners/drivers to insure their liability to third parties arising out of the use of the motor vehicles in public places for the monetary limits stipulated in the said Act. The insurance of the loss of or damage to the motor vehicles is not compulsory, and it is for the individual vehicle owner to decide whether or not to insure the same.

For the purposes of motor insurance, a ‘vehicle’ means any mechanically propelled land vehicle (and its trailers) provided it does not run on rails. For purposes of insurance, the vehicles are classified as under:

- Private cars;
- Commercial vehicles; and
- Motor cycles and scooters.

The types of cover available for each type of vehicle are as under:

- Comprehensive cover;
- Third party liability only cover; and
- ‘Act’ liability only cover.

In respect of certain vehicles, cover is also available for third party liability and fire and/or theft risks.

The comprehensive cover, covers both the loss or damage risks (also known as own damage risks) and third party liability. It affords the widest protection and attracts the highest rate of premium.

The third party liability only cover, covers only the third party liability of the vehicle owner/driver for personal injuries and property damage. This cover is wider than 'Act' liability only cover, because it covers the third party liability arising in public and other places, and that too, for an unlimited amount.

The 'Act' liability only cover, covers only the liability of the vehicle owner/driver required to be covered compulsorily under the provisions of the Motor Vehicles Act. It affords the narrowest protection and attracts the lowest rate of premium.

PRIVATE CAR COMPREHENSIVE POLICY

The policy is divided into three sections. Section I deals with the loss of or damage to the car itself, and is known as the loss or damage section, or own damage section. Section II deals with the cover in respect of liability to third parties. Section III provides for the reimbursement of medical expenses.

The cover is operative whilst the car is garaged, parked, if plying on roads or is in transit on road, rail, inland waterway, anywhere in India.

The insurers indemnify the insured against all sums which he may become legally liable to pay to third parties by reason of death or bodily injuries caused to such third parties or by reason of damage to the property of such third parties caused by or arising out of the use of the motor car.

If the insured or any occupant of the motor car is injured as a result of an accident to the motor car and if the insured incurs medical expenses for the treatment of such injury, he is reimbursed for expenses reasonably incurred.

COMMERCIAL VEHICLES COMPREHENSIVE POLICY

This policy is similar to that of private car comprehensive policy but for some differences, which are as follows:

i. Loss of or damage to the vehicle and/or its accessories is covered against the risks of burglary, housebreaking or theft, only if the vehicle is also stolen at the same time.

ii. Loss of or damage to the vehicle and/or its accessories whilst thereon is not covered, if overloading or strain or by explosion of the boiler of the motor vehicles.

iii. Whilst the insured vehicle is being used for the purpose of towing, the cover provided by the policy remains operative provided the vehicle is not towed for hire or reward.

Burglary Insurance

This insurance is useful to manufacturers and traders in respect of their trading stocks, furniture, fixtures, etc. and to households in respect of general household goods and personal effects.

This business is not tariffed. However, in those cases where combined fire and burglary insurance policies are issued, fire insurance tariff rates have to be followed for granting cover for the fire portion of the risk.

The following factors are normally considered while underwriting burglary insurance proposals:

- Situation and neighborhood of the premises
- Construction of the premises
- Nature, type and value of the insured property

- Occupation of the premises
- Manner in which the doors are locked and secured at night
- Whether the premises are guarded by a watchman or not
- Whether the premises are left unoccupied for long periods, and
- History of claims and insurance.

TYPES OF POLICIES

The following are the main types of burglary insurance policies:

i. **Burglary (Business Premises) Insurance Policies**

The perils covered are burglary and housebreaking. The policy may be extended to cover the perils of riot and strikes, robbery, dacoity and hold-up, on payment of additional premium.

Any or all of the following property in any business premises can be covered:

i. Stock-in-trade

ii. Goods held in trust or on commission

iii. Furniture, fixture and fittings

iv. Cash and currency notes in locked safe.

In addition to the loss of or damage to the insured property by any of the insured perils, the policy also covers the damage caused by the burglars to the premises containing the insured property.

ii. **Burglary (Private Dwellings) Insurance Policies**

The perils covered are burglary, housebreaking and theft (or larceny).

All the contents of the insured in his private dwelling house are to be insured. The insurance has to be on full value basis. The total sum insured is to be divided under the following items:

i. Furniture, fixtures and other household goods

ii. Personal effects of every description

iii. Jewelry and valuables.

The sum insured on ‘jewelry and valuables’ cannot exceed one-third of the total sum insured, unless an extra premium is paid on the amount covering jewelry and valuables in excess of one-third of the total sum insured.

Sometimes, the policies issued in respect of private dwellings also cover the peril of fire in addition to the perils of burglary, housebreaking and theft (larceny). These policies are then known as combined fire and burglary insurance policies. Currently, the issue of these policies is not common, and the modern trend is to issue composite insurance policies (also known as multi-peril policies).

iii. **All Risks Insurance Policies**

The perils covered are fire, burglary, housebreaking, theft (or larceny) and accidental external means are covered by all risks insurance policies.

The policy is specially suitable for covering jewelry, valuables, curios, antiques and other works of art, paintings, watches, clocks, camera, opera glasses, furs, trinkets and other similar articles.

Although these policies are known as all risks insurance policies, strictly speaking they are not all risks policies, because they do not cover all conceivable risks.

iv. **Baggage Insurance Policies**

These policies cover the wearing apparel and personal effects carried by the insured during journeys. Normally, jewelry and valuables are excluded, but wrist watches and fountain pens may be covered.

The peril covered is theft, but accidental loss or damage is also covered by some insurers; pilferage is not covered.

The cover is operative only when the insured is traveling by any accepted mode of travel.

Temporary residence at any hotel or rest house during the course of travel, is also covered. The period of cover does not exceed one year.

v. **Money-in-transit Insurance Policies**

The property covered by these policies is money and/or securities-in-transit from one place to another. Sometimes, money and/or securities kept in the insured's premises are also covered for short period of time.

The perils covered for transit risks are theft, robbery and accident. If the money and/or securities kept in insured premises are also covered, the perils in respect of these risks are burglary and housebreaking only. The policy may be extended to cover riot and strike risks, on payment of additional premium.

The policy specifies the amounts viz. limit of the insurer's liability for any one loss and the estimated amount in transit during the policy period. The former represents the maximum amount that the insurers may be required to pay in respect of such loss. The latter represents the amount to which the rate of premium is to be applied to arrive at the amount of premium.

Engineering Insurance

Engineering Insurance comprises the following broad types:

i. **Boiler Explosion Insurance**

The property covered are boilers and pressure vessels. The policy provides cover for the damage other than by fire to the insured property and to the other surrounding property of the insured. The policy also provides for legal liability of the insured caused by explosion or collapse of the boiler occurring in the course of ordinary working. Riot and strikes damage is not ordinarily covered, but can be covered on payment of additional premium.

ii. **Machinery Breakdown Insurance**

The policy provides indemnity against any unforeseen and sudden damage to the machinery by causes such as short circuit, faulty design, bad workmanship, erection faults, etc.

iii. **Erection Insurance**

This policy covers plant and machinery under erection. The cover normally commences from the arrival of the materials at the site of erection, operates during storage of the material, erection and test running of the plant, and terminates on the commissioning of the plant. Third party liability arising out of the erection work is also covered.

Unlike other policies, the erection insurance policy is issued for entire period of erection, which may be several years.

iv. **Marine-cum-Erection Insurance**

Under this policy, transit insurance and erection insurance covers are combined. The cover commences right from the time the machinery leaves the manufacturer's warehouse abroad or within the country and remains in force during the voyage and while in transit to the site of erection, during storage at site and terminates on completion of erection and testing. The marine transit insurance cover is against all risks of physical loss or damage, and the erection insurance cover is as described earlier.

v. **Contractors' All Risks Insurance**

The property covered is civil works like buildings, marine works like bridges, dams, etc., and the contractors, plant and equipment.

The cover offered is against most of the natural calamities. The third party liability arising out of constructional activities can also be covered, if desired.

The policy is issued for the entire period of construction which may be several years.

AGRICULTURAL INSURANCE

Agricultural Pump-sets Insurance

The property covered is pump-sets used for agriculture, whether operated by electricity, diesel or oil.

The perils covered are fire, lightning, burglary, theft and mechanical and/or electrical breakdown. Each claim arising out of mechanical breakdown is, however, subject to an excess.

Cattle Insurance

This insurance provides cover against death of animals within the geographical area specified in the policy arising from any disease or accident occurring after the commencement of the insurers' liability under the policy.

Crop Insurance

Crop insurance schemes were introduced in certain states on condition that the states concerned shall participate in these schemes as co-insurers sharing claims as well as premium to the extent of at least 25 percent, and that the concerned states shall provide all necessary technical and administrative assistance.

The cover would be against unavoidable loss of production due to or arising as a result of one or more of the following causes among others:

- Climatic reasons such as drought, flood, frost and cyclone
- Pest infestation
- Plant diseases
- Riot and strikes
- War and kindred risks are excluded.

Aviation Insurance

Besides the classes of miscellaneous insurance described above, aviation insurance is also an important class. However, in view of the large premium and the technicalities involved, the business of this class is generally handled separately and not as a part of miscellaneous insurance department.

Health Insurance

Health insurance is also known as medical insurance, accident and also sickness and accident insurance; it also covers all types of disability, loss of income, medical expense and accidental death. It can be defined as "any form of insurance whose payment is contingent on the insured incurring additional expenses or losing income because of incapacity or loss of good health". In Medical insurance benefits becomes payable on disability as a result of accident or sickness. Health insurance can address the problems related to rising medical expenses.

The health insurance coverage can be divided into three. They are:

i. Medical Expenses Cover

ii. Major Medical Expenses Cover

iii. Disability Income Cover.

i. *Medical Expense Cover*: Basic hospitalization expenses are reimbursed. It covers payment of expenses related to hospitalization and the services rendered by the doctor and the nursing home. In the US context medical insurance is popularly covered through Blue Cross and Blue Shield insurance schemes. These medical schemes take care of the medical expenses. The main benefit under these insurance schemes is that a predetermined number of day's stay in the hospital and hospital costs are covered in the scheme. Apart from these costs, all other costs for services provided by the hospital are covered while the insured remains hospitalized. Blue shield plans, pay to the doctor/hospital on behalf of the insured. In some cases, the balance of the expenses are to be borne by the insured himself.

ii. *Major Medical Expense Cover/Long-term Care Insurance*: Covers expenses related to major surgery or operations, due to serious illness or disease. Major medical coverage continues protection after basic medical expense insurance benefits have exhausted. The major medical insurance policies may add benefits for some services not covered by the medical expense insurance policies. A high deductible is applied to major medical insurance. The insured must pay an amount of medical bills equal to the deductible, so that the insurer will pay the expenses in excess of the deductible.

iii. *Disability Income Cover*: Is primarily aimed at providing for the lost income in the disability period or in the treatment period. It tries to replace the income that cannot be earned due to sickness of the assured. The benefit is usually paid as a percentage of the capital sum insured, and is paid weekly. It is basically an indirect protection to the insured. The period for such compensation is short.

Classification of Health Insurance

Health insurance is sometimes called sickness insurance or disability insurance. Whatever the name given, it refers to numerous distinctive plans of coverage to protect the insured against specific financial losses resulting from illness, injury, or incapacity. Unlike life or general insurance where there are only two parties, the insurer and the insured, in health insurance – besides the insurer and the insured, there is a third element namely doctors, hospitals, etc., that provide the required medical services. Presence of this third party in the health segment is at times perceived as a source for moral hazards.

As discussed in the first chapter, health insurance is classified into three categories:

- Medical expense insurance.
- Long-term care insurance.
- Disability income insurance.

We shall now discuss them in detail with added emphasis on long-term care and disability income coverages because of their importance in the individual policy market.

Individual Medical Expense Insurance

Every individual requires health insurance coverage but group plans or government health plans do not cover all the people. Individual policies are meant for such people and the following people fall under this category.

- Self-employed.

- Students not covered by their parents' insurance.
- Early retirees.
- Employees who are not offered any medical expense coverage.
- Part-time, temporary or contract workers who are not eligible for coverage through their employees.
- Unemployed persons who are not eligible for government sponsored health plans for the poor.
- Spouse, children and other dependents who are not eligible for coverage.

Even the individuals whose basic need is fulfilled by group or government plans may find enough reason to be covered by individual policies. Government health insurance plans do not provide coverage for all medical expenses.

Similarly, the individuals covered by a medical expense insurance may find their existing insurance inadequate. The health insurance plan may pay less than the actual hospital charges for room and board. Some insurance plans may limit the existing medical expense insurance converge.

Private health insurance policies cover such uncovered expenses and serve as a supplemental health insurance plan.

COMPREHENSIVE MAJOR MEDICAL POLICY

All categories of medical care services and supplies are covered under this policy. The reimbursement of all covered expenses is made after providing for the deductible. For example, a reimbursement of 80 percent of the total covered expenses in a year after providing Rs.500 for deductible up to a maximum amount of Rs.1,00,000. The major advantages of comprehensive major medical plan are as under:

i. Simple design of the plan

ii. No duplicate coverage.

A wide range of comprehensive major medical plans are developed that cover the various expenses of the insured. Some plans covering specific types of expenses like hospital expenses, surgeon's fees would not require to provide any deductible, and co-insurance need not be applied on the initial hospital expenses. Today, many plans put a maximum annual out-of-pocket cap on expenses incurred by the insured.

SPECIAL INDIVIDUAL INSURANCE COVERAGE

Insurers offer special individual policies to meet the needs of the public who are interested in getting insured. These policies include:

a. Hospital Confinement Indemnity Policies

b. Temporary Major Medical Policies

c. Specified Disease Policies.

Hospital Confinement Indemnity Policies: A fixed sum is paid for each day of hospital confinement. Generally, the benefit is provided as monthly amounts for continuous confinement as up to a specific period. The amount paid for a month is actually an aggregate of possible daily expenses in any 30-day period of hospitalization.

Temporary Major Medical Policies: As the name suggests these policies are temporary or are for a short period. These policies are nothing but a short version of major medical coverage. Temporary major medical policies cover for only one term if the coverage is on a three-month basis.

Specified Disease Policies: Also called “dreaded disease policies”, these provide various types of benefits up to a substantial maximum (higher amounts) wholly for the purpose of treatment of dreaded disease, mentioned in the policy. Generally, the benefits are paid in a fixed amount of indemnity for specified events, like hospital confinement, medical procedures, etc. Since specified disease policies provide coverage only for a specified disease, it can be used only as a supplement to the other insurance policies.

Long-term Care Insurance

Regular medical expense insurance policies do not cover the expenses incurred in a nursing home, or medical expenses incurred in his/her own home. Long-Term Care (LTC) expenses and home health care expenses are covered under this insurance. Long-term care plans are special policies that provide coverage for nursing home care and home health care for a period specified in the policy. Either individuals or groups can benefit from LTC. Long-term group insurance is playing an important role in this fast developing market though, the LTC market developed initially by the individual products.

DEFINITION OF LONG-TERM CARE

Long-term care has taken a broad meaning and is no longer synonymous with nursing home care as it was in the past. The New York State Insurance Department has defined long-term care as:

“Long-term care refers to a broad range of supportive medical, personal, and social services needed by people who are unable to meet their basic living needs for an extended period of time because of an accident, illness or frailty. Long-term care involves receiving the assistance of another person(s) to perform the essential Activities of Daily Living (ADL) when these tasks are no longer performed independently. ADL assistance may be provided at home by formal (paid) caretakers, such as home health aids, by informal (unpaid) caretakers, such as family members or friends, or in a nursing home.”

NEED FOR LONG-TERM CARE

Today, people are living for longer periods when compared to people in the earlier days. The life expectancy of people has increased due to the availability of proper medical facilities. Longer lives lead to a rise in the older population which presents many challenging problems. With longer lifespans, the number of old people incapacitated by chronic diseases will increase. Such people require continuous care to meet their daily needs.

The possibility of entering a nursing home increases with age. A man in his sixties will definitely need more health care than a man in his thirties. Past studies reveal that one percent of people between the ages of 65 and 74 reside in nursing homes. The percentage rises to 6% between the ages of 75 and 84 and to 25% in case of the age group of 85 and above. However, older people are not the only group of people who need long-term care. Younger persons who cannot take care of themselves due to illnesses, accidents, birth defects, and mental conditions, etc., also require long-term care.

INCREASE IN COSTS

Not less than $50 billion per annum is spent on nursing home care. Nursing home costs are rising at a faster rate than the inflation rate. The increase in costs is attributed to the growing demand for nursing home care and the shortage of skilled medical personnel.

INABILITY OF FAMILIES

Traditionally, it was observed that family members provided long-term care, often at substantial personal sacrifices and enormous personal stress. But today, it has almost become impossible for the families to provide long-term care due to the following reasons:

- The geometric dispersion of family members
- The increase in childless families
- Fewer children in the families
- Increased divorce rates
- Increased number of children and women joining the paid workforce
- A rise in the number of older persons in a family.

Coverage Under Long-Term Care

Application and the attending physician's statements serve as the basis for most of the individual LTC policies. Some insurers, however, may conduct telephonic interviews and require a paramedical examination. Insurance companies classify long-term insurance policies into the following two major categories:

a. Nursing Home Care

b. Community Care.

a. **Nursing Home Care:** Insurance policies have three levels of nursing home care:

   i. *Custodial Care:* It is the basic level of nursing care and takes the form of assistance with the daily living activities. Non-medical professionals can provide such assistance on the order of a physician and such care should be supervised by a nurse.

   ii. *Intermediate Care:* It is preventive and rehabilitative in nature. The policy provides continuous programs of nursing care for individuals who cannot live alone.

   iii. *Skilled Nursing Care:* It is the highest level of nursing care and needs good expertise. A doctor must order care for people in these facilities. A registered nurse and other medical personal provide medical care 24 hours a day.

   Most policies pay if the insured fails to perform basic living activities without assistance. Normally, LTC policies contain Activities of Daily Living (ADL) and if the insured fails to perform two or more than two ADLs, the insured can get the benefit. The following is the typical list of ADLs:

   - Eating
   - Bathing
   - Dressing
   - Toileting
   - Transferring
   - Continuance
   - Taking Medicine.

b. **Community Care:** LTC policies usually provide benefit payments for the insured individuals who require assistance and stay in their homes. The benefits are stated as a percentage of the nursing home benefits and are provided by a variety of programs and services which are as under:

i. *Home Health Care:* The aim of home health care is to maintain, improve or restore the individuals' health. It includes skilled nursing, physical therapy and related professional and personal services.

ii. *Hospice Care:* The policies pay for hospice services for the treatment of terminally ill patients. The aim of hospice care is not to save the patient's life but to make life more comfortable, thereby, allowing the patient to die with dignity. Such care can take place at home or in hospital.

iii. *Respite Care:* It provides temporary relief for family members providing care in the individual's home. The relief can be placing the individual in a long-term care facility temporarily, such as weekend and make someone to stay with the individual in his/her home temporarily.

Benefits of Long-Term Care

Every LTC policy contains the benefit provisions. The benefits are payments to be made by the insurer if an insured event occurs. The benefit provisions in LTC policies deal with the types and levels of care for which benefits will be provided and include the criteria for benefit eligibility and the level of benefits payable. It should be understood that no policy covers all LTC expenses.

a. **Elimination or Waiting Period:** Many insurance companies give the insured a choice of elimination period ranging from zero to 365 days. The larger the elimination period, the lower the premium and vice versa, other things being the same.

b. **Daily Benefit and Benefit Period:** Insurance companies provide a choice from a schedule of maximum daily benefits and length of benefit periods. For example, an LTC policy might offer the buyer a schedule of Rs.100 per day, increasing by Rs.25 to a maximum of Rs.500 per day and the benefit periods schedule might range from 2 to 5 years. Some companies make monthly payments to the insured. A typical policy might pay Rs.5,000 per month.

c. Community care is cheaper than the nursing care and is mostly preferred by the elderly. The maximum daily benefit under community care is normally 50% of the maximum daily benefit of nursing home care. The length of the benefit period is often the same for community care and nursing care but some policies might have different waiting periods. Most of the insurance policies provide some kind of inflation protection for an extra premium. Such inflation protection makes sure that the benefit amount increases with the cost of living.

Disability Income Insurance

The ability to work and earn an income is the most valuable asset for most of the people. Work provides them the livelihood. Most people do not inherit or accumulate so much wealth that is large enough to give them the luxury of not joining the work force. It is necessary for a majority of the population to work for a living and people whose inability keeps them out of the workforce face economic problems in their lives.

People may assume that they will enjoy a healthy life and have the ability to participate in the workforce for a major period of their lives, if not throughout their lives. Health impairments, however, may limit or stop an individual from participating in the workforce either temporarily or permanently. Accidents, illnesses and congenital defects take the toll on individual lives. The financial consequences of a disability can be substantial and in some cases disability can prove to be more financially distressing than death. With disability, not only is the income of the income producer lost but he/she continues to incur expenses unlike with death. Adequate income insurance helps individuals to avoid financial distress due to disability.

BASIC BENEFIT ARRANGEMENTS

The benefit arrangements of disability policies contain two types of benefits. They are:

a. Total Disability Benefit

b. Waiver of the Premium Benefit.

These two benefits are common to all insurers regardless of extra coverage, which are included in the insurance policy form. The benefit provision generally describes the circumstances of loss, the way the benefits are paid and the duration of the benefit period.

a. **Total Disability Benefit:** The insurance companies pay the insured if he/she becomes disabled during the period of the policy and remains disabled till the end of the elimination period. No indemnity is payable during the elimination period or after the elimination period and the monthly indemnity will be payable at the end of each period. Such indemnity benefit will stop with the end of benefit period.

   Rehabilitation benefit: A specific amount, normally 25% of the monthly indemnity and supplemental indemnities, is paid to the insured to cover costs not paid by others or public funding when insured seeks a formal re-training program, which will help him/her join the workforce.

   Non-disability benefit: The insured is paid a particular amount, usually 25% of the monthly indemnity, for medical expenses incurred for the treatment of injury that resulted in partial disability.

b. **Waiver of the Premium Benefit:** The waiver of the premium benefit excuses the insured of the premiums that fall due after the insured has been totally disabled for 90 consecutive days or the elimination period whichever is shorter. The benefit also allows the refund of insurance premiums paid during this period. Further premiums may also be waived off if the insured remains disabled until the age of 65.

SUPPLEMENTAL BENEFITS

Insurers offer supplemental benefits to the insured at an additional premium. The following are the most common supplemental benefits:

a. Residual Disability Benefit

b. Inflation Protection Benefit

c. Provision for Increased Future Benefit Amounts

d. Partial Disability Benefit.

Residual Disability Benefit

Residual disability means that the insured is engaged in his/her regular occupation but the income of the insured is reduced due to an accident or sickness by at least 20% of his/her prior income.

The residual disability benefit provides reduced monthly indemnity in proportion to the insured’s lost income when he/she returns to occupational work at reduced earnings. To satisfy the elimination period and to qualify for waiver of premium the insured must be either totally disabled or partially disabled.

The provisions of residual disability resemble those of total disability but technically they are different. The residual disability provisions are accompanied by a series of technical definitions in order to clarify terms like prior income and current income. The following is the customary formula to compute the benefits:

$$\text{Residual Benefit} = \frac{\text{Loss of Income}}{\text{Prior Income}} \text{ x Montly Indemnity Benefit}$$

Loss of Income: It is the difference between the insured's prior income and the current income. Here, the term income includes earned income and excludes income from investments, savings, real estate etc.

Prior Income: It is the average monthly income prior to the residual disablement. Generally, the insurers prepare an index of prior income at the end of each year of claim in order to make provisions for increased cost of living.

Current Income: It is the insured's monthly-earned income during the period of disability. Most insurers consider the income earned but not received as current income while some

Inflation Protection Benefit

The Cost Of Living Adjustment (COLA) benefits are provided to the insured in order to reflect changes in cost of living from the time the claim started. The adjustments for benefits are made each year during a long-term claim and are computed at the rate of change shown in the price index.

The method of benefit adjustment is quite complex. Generally, comparison of the current claim year index with the index for the year in which the claim started shows an increase or decrease in the index, the benefits for the next year are adjusted at the beginning of the claim by the percentage change in the specified index. The percentage change in the specified index is limited to a particular rate of inflation. Similarly, the adjusted benefits may increase or decrease but cannot be decreased below a level specified in the insurance policy.

Provision for Increased Future Benefit Amounts

Two supplemental provisions facilitate an increase in the future benefit. Namely, automatic increase benefit provision and guarantee for future insurability. These two provisions provide for increases in the monthly indemnity. However, the insured has the right to refuse one or more of the automatic increases for another five-year period, at the expiry of the schedule.

These provisions allow an insured to buy additional disability income insurance in future years without the evidence of insurability. The total increase in the benefit varies among insurers but usually will not exceed twice the monthly indemnity.

The insured can use the purchase option once a year until the particular age prescribed in the policy. The additional monthly indemnity that the insured can purchase every year depends on the policy's limits for insurance with regard to earned income or a fixed amount such as Rs.2,000 or Rs.4,000.

The insured can buy additional monthly indemnity even if he/she is disabled on an option date but the additional amounts do not apply to the current claim. Major insurance companies allow future increase options immediately for an existing claim if the insured is disabled on the date he/she may otherwise have exercised the option.

Partial Disability Benefit

Insurers provide a provision for partial disability as an optional benefit for the insured. The benefit for partial disability is usually 50% of the monthly indemnity for total disability payable up to six months. Partial disability includes the following:

- Inability of a person to perform one or more duties, but not all the major duties of his/her occupation because of an injury or sickness.
- Inability of a person to work for more than one half of the time required in his/her usual work.

Personal Accident Insurance

This class of insurance provides monetary compensation for death or disablement arising out of accidents, and for disablement arising out of sickness. Death arising out of sickness is not covered under this class.

Personal accident insurance policies offered by the General Insurance Corporation can be taken by individuals on their own lives or on the lives of certain other persons. Policies can also be issued covering groups of individuals. The examples are the group policies obtained by (a) employers on the lives of their employees, (b) school authorities on the lives of their students, and (c) trade associations on the lives of their members. In group policies, there are three parties (viz., the insurers, the insured organization and the insured persons) as against two (viz., the insurers and the insured) in individual policies.

The cover can be operating for 24 hours of a day or restricted to the duty hours only, as per the agreement.

Personal accident insurance policies are not contracts of strict indemnity, but this does not mean that the insured under these policies can make profit out of a loss. Although the principle of indemnity does not strictly apply to these policies, the insurers preserve the principle of indemnity to the extent possible by limiting the sum insured under the policy to an amount equivalent to about 75 to 100 months' wages of the insured person.

The following factors are normally taken into consideration while underwriting personal accident insurance proposals:

a. Insured person's age;

b. Insured person's health and physical built;

c. Nature of the insured person's occupational duties;

d. Manner in which the insured person spends his spare time outside his occupation; and

e. Insured person's moral hazard.

The policy provides for payment of specified monetary compensation on the happening of specified contingencies arising out of accidental bodily injury.

REFORMS IN INSURANCE SECTOR: PROGRESS

The Malhotra Committee, headed by Shri R N Malhotra, former Governor of RBI, was appointed in April, 1993, submitted its report in January, 1994. The committee recommended the setting up of a strong and effective Insurance Regulatory Authority (IRA) in the form of a statutory autonomous board on the lines of SEBI. Following this, in August, 1995, an interim Insurance Regulatory Authority was set up by a Government resolution dated 23rd January, 1996. It was set up as a body corporate having perpetual succession and a common seal with power to acquire, hold and dispose of property and to contract.

In pursuance of the announcement made by the Finance Minister in his Budget Speech of 1998-99, the Insurance Regulatory & Development Authority Bill, 1999 as passed by both Houses of Parliament was notified on 29th December, 1999. The Act provides for the establishment of a statutory Insurance Regulatory & Development Authority to protect the interest of holders of insurance policies and to regulate, promote and ensure orderly growth of the insurance industry. It also amends Life Insurance Corporation Act, 1956, General Insurance Business (Nationalization) Act, 1972 and brings in consequential provisions in Insurance Act, 1938 with a view to cease the exclusive privilege of LIC and GIC in life and non-life business respectively.

The Authority has been constituted on 19.4.2000. The duties, powers and functions of authority are:

– To regulate, promote and ensure orderly growth of the insurance sector.

– To exercise all powers and perform all functions of the Controller of Insurance under the Insurance Act, 1938, Life Insurance Corporation Act, 1956 and the General Insurance Business (Nationalization) Act, 1972 or any other law relating to insurance for the time being in force.

– To protect the interest of the policy holders in matters concerning assigning of policy, nomination by policyholders, insurable interest, settlement of insurance claims, surrender value of policy and other terms and conditions of contract of insurance.

– To promote efficiency in the conduct of insurance business.

– To promote and regulate professional organizations connected with the insurance business.

– To levy fees and other charges for carrying out the purposes of the proposed Act.

– To call for information from, undertake inspection and conduct enquiries and investigations including audit of the insurers, insurance intermediaries and other organizations connected with the insurance business.

– To control and regulate the rates, advantages, terms and conditions that may be offered by insurers in respect of general insurance business not so controlled and regulated by the Tariff Advisory Committee, under the Section 64U of the Insurance Act, 1938.

– To prescribe the form and manner in which books of account will be maintained and statement of accounts will be rendered by insurers and other insurance intermediaries.

– To regulate investment of funds by insurance companies.

– To maintain margin of solvency.

– To adjudicate disputes between insurers and intermediaries.

– To exercise powers prescribed by the Central Government.

The Authority has already issued regulations on 15 subjects which included appointed actuary, actuarial report, insurance agents, solvency margin, re-insurance, registration of insurers, obligation of insurers to rural and social sector, investment and accounting procedure. The Authority is likely to issue further regulations on brokers and re-insurance-life. The liberalization of the insurance sector led to the increased competition, development, and growth of the insurance sector. It also channeled investments into the insurance sector.

The Budget for 2001-02 provides for the following:

– Amendment for providing level playing field to private insurers.

– Relief for low paid salaried employees.

– Personal Insurance for KCC holders.

– New scheme for organized labor.

– New Social Security Cover Schemes.

– Expanding the net of Service Tax.

Malhotra Committee Recommendations

Ever since Life Insurance Industry and General Insurance Industry were nationalized in 1956 and in 1973 respectively, the critics of nationalization have been critical of the virtual monopoly granted to these insurance companies. The methodology of working of these entities has been under criticism recently by one and all as being inflexible and limited applicability in dynamic economic environment.

The business of LIC has increased from five million policies at the time of nationalization to over 58 million at present. The GIC too has progressed similarly in the last 24 years, with business volume of premium income growing from Rs.207 cr. in 1973 to Rs.45,174.15 cr. in 1999-2000. However, India still ranks as the 51st country in the world in terms of insurance cover, while India ranks 10 among the top 78 countries in terms of corporate presence. In fact, India is one of the very few insurance markets in the world to remain a government monopoly, Myanmar being the only other exception in the Asian region.

In order to improve insurance services in India, Malhotra Committee was constituted which submitted its report in 1992. The report suggested radical reforms regarding entry of insurance companies and suggested that private sector be allowed entry in insurance sector. The recommendations of the report, if implemented, would have far-reaching implications for insurance sector. Some of the recommendations of Malhotra Committee concerning the services offered (not the management) by the existing insurance companies is given below:

i. Mortality tables of LIC date back to the days of nationalization, with better living conditions and improved hygiene in the modern era, LIC has to revise its tables. This would decrease the amount of premium payable for a policy.

ii. The minimum sum assured of a life policy was fixed at Rs.1,000 in 1956. It has been raised to Rs.5,000 under endowment and Jan Raksha plans and Rs.10,000 for money back and other plans. Considering the cumulative inflation since 1956 and the present average sum assured per policy of Rs.36,000, the minimum sum assured should be Rs.15,000 under endowment and whole-life policy type of plans, and Rs.25,000 for ‘money back’ type of plans which are usually preferred by the relatively better off proponents.

iii. There should be encouragement for establishment of direct branches dealing directly with the agents for LIC.

iv. LIC declares reversionary bonus at a rate uniform for ‘endowment’ and ‘money back’ types of policies though the final additional bonus varies between these two plans. Compared to the other plans, the contribution of the money back type of plans and short-term endowment plans towards the valuation surplus is somewhat lower. There might be a justification for differential rates of reversionary bonus for these classes. Further, LIC has introduced a system of final additional bonus. That system, however, does not take into account unrealized appreciation on its equity portfolio and real estate investments.

The reforms in insurance sector in India are guided by the following consideration:

i. Availability of a variety of products at competitive prices to meet the demands and preferences of various categories of customers.

ii. Improvement in the quality of customer services through healthy competition in the insurance sector.

iii. Tap the vast potential in the insurance sector in the country by encouraging new players in the field of insurance both in life and general insurance sector. Intensity of insurance coverage in India is low. Insurance premium in India is 2.01% of GDP, which is among the lowest.

iv. Permitting free play of market forces in insurance sector. Nationalized insurance companies are capable of facing competition, as they are strong in terms of finance, technology and manpower. Permitting competition in insurance sector will enable consumers to reap the benefit in terms of service, product and prices.

v. Increase in the employment opportunities through expansion of insurance market.

vi. Expansion of the Insurance market will generate additional resources for infrastructure and social sector.

MAIN TYPES OF LIFE INSURANCE POLICIES

Whole Life Policy

A typical whole life policy runs as long as the policyholder is alive. In other words, the risk is covered for the entire life of the policy holder, which is why they are known as whole life policies.

The policy monies and the bonus are payable only to the nominee of the beneficiary upon the death of the policy holder. The policy holder is not entitled to any money during his or her own lifetime, i.e. there is no survival benefit.

This represents a serious drawback in the case of whole life policies. Suppose, for instance, you buy a whole life policy at the age of thirty when your children are young and the family needs protection. Conceivable, by the time you are 55 or 60 or so the children may be well settled, no longer truly needing the protection the whole life policy provides. On the other hand, you would probably require the money for yourself and your wife in your retired life but this would not possible since the sum assured is payable only when the policyholder dies.

In this sense whole life policies are fairly rigid and inflexible and are suitable only in a few, very specific cases.

On the other hand, since whole life policies are the cheapest category of policies. However, given the rigidity pointed out above one should be careful about buying a whole life policy when young. Your insurance portfolio is best built around endowment policy. The one exception is the Convertible Whole Life Policy.

While it is true that as a category, whole life policies are cheaper than other policies, but Bima Kiran, Jeevan Mitra Double Cover Plan and Money Back endowment policies can be equally cost-effective.

On the whole, whole life policies may be best considered after the age of 45 either for the purpose of leaving behind an estate for one’s heirs or for covering the possibility of premature stoppage of pension income in the case of relatively early death after retirement.

However, the insurance companies have brought out some relaxations whereby the sum assured and vested bonuses, if any, become payable on attainment of 85 years of age by the life assured or on completion of 40 years from the date of commencement of the policy whichever is later, provided, however, that the policy is in force.

If payment of premium ceases after at least three years premiums have been paid, a free paid-up policy for a reduced sum can be allowed according to the rules, provided such reduced sum assured, exclusive of any attached bonuses is not less than Rs.250.

In the case of with profit plans, such reduced paid-up policy will not be entitled to participate in the profits declared thereafter, but such bonus as has already been declared on the policy will remain.

All modes of payment i.e., Yearly, Half-yearly, Quarterly and Monthly are allowed.

The Policy can be issued with profit or without profit.

Other eligibility conditions for the plan are:

Minimum age at entry	– 18 years (Premiums of 15 years)
Maximum age at entry	– 60 years
Minimum Sum Assured	– Rs.10,000.

Endowment Assurance Policy

It not only makes provision for the family of the life assured in the event of his untimely death, but also assures a lump sum at any desired age. For example, if a person aged 30 years wishes to provide for his old age after retirement at age 55, he may take an Endowment Policy (With Profits), say for Rs.50,000 for a term 25 years. If he survives up to the end of the term, provided the premiums are paid up to the stipulated period then he will get the sum assured of Rs.50,000 together with accrued bonus. In the event of his unfortunate death during the term, provided the policy was in force at the time of his death, his family will get full sum assured of Rs.50,000 together with accrued bonus as at that time.

Eligibility conditions for insurance under Endowment Assurance Policy are

Minimum age at entry	– 12 years
Maximum age at entry	– 65 years
Minimum term	– 5 years
Maximum maturity age	– 75 years
Minimum sum assured	– Rs.10,000.

Typically, one's responsibility for the financial protection of the family reduces significantly once the children are grown up and independently settled. The focus then shifts to managing a smaller family – perhaps only oneself and one's spouse – after retirement. This is where the endowment – the original sum assured and the accumulated bonus – received back from insurance company comes in handy.

Money-Back Policy

Unlike ordinary endowment insurance plans where the survival benefits are payable only at the end of the endowment period, this scheme provides for periodic payments of partial survival benefits as follows during the term of the policy, of course so long as the policy holder is alive:

- In the case of a 12-year policy, 20% of the sum assured becomes payable each at the 4th and 8th years, and the balance 60% plus the accumulated bonus at the end of the 12-year term.
- Similarly, for a policy of 15 years, 25% of the sum assured is payable each after 5 and 10 years, and the balance 50% of the sum assured together with the accumulated bonus at the end of the 15th year.
- In the case of a 20-year Money-Back Policy, 20% of the sum assured becomes payable each after 5, 10, 15 years, and the balance of 40% plus the accrued bonus become payable at the 25th year.

- For a Money-Back Policy of 25 years, 15% of the sum assured becomes payable each after 5, 10, 15 and 20 years, and the balance 40% plus the accrued bonus become payable at the 25th year.

An important feature of this type of policies is that in the event of death at any time within the policy term, the death claim comprises full sum assured without deducting any of the survival benefit amounts, which may have already been paid as money-back components. Similarly, the bonus is also calculated on the full sum assured.

The extra premium for this benefit is very reasonable and well worth it, unlike in the case of the whole life anticipated policy.

Policy Term

Money-back policies are issued for terms of 12, 15, 20 and 25 years only.

Bonus

Bonus additions to the policy are reckoned on the full sum assured.

Insurance Limits

The minimum amount for which a Money-Back Policy is issued is Rs.5,000.

Premium Payment Term

The premiums for these policies are payable for the selected term of years, or till death if it occurs earlier.

Mode of Premium Payment

There are no restrictions on the mode of premium payment.

Loans

No loans are available under this type of policies.

Eligibility

You have to be at least 15 years old to be eligible for a Money-Back Policy. Moreover, these policies cannot cover you beyond your 70th year.

Recommendation

Among the various endowment plans, Money-Back Policies are highly recommended along with Bima Sandesh, Jeevan Saathi and Jeevan Mitra Policies for stages 1, 2 and 3 of the insurance time-table. If one were to consider that the periodic survival benefits received from insurance company are used for subsequent premium payments, the effective cost of these policies works out to a very attractive average of only 2%.

On the other hand, if the survival benefits were deployed in investments yielding high returns, Money Back policies would probably be as cost-effective as Bima Sandesh.

Little wonder these policies have grown to be very popular.

The Money Back Policy provides cash at periodical intervals during the currency of the policy and guarantees full protection throughout the period. These timely payments help you satisfy important financial needs like children’s marriage and education, down payment for a house or a long awaited holiday.

Under all plans, full protection against premature death continues throughout the term irrespective of periodical payments received. Similarly bonus is accumulated on the full face value throughout the term.

This unique policy helps you enjoy full protection and also profitably use your savings at periodical intervals. It is the best solution to your needs in the context of present problems of life and living.

Term Policy

Under Term Assurance policies, only the risk is covered during the selected Term period. If the policyholder survives the term, the risk cover comes to an end. Theoretically, premiums paid are not returned.

A Term plan of assurance is designed to meet the needs of the people who are initially unable to pay the larger premium required for a whole life or an endowment assurance policy, but they hope to be able to pay for such a policy in the near future. Hence, it may be desirable to leave the final decision regarding the plan to a later date when a better choice could be made.

No surrender, loan or paid-up values are granted under these policies because reserves are not accumulated. If the premium is not paid with the days of grace, the policy will lapse without acquiring a paid-up value.

However, a lapsed policy may be revived during the lifetime of the life assured but before the expiry of the period of two years from the due date of the first unpaid premium on the usual terms. Accident and or Disability benefits are not granted on policies under the Term plan.

Joint Life Policy

Joint life policies are in fact a variant of endowment policies in that these policies also offer maturity benefits to the policyholders, apart form covering the risks as all life insurance policies do.

The reason we have chosen to categorize joint life policies separately is that these policies cover two lives together thus offering a unique advantage in some cases; notable, for a married couple or for partners in a business firm.

In the case of a married couple, for instance, a Jeevan Saathi Joint Life Policy is like having a separate policy for each of the spouses at a very attractive rate.

Age

The policy holder’s age has a bearing both on one’s eligibility for a policy and also on what the rate of premium would be.

In the case of joint life policies where two lives are covered by a single policy, the ages of the policyholders for these two purposes are considered reckoned as one which falls somewhere in between the ages of the two people covered by the policy in accordance with the rules framed by insurance company.

This is not a simple average of the two ages. It is known as the Mean Age and is deduced by adding a specific figure to the lower age.

Joint Life Insurance Policy

Considering the tensions and uncertainties of modern life, it becomes necessary for a person to provide adequate life insurance security to his family.

If the breadwinner is snatched away from the family prematurely, the dreams of the family are shattered. The earning capacity of a person makes his life very valuable for his dependents and, therefore, one should provide adequately for them.

This policy is a double cover plan, ideally meets the risks of contemporary society. This double benefit plan provides a new dimension to the concept of insurance security.

This plan is substantially different from the conventional Endowment Plans.

Under this plan, if the life assured survives the term, then the basic sum assured along with bonuses is paid.

In the event of death of the assured during the term of the policy, the life insurance protection becomes double. The basic sum assured is doubled and the accrued bonus is also paid, for example, if a person is insured for Rs.10,000 under this plan, in the event of death before the maturity of the policy, Rs.20,000 plus bonus accrued on the basic sum assured of Rs.10,000 becomes payable.

If the policyholder survives the full term, the maturity benefits will be Rs.10,000 plus bonus.

OTHER BENEFITS

Accident Benefit

By paying a small extra premium of Re.1 per thousand sum assured per year, accident benefit equivalent to basic sum assured would also be available under this plan. For example, if a person takes a Rs.10,000 policy under this plan and if death is due to accident, Rs.30,000 is paid. In addition to this, the bonus accrued on the basic sum assured of Rs.10,000 is also paid.

The accident benefit would be subject to the overall limit of Rs.5 lakh basic sum assured on all the policies on the same life put together.

Eligibility Conditions:

a. Any male aged 18 to 50 years can propose for a policy under this plan.

b. Females from 18 to 50 years of age under category I or II[7] as stipulated by the Corporation for underwriting purposes, are also eligible.

c. This plan is available for specified terms ranging from 15 to 30 years subject to maximum maturity age 70 years.

d. This plan is available only as a ‘‘with profit’’ scheme and bonuses will be reckoned only on the basic sum assured.

e. Minimum sum assured under this plan is Rs.10,000.

Children’s Policy

Children’s assurance includes policies through which parents or legal guardians can provide for life insurance cover from the child’s very birth. With the risk cover commencing from the child attaining the age of 12/17/18/21 (known as the Date of Risk), a children’s assurance policy will vest itself on the child upon his or her attaining majority on completion of age 21, if the case demands so.

Under children’s assurance policies, the three main dates are the date of commencement, the date of risk and the date of maturity or vesting.

Until the child attains majority, the parents are the owners of the policy and have to pay the premium periodically.

Recommendation

These policies should be considered only after the insurance portfolios of the parents have been completed. The family’s insurance budget should primarily buy as much life insurance as possible on the lives of the breadwinner and should not be frittered away on the children’s lives as their insurance is useless in the event of any premature death of the breadwinner.

In fact, those lives should be insured that have maximum economic emphasis. Quite often, these policies lapse if and when the premium paying breadwinner of the family die before the vesting age. After all, the child may not be in a position to continue paying the premiums.

7 Female categories are disclosed under eligibility conditions for option for this plan in the next page.

However, the waiver of premium can also be secured by payment of extra premium. If waiver of premium is opted for, and the premium paying parent or guardian dies before the vesting date of the child's policy, all the premiums payable until the Deferment period are waived off immediately. The insurance company will consider them to have been received in advance.

Group Insurance Plans

Group Insurance offers life insurance protection under group policies to various groups such as employer-employee, professionals, co-operatives, weaker sections of society etc. It also provides insurance coverage to people under certain approved occupations at the lowest possible premium cost. Besides providing insurance coverage, it also offers group schemes to employers, which provide funding of gratuity and pension liabilities of the employers.

SALIENT FEATURES OF GROUP SCHEMES

The main features of the schemes are low premium, simple insurability conditions such as employee not being absent from duty on grounds of ill health on the date of entry, and easy administration by way of issue of a single master policy covering all the employees/members. Premiums are based upon age combination of members, occupations and working conditions of the group. However, there are certain conditions as to minimum group size and the minimum participation to make the scheme viable. The standard schemes offered are as follows:

Group Term Insurance Schemes

Employer-employee groups may be offered group insurance schemes providing uniform or graded cover. These groups may also be offered schemes covering outstanding housing loans and outstanding vehicle advances granted by the employer to his employees.

Group insurance schemes providing uniform cover can be granted to associations of professionals (such as doctors, lawyers, chartered accountants, etc.), members of co-operative banks, welfare funds, credit societies and weaker sections of society.

Creditor-Debtor groups are also offered group insurance schemes covering outstanding loans. These groups are, members of primary housing societies wherehousing loans are granted by State Apex housing societies, borrowers granted loans by institutional agencies in public/joint sectors for housing purposes and borrower members of cooperative societies/banks formed by employees of the same employers.

Group Insurance Scheme in Lieu of EDLI

Employees Deposit Linked Insurance scheme is applicable to all establishments and undertakings contributing employee's Provident Fund under the EPF and MP Act, 1952, with effect from 1-8-1976, unless exempted under Section 17(2A) of the Act. The scheme provides for an insurance cover to an employee linked to his balance in the PF Account subject to a maximum of Rs.35,000.

The Act empowers the Central Provident Fund Commissioner to exempt an employer from EDLI if he opts for a Group Insurance Scheme of the insurance company which is more beneficial to the employees. Under this Scheme the insurance cover ranges from Rs.11,000 to Rs.37,000 depending upon the service put in by the employee and the current monthly salary on each Annual Renewal Data. The employer can also opt for a uniform cover of Rs.37,000. The premiums depend on the average age, occupation of members and the size of the group. The insurance company's scheme has the advantage of low premium in many cases and the prompt settlement of claims.

Group Gratuity Scheme

Gratuity is a statutory liability of most of the employers which accrues to an employee for every year of service put by him. As the liability accrues every year, from the point of view of sound accounting practice, it is desirable to provide for this liability before the profits are determined. The Group Gratuity Scheme provides a scientific method for funding gratuity liability as the premiums are based on actuarial principles. The attractive feature of the scheme is the life insurance cover to every employee due to which in the event of the premature death of an employee, his dependents become entitled to substantially higher benefits.

The funding of the Gratuity benefits can also be made on Cash Accumulation basis, whereunder the fund is accumulated at an attractive rate of interest.

Attractive tax advantages are available to the employer and the employees.

Group Superannuation Schemes

a. **Money Purchase Scheme:** The contributions are fixed generally as a percentage of salary. The accumulated value of such contributions is utilized to purchase the pension of appropriate amount.

b. **Benefit Purchase Scheme:** The amount of pension is fixed by the employer in advance generally in relation to the salary drawn by the employee at the time of exit. Insurance company determines the contributions payable for funding of pension benefits.

   Different types of pension are available under insurance company's scheme such as pension payable for life, guarantee for 5, 15 or 20 years and thereafter for life, joint life last survivor pension, pension payable for life with return of purchase price on death of the pensioner, etc.

Group Savings Linked Insurance Scheme

The Group Savings Linked Insurance Scheme (GSL) offers insurance cover together with a savings element. The contribution under this scheme is deducted from the monthly salary of the member. The scheme is allowed to selected Employer-Employee groups such as quasi-govt. bodies, public sector corporations and reputed companies in public and private sectors who keep accurate records of their employees. Under the scheme, out of the contribution received in respect of each employee, a portion is utilized for the insurance cover and the balance, known as contribution for savings, is accumulated till exit at an attractive rate of interest, which at present is 11% p.a. The amount apportioned from the monthly contributions towards insurance premium will be determined on the basis of the nature of the group, occupation, age composition of members, etc. The savings contribution is returned with interest at the time of retirement, or exit by any other mode. In case of death during service the amount for which the member was covered at the time of death is also paid along with accumulated savings.

Special Plan

Special plans, basically are insurance policy plans available from the national insurance providers to serve the needs of citizens that cannot be commonly classified or segregated.

These special plans are designed to satisfy needs ranging from debt-clearance in event of the death of the insured to financial aid in the event of a medical mishap.

Special plans also provide financial assistance for handicapped dependants as well as emergency surgery required if and when a medical condition arises.

Social Security Schemes

As per the directions of the Central Government a Social Security Fund was created in 1998-99. The object of the fund is to extend insurance benefits to economically weaker sections of the society in the unorganized sector. Half the premium will be drawn from the Social Security Fund maintained by the LIC. The remaining 50 percent of the premium is collected from a designated Nodal Agency which may be contributed by the State Government, and/or the beneficiaries.

Insurance cover up to Rs.5,000 can be granted under these schemes. However, in case of death or permanent disability (including loss of 2 limbs of use) due to accident, a sum of Rs.25,000 and in case of loss of use of one limb due to accident, a sum of Rs.12,500 is payable irrespective of basic insurance cover. 23 occupations have been approved by Government of India for the extension of the benefit under the Social Security Group Insurance Scheme. The approved occupations are, beedi workers, brick-kiln workers, carpenters, cobblers, fishermen, hamals, craftsmen, handloom weavers, khadi weavers, lady tailors, leather and tannery workers, papad workers attached to SEWA, physically handicapped self-employed persons, primary milk producers, rickshaw pullers/auto & taxi drivers, safai karmacharis, salt pan workers, tendu leaf collectors, urban poor, forest workers, sericulturists, toddy tappers and powerloom workers.

Lalgi Scheme

All Landless Agriculturual Laborers (numbering about 1.20 crore) of India have been covered for a uniform sum assured of Rs.2,000 (payable to the family of the deceased laborer). The entire premium is met from Social Security Fund maintained by LIC.

Beneficiaries under IRDP Scheme

The Central Government grants loans to lakhs of persons every year identified by the Government under IRDP program. All these borrowers have been extended Group Insurance benefits. A sum of Rs.5,000 is payable on the death of the borrower if death takes place due to natural cause and Rs.10,000 if death is due to accident. No premium is chargeable to the beneficiaries. The number of borrowers provided insurance benefit under the IRDP Scheme so far is over 1.94 crore.

Rural Group Life Insurance Scheme

The Government of India has announced the introduction of Rural Group Life Insurance Schemes which are administered by designated Branch Offices of LIC through Intermediate Level Panchayats (ILPs). The effective date of the scheme is 15th August, 1995. Following are some of the salient features of the scheme.

Entry Age	:	20 years (minimum) and 50 years (maximum)
Premium	:	Rs.60 p.a. for those who enroll up to the age of 40 years and Rs.70 p.a. for those who enroll beyond 40 years.

Two types of schemes are offered. Under the General Scheme any person within jurisdiction of the concerned ILP can be covered by charging full premium. Under the Subsidized Scheme only one person from the households below the stipulated poverty line will be covered. The premium will be subsidized to the extent of 50 percent to be shared equally by the State/Union Territories and the Central Government. In 1999-2000, LIC settled 66.42 lakh claims for an amount of Rs.9,211.30 crore.

SUMMARY

- Insurance is an *uberrimae fides* contract where one party agrees to compensate the other in consideration for a smaller sum.
- The elements of an insurance contract are insurable interest, utmost good faith, indemnity, subrogation, warranties, proximate clause, assignment and nomination.
- Insurance in India is divided into Life Insurance and General Insurance.
- Recently, the Government of India has opened the insurance sector to private parties. This is bound to bring more competition to the industry and better service to the public.

Appendix

Table for N(x) When x ≤ 0

This table shows values of N(x) for x ≤ 0. The table should be used with interpolation. For example,

$$N(-0.1234) = N(-0.12) - 0.34[N(-0.12) - N(-0.13)]$$
$$= 0.4522 - 0.34 \times (0.4522 - 0.4483)$$
$$= 0.4509$$

x	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
–0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641
–0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
–0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
–0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
–0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
–0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
–0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
–0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
–0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
–0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
–1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
–1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
–1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
–1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
–1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
–1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
–1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
–1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
–1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
–1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
–2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
–2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
–2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
–2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
–2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
–2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
–2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
–2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
–2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
–2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
–3.0	0.0014	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
–3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
–3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
–3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
–3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
–3.5	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
–3.6	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
–3.7	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
–3.8	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
–3.9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
–4.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table for N(x) When x $\geq$ 0

This table shows values of N(x) for x $\geq$ 0. The table should be used with interpolation. For example,

N(0.6278) = N(0.62) + 0.78[N(0.63) – N(0.62)]

= 0.7324 + 0.78 x (0.7357 – 0.7324) = 0.7350

x	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9986	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998
3.5	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998
3.6	0.9998	0.9998	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.7	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.8	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.9	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
4.0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Glossary

Absolute Advantage : The skill and expertise of a country to produce a given good or to render services by using its indigenous resources at a much cheaper rate. In case of swaps, one party can be at an advantageous position to borrow at a lower rate in a given currency compared to others.

Accounting Exposure : The volume of foreign exchange exposures stated in the accounting statements of a company.

Alpha : A measure of the difference between a security's expected return and its expected equilibrium.

American Option : An option which can be exercised at any time between the purchase date and the expiration date.

Amortizing Swap : A swap in which the notional principal is repaid over the tenure of the swap. The interest exchanges also gradually diminish with the principal.

Arbitrage : The simultaneous purchase and sale of the same financial asset in an attempt to profit by exploiting price differences on different markets or in different forms.

Arbitrage(u)r : An individual who makes risk-free profits by taking the opportunity of market imperfections.

Ask Rate : The price which is offered by a bank or a dealer to sell an asset.

Asset-Liability Management : A strategy adopted by the banks and financial institutions. Here the assets as well as the liabilities are designed in such a way, that match the cash flows, duration and maturities of both.

Asian Option (Average Rate Option) : A typical option that enables the holder the right to deal at the average price of the underlying asset during the holding period of the option. After the option expires, the average spot rate of the asset is calculated and compared with that of the strike price. If the average rate is found to be in the money, the buyer will receive the difference between the two rates multiplied by the face value of the option. Since the volatility of the average rate is less than the price of the underlying asset, these options are cheaper.

At-the-money Option : An option whose strike price is equal to the underlying asset price.

Back-to-Back Loans : A special type of loan arrangement involving two different loans between the same parties. In the first loan, party A is the lender and party B is the borrower. While the reverse fact is true in case of the second loan.

Backwardation : When the forward or future rates are less than the existing market price of an asset.

Barrier Option	:	A path dependent option which can be canceled or activated depending upon the price of the underlying asset at various situations: Up and out options are the nature of put options which stand to be canceled if the price of the underlying asset exceeds a certain level. Similarly, up and in options are of no value, if the price of the subject asset rises above a certain level. Down and out options are calls which are treated as canceled price moved down to a certain level. But the down and ins are assumed to be activated if the price of the asset gone down to a certain level.
Basis	:	The difference between the futures price and the spot rate of an asset.
Basis Point	:	A basis point is used to express the fractional interest rate, where 100 basis points is equal to 1%.
Basis Risk	:	The risk to a future investor of the basis widening or narrowing.
Bermudan Option	:	An option which is partly American and partly European which can be exercised on a limited number of occasions as stated in the contract. Hence, it is also known as quasi-American option.
Beta	:	It is a statistical measurement of risk associated with an individual stock or a portfolio of stocks. It is the ratio of the covariance of the security return and market return to that of the variance of the market return.
Bid-ask Spread	:	The simple difference between the selling price and buying price of any asset. In the forex market, the bid-ask spread is the dominant source of a dealer's income.
Bid Rate	:	The price at which a bank or a broker is willing to buy an asset.
Black-Scholes Option Pricing Model	:	It was developed by Fischer Black and Myron Scholes in the year 1973 as a first complete and logical option pricing model.
Boundary Condition	:	The condition expressed to limit the price of an option like maximum or minimum or some other conditions.
Box Spread	:	An option strategy taken simultaneously in the following way: Horizontal or calendar call spread and horizontal put spread having the same expiration date and exercise price for the long or short positions.
Break Even Point	:	The price of an asset at which the option holder is making neither gain nor loss, i.e., he is indifferent in exercising the option.
Butterfly Spread	:	It is a typical combinations of four options of same maturity and all of the same nature (call or put). Two of the options that have the same strike price, intermediate to the other two, are sold while the two options with end strike prices are bought by the speculator.
Calendar Spread	:	Also known as horizontal or time spread. Here, the option holder sells an option of shorter maturity and buys another option of longer maturity, having the same strike price.

Call Option : An option which gives the right to buy the underlying asset at the exercise price to its holder. But the seller has to bear the obligation to sell the same at the above price.

Callable Bond : A bond in which the interest as well as the principal can be pre-paid by the issuer on or after the call date but before the maturity.

Callable Swap : A special type of swap deal that can be terminated at a time before its scheduled maturity at the option of the fixed-rate payer.

Caption : It is an option on a cap. The term ‘caption’ is a registered service-mark of the Midland Bank. The caption holder will enjoy the right to make a particular interest rate cap by paying a premium for a certain period of time.

Carrying Costs : The cost of actually holding an asset, including insurance costs, storage costs, interest charges, etc.

Cheapest-to-Deliver Instrument : In case of an interest-rate future, it is the least costly instrument to acquire and take delivery. It is one of the most commonly used terms with respect to T-bond and T-note futures.

Chicago Board of Options Exchange (CBOE) : Established in the year 1973, as a subsidiary of the Chicago Board of Trade, it provides an organized exchange for trading in listed options. It is the oldest options exchange in the US.

Chicago Board of Trade (CBOT) : Established in the 1860s, to trade in grain futures contracts, it is the oldest futures exchange in the US. After that, CBOT expanded rapidly to trade a wide variety of futures contracts.

Chicago Mercantile Exchange (CME) : Started its operations for trading in agricultural commodities. It presently trades in many financial instruments. Its subsidiary International Monetary Market (IMM) trades in currency futures, eurodollar futures, etc. CME is also popularly known as Merc.

Chooser Option : The option in which the holder is given the chance to choose the same as a put or call option within a certain time period.

Circus Swap : Here fixed for floating interest rate swap and fixed for floating currency swaps are combined. In both cases, the floating rate is based on LIBOR. It is the basis for the creation of a fixed for fixed or floating for floating currency swap.

Clearing House : An organization that assures the systematic operation of the market (may be a stock market, a futures market or an options market) by guaranteeing the performance among the clearing members. It may be an integral part of an exchange or may be a separate entity. The major functions of a clearing house are registration, monitoring, matching and guaranteeing trades and final settlement of all the transactions.

Clearing Member : It implies a member of a clearing house. A clearing member has to be a member of the concerned exchange but every member of the exchange need not be a clearing member. Any trade performed by a non-clearing member has to be registered with a clearing member and even be settled through him only.

Collateral : The valuable asset of the borrower mortgaged to the lender as a mark of security as well as proof of creditworthiness of the borrower.

Commodity Arbitragers : They play an important role towards the validity of the law of one price by buying commodities from the places where it is available at a cheaper rate and selling at other places where it is more expensive. The gulf of price difference will be reduced with the entry of a number of arbitrageurs.

Commodity Fund : It is a type of mutual fund. In this case, funds collected from the retail investors are pooled together to invest in the options and futures markets. Professional fund managers are employed to manage invested funds.

Commodity Futures Trading Commission (CFTC) : It is a regulatory authority in the US formed after the Commodity Exchange Act of 1974. CFTC regulates the trading of futures and commodity options.

Commodity Swaps : These are a particular type of swaps, structured to change the floating prices paid (or received) for commodities into fixed prices and vice versa. These types of swaps resemble the interest rate swaps.

Comparative Advantage : It is a related term with the theory of comparative advantage required to analyze the trading among various nations. Comparative advantage implies a situation when a country (or firm) can produce goods or deliver services (or can borrow fund) at a lesser cost in comparison to any other country (or firm).

Compound Option : An option holder is given the choice to acquire an option on an option.

Contract Market : A recognized market under the Commodity Futures Trading Commission Act, 1974 to trade in options and futures contracts.

Convenience Yield : It implies the level of backwardation in a market and is measured as implied or non-pecuniary return from holding a commodity.

Convergence : As the futures contract approaches maturity, the cash and futures prices come closer (i.e. the basis shrinks) and ultimately, on maturity, both coincide to a particular price. This process is called as convergence.

Conversion : It is an arbitraging strategy by buying a put and selling a call option at the same time. A long position is taken against the underlying asset to lock the profit.

Conversion Arbitrage : A strategy which combines or separates financial instruments of a particular set of investment characteristics with an objective to design one or more instruments having a different set of investment characteristics. The final instrument thus obtained is called a 'Synthetic' instrument.

Conversion Factor : It is a pricing factor, usually provided by the exchange. The prices of T-bonds or T-notes are calculated by taking this factor into consideration.

Cost of Carry : The total cost – explicit as well as implicit – inclusive of financing, storage and insurance costs needed to be borne regarding holding or carrying a commodity or an asset.

Counterparty : An active participant in a swap deal or trading of derivative instruments, not an agent or a broker.

Country Risk	:	Uncertainty of cash flows from an asset followed by an investment abroad due to the possibility of civil war, external invasion or the host government's policy of nationalization. It may also be due to some other adverse developments in the social, political or economic environment in the host country. It is also known as political risk or sovereign risk.
Coupon	:	The interest periodically receivable by a holder of debt instrument or a participant in a swap deal.
Coupon Bonds	:	A particular type of bond that pays interest periodically. The periodic interest payment is also known as coupon.
Coupon Rate	:	The fixed rate of interest periodically receivable by a holder of a debt instrument or a participant in a swap deal.
Covered Interest Arbitrage	:	The strategy by which an arbitrager exploits the market imperfections due to interest rate and exchange rate differentials in the forex markets. Here, the borrower borrows in one currency and lends in another one involving two simultaneous forex trading deals (one at the spot market while other at the forward market).
Covered Option	:	A sold option which is supported by cash or actual asset or suitable futures position or an offsetting option position of similar nature. It carries little or almost no risk.
Crack Spread	:	The spread created by taking a long (or short) position of crude oil futures and correspondingly a short (or long) position of heating oil or gasoline futures.
Credit Risk	:	Possibility of the failure of a counterparty to a contract to fulfill his contractual obligation specially in case of a swap deal due to bankruptcy or some other reason.
Cross Hedging	:	This strategy is taken to hedge the adverse price of a commodity with respect to its related commodity (in terms of price movements).
Crush Spread	:	The spread obtained by taking a long (or short) position on soybean futures and at the same time assuming a short (or long) position on soybean oil or soymeal futures.
Currency Futures	:	A futures contract performed to exchange the currencies. In the US markets, the currency futures are written on US terms.
Currency Markets	:	The place where world's currencies are exchanged between two parties. These markets are dealers'markets. Currency markets are also known as foreign exchange markets, FOREX markets or FX markets.
Currency Option	:	It enables the holder to buy or sell a given amount of currency of a country at a specified rate on a predetermined date in future.
Currency Swap	:	The agreement between two parties to exchange a future series of cash flows – interest and principal, where one party pays in one currency and the other party in a different currency. The exchange rate is generally assumed as fixed over the tenure of the swap.
Defaulting Party	:	A counterparty in a swap deal or a borrower that commits default towards the fulfillment of contractual obligations.

Default Risk : The possibility of the failure of a party to make payment at the required time due to insolvency or bankruptcy. In swap banking, the term is considered to mention swap bank's exposure due to credit risk and market risk.

Delivery Month : The calendar month in which the underlying asset in a future contract must be delivered.

Delivery Risk : Differences between market settlements hours that may lead to the exchange of interest and/or principal at different hours or even on different days. The chance of failure of the second party towards the fulfillment of contractual obligations, since the first party exposes itself by paying its part earlier.

Deliverable Stock : The specified amount of commodity that meets the quality standard of the exchange and is available at the places nominated by the exchange.

Delta Hedge : To achieve complete cover against the exposure, an options strategy is taken in which the number of contract is ratioed up by the reciprocal of the option delta.

Delta of Option : The change in option premium expected from a small change in the stock price.

Derivative Instrument : A financial instrument, which derives its value from the underlying asset. For example, stock options, index futures, etc.

Diagonal Spread : A combination of vertical spreads and horizontal spreads taken at the same time.

Duration : The duration of a bond is the weighted average of the cash flows to be received by the bondholder. The weights represents the timing of cash flows to the holder. It is an important tool to find out the sensitivity of the bond's price with respect to the changes in interest rate.

Economic Exposures : The risk of appreciation or depreciation of the currency of a country involved due to the development in the economic environment of a country. For example, in the year 1997, the Indonesian Rupiah was depreciated by more than 50% due to substantially high amount of external debt.

Efficient Portfolio : The investment made in a number of assets in such a way that the return on investment is maximized with a given level of risk or a certain level of return that can be earned at a minimum level of risk.

Environmental Risk : The chance of changes in environmental conditions, beyond the control of a firm, in which the firm operates. The examples of environmental risks are natural calamity, changes in government policy, tastes and preferences of people, economic development, recession, etc.

European Option : An option that can be exercised only on the expiration date.

Exercise Limit : The maximum number of option contracts an option holder can exercise.

Exercise Price : Same as strike price.

Exchange of Futures for Physicals : It is an alternative method of delivery in a futures contract. Here, the exchange specifies the quantity of cash instruments to be exchanged against an equivalent amount of futures at mutually agreed terms and conditions. Both the parties of the exchange are supposed to inform the clearing house about such transaction.

Exchange Rate Risk	:	The chances of adverse fluctuation in the value of an asset, liability or operating income of a company due to the unexpected changes in the exchange rate parity.
Exercise	:	The application of right by the option holder to buy or sell the underlying asset at the strike price.
Expiration Date	:	The date of maturity of a future or an option contract.
Fair Value	:	It is the no-arbitrage value of an option or future contract, obtained theoretically, by applying a mathematical valuation model.
Fixed for Floating Interest Rate Swap	:	A very popular type of swap deal in which one counterparty pays fixed rate of interest while the other one pays floating rate of interest on the same notional principal.
Floating for Floating Interest Rate Swap	:	Both counterparties pay a floating rate of interest based on different reference rates. This type of swap is also called as basis swap.
Floating Rate Notes (FRN)	:	A note issued by a borrower with a promise to pay the interest on floating rate basis. These are also known as floaters.
Floor Broker	:	An exchange member who is entitled to execute orders for other members as well as customers on the floor of an exchange.
Floortion	:	An option contract on floors.
Forward Contract	:	Two parties sign this type of deferred contract where they agree to buy and sell an asset at some point of time in future under mutually acceptable terms and conditions. Compared to futures contract, forward contracts are neither standardized nor regulated by any authority.
Forward Discount	:	The percentage at which the forward price of the currency of a particular country with respect to another country is less than the corresponding spot rate.
Forward Exchange Rate	:	The price of the home currency at which a forward contract can be made to buy or sell a certain amount of foreign currency on a predetermined future date.
Forward Rate	:	The rate at which a forward contract for a loan has been agreed or the rate obtained by the relationship between interest rates of different maturities.
Forward-forward Swap	:	The process of cancelation of a forward contract to buy/sell certain amount foreign currency by taking another forward contract to sell/buy an equal amount of the same foreign currency maturing on the same day.
Forward Premium	:	If the forward rate is above the spot rate, the difference between the two rates is called as forward premium.
Forward Rate Agreement (FRA)	:	A forward contract on interest rate on the basis of a fixed notional principal where cash is settled based on the difference between the contract rate and the reference rate existing on the closing date. The final settlement is done on the basis.
Forward Swap	:	A typical interest rate swap where the swap coupon is decided as per the contract but the swap is started after a mutually agreed time period.

Futures Commission Merchant (FCM) : A legally authorized individual or organization permitted to solicit or accept orders to buy or sell futures or futures options contract by abiding to the governing rules. FCM can accept payment as well as seek margin deposits from its clients. A FCM must have to register itself with Commodity Futures Trading Commission (CFTC).

Futures Contract : By signing this agreement, one can buy or sell an asset of standardized quantity at a specific future date. The price is decided by open auction in a trading pit. The rules and regulations for transaction are set by the concerned trading market.

Futures Option : An option which enables the holder to buy/sell a futures contract at a specified price on a particular date.

Gamma : It implies the degree at which the delta of an option changes against every unit change in the price of the underlying asset.

GLOBEX : With the combined efforts of CME, CBOT, Reuters and MATIF, a global electronic exchange has been developed to carry out screen-based trading of various contracts throughout the world. Based on the bids and offer rates and the availability of trades, one can trade on-line through it and confirmation will be obtained almost instantaneously.

Hedge : A technique by which the adverse price risk which is inherent to any cash market is managed by taking a risk management instrument such as forward or futures or options contract.

Hedge Ratio : The minimum number of units of a hedging instrument needed to be held in order to minimize the overall portfolio, which is a combination of a cash position and an hedge position.

Hedged Portfolio : A portfolio which has been hedged by using a long stock, short call or long stock, long put in such a way that the hedge ratio can be continuously adjusted to achieve a risk-free portfolio.

Hedging : A risk management strategy is done through the following steps:

a. The amount of necessary exposure is to be estimated.

b. Suitable derivative instrument need to be chosen in such a way that it will create another type of risk which is equal but opposite to that of earlier one.

Horizontal Bear Spread : An option strategy where the speculator has taken a long position for the option maturing in the near (front) months and short position in the back (far) months.

Horizontal Bull Spread : It is just opposite to that of horizontal bear spread. Here, the speculator has to take a long position for the back (far) months and short in the near (front) months.

Horizontal Option Spread : A hedging strategy involving buying and selling of call or put options (one type of option) of same strike price but different maturity period.

Horizontal Spread : A combination of simultaneous long and short position in options of the same class where the strike price is same but the maturity of the options are different. This strategy is also called as a calendar spread and as a time spread.

Implied Volatility	:	The expected future price volatility of an asset on the basis of the prevailing premium of a particular option contract.
Inflation Risk	:	The possibility of reduction in purchasing power of money due to the possibility of price rise in future.
Initial Margin	:	The amount (in terms of cash or asset) of deposit to be made by a customer to confirm his acceptance of contractual obligation while trading with futures and options.
Inter-commodity Spread	:	The spread obtained between two futures contracts, which are written on different commodities but related in nature.
Interest Rate Parity	:	A theory which describes the relation between the forward premium or discount on one currency with respect to another one and the short-term interest rate differentials between these two currencies.
In-the-money Option	:	An option that has positive intrinsic value based on the stock price and strike price. Calls are in-the-money when the strike price is less than the stock price; Puts are in-the-money when the stock price is less than the strike price.
Insider Information	:	Privately held news that, when realized to the public, is likely to have an impact on the price of securities. Trading on the basis of inside information is not legal.
Insurance	:	An agreement that transfers the risk of financial loss due to the action of any peril from one party to another against some upfront fee known as premium.
International Monetary Market (IMM)	:	Presently it is operating as a subsidiary of Chicago Mercantile Exchange (CME), a major market maker in the US for currency futures and Eurodollar contracts.
Interest Rate Cap	:	It is a cash settled options on interest rates where as a multi-period cash flow is involved. The holder will receive a cash payment on maturity if the reference rate exceeds the ceiling rate as contracted.
Interest Rate Collar	:	A clause in a borrowing contract where the payments are made on a floating rate basis. This clause places an upper and lower limits on the rate of interest. A collar is a combination of interest rate cap and interest rate floor where the cap is purchased and the floor is sold and vice versa.
Interest Rate Floor	:	It enables an option-holder to receive cash payment if the reference rate is below the floor rate as contracted on the date of maturity in a multi-period interest rate option contract.
Interest Rate Futures	:	A futures contract based on debt instruments or debt indexes. The changes of values of the interest rate futures contract are negatively correlated with that of the interest rate contract.
Interest Rate Option	:	An option in which case the value of the underlying asset is stated on the basis of interest rate or yield. It may be single period or multi-period in nature. The caps and floors contracts are available for the multi-period options only.
Interest Rate Parity	:	It express the relationship between the nominal interest rates and the spot and forward rates of the currencies of two countries. This parity indicates the availability of an arbitraging opportunity by trading in foreign currencies.

Interest Rate Risk : The adverse fluctuations of interest rate which may affect the asset value of an investor or which may impose additional burden to a borrower.

Interest Rate Swap : A contract between two entities where a series of interest payments are exchanged against the same notional principal denominated in the same currency.

Interest Rate Swap Agreement : An exclusive contract to swap US dollar interest rate. On the basis of 1986 code, a standard form of swap agreement was published by ISDA in 1987 duly incorporating the code of reference.

Intra-commodity Spread : The spread obtained by writing two futures contracts on same commodity but with different maturity period.

Intrinsic Value : An important feature to decide the value of an option. It is usually the greater of the amount by which an option is in-the-money or zero.

Invoice Price : It is the actual price that a buyer has to pay to the seller of the subject asset after making all types of adjustments.

Lambda : It implies the change in option premium against an unit change in the price volatility of the underlying asset.

Leading and Lagging : The technique of netting the inflow or outflow of a foreign currency by preponing (leading) or postponing (lagging) the timing of receipt or payment in order to match it with a corresponding outflow or inflow of the same currency. The multinationals and exporters generally adopt this strategy to reduce the transaction costs as a part of the management of their current assets.

LIBOR : It is an acronym of London Inter Bank Offered Rate. Actually, it is the standard rate at which the banks lend eurodollar deposits among each other in London.

LIBOR Flat : The actual quoted value of LIBOR, without charging any premium or without offering discount.

LIFFE : The acronym of London International Financial Futures and Option Exchange where FTSE 100 Index futures and futures on long-term interest rate as well as short-term interest rate are available. Apart from these, options on the above futures and on individual stock of UK equities are also traded there.

Limit Order : In a contract of buying or selling securities, where the client specifies the upper price limit to be paid in case of buying and lower price limit acceptable in case of selling.

Long : A position created by a person by buying an asset without taking any offsetting position. The above buyer will gain when the price of the asset rises and lose due to the fall in price.

Long Hedge : It is done by taking a long or short position to protect against adverse price movements.

Look Back Option : A special type of option which enables an holder the right to buy at the lowest price and the right to sell at the highest price of the underlying asset during the tenure of the option.

Maintenance Margin : The minimum amount of money (cash or cash equivalent) that must have to be maintained by a client of the option or futures market with the broker or with the clearing house. If the margin falls below that level due to marked to the market, the broker has to make a margin call to increase it to the level of initial margin.

Marche a Terme Internationale de France : The exchange, located in Paris, where the contracts on long-term and short-term interest rate futures and stock index futures are listed.

Margin : For buying bonds and shares, it is the fraction of purchase price paid by the buyer while for futures contracts, the amount of money needed to be submitted by a client as decided by the exchange to assure the performance of the contract.

Margin Call : A request issued by a broker to a client or by a clearing house to a clearing member for additional funds. The request is made when the fund position falls below the amount of maintenance margin.

Market-if-Touched (MIT) : Also known as board order. This order will be accepted in case of buying, if the market price is equal to or below the specified limit price while for selling, it is above or equal to the limit price.

Market Maker : Generally, they are known as dealers. They make a market by offering to buy and sell an asset simultaneously. A market maker earns profits through the difference between the bid and ask rates.

Market Risk : The possibility of adverse market price movement which may affect the asset value of an investor or may affect the profitability of a manufacturer. The similar case will be for an importer, exporter or borrower or a lender.

Marking-to-market : A typical procedure adopted while trading in futures.

Here the margin account of the client is adjusted daily depending upon the changes in the latest closure of future price with respect to the previous closure.

Markowitz Model : The portfolio construction algorithm that requires the knowledge of all pair-wise covariances between the potential portfolio components.

Maturity Date : The date on which a bond or forward or futures or options contract matures.

Minimum-risk Hedge Ratio : It indicates the number of futures or options need to be bought or sold in order to reduce the variability of the total hedged position to the maximum possible extent.

Mismatch Risk : The possibility of a swap bank failing to match the various transactions according to its swap book. The same thing may also happen to a bank holding similar type of portfolio.

Modified Duration : Developed by Macaulay, it is obtained by dividing the duration by one plus yield divided by the frequency of coupon payments.

Monte Carlo Simulation : Simulation method using random numbers to test various situations or possible conditions.

Naked Call Writing : The event of writing a call when the underlying asset is not under the possession of the writer or is not owned by him.

Naked Put Writing : The event of writing a put when the writer does not have sufficient cash (or securities) in his brokerage account to purchase the stock.

Nearby Contract : It is a type of futures contract likely to be matured within a month, which is nearby in time.

Netting : The standard practice followed by a multinational company in order to reduce the transaction costs during the flow of funds from one subsidiary to another or from the parent company to a subsidiary one or vice-versa or to make payment to or to receive payment from a party in abroad. Through netting, the difference between the payables and receivables are estimated. Based on the result, hedging will be done only for the net amount of currency – incoming or outgoing.

Normal Distribution : A bell shaped continuous distribution curve that is used to measure a wide variety of data on the same scale, as it fits the measurements of many human characteristics and machine-produced items.

Off-balance Sheet : A contract (like lease agreement) undertaken by a company which may have a serious financial consequences, but that does not appear at all in the balance sheet

Offset : The method of liquidating a futures or options contract by buying or selling another identical contract of equal amount and same maturity.

Open Outcry : An auction market system in which the floor brokers of a futures exchange make bids or offer openly by shouting. The others have to identify the most competitive rate for trading with those.

Operating Exposure : The risk of changes in the operating income of a domestic company due to the changes in the exchange rate in the forex market.

Operating Risk : Changes in the values of the domestic currency due to unexpected changes in exchange rates.

Optimal Hedge : The hedge at which the utility of the hedger is maximized.

Option Clearing Corporation (OCC) : In the US, it is the clearing house of all listed stock options and most commodity options which are transacted.

Option Contract : Through this type of contract the buyer buys the right to buy or sell an asset by paying the option premium. But the seller, by getting the option premium takes the obligation to sell or buy the asset at a specified price on or before a predetermined future date.

Option Holder : The buyer of an option or the owner of an option or one who is said to have taken a long position. The person who enjoys the right to buy or sell an underlying asset at the strike price.

Option Premium : The price that the buyer pays to the seller to get the right to buy or sell the underlying asset.

Options on Futures : The very option which is written against futures contracts. On exercising the right to buy or sell, the futures contract will be assumed to be delivered.

Option Writer : The seller or writer who takes the obligation to buy or sell the underlying asset following the wish of the option holder, in return for a premium, under an option contract.

Out-of-the-money Option : An option that has no value. In the case of a call option, the option whose exercise price is greater than the market price of the underlying asset. In the case of a put option, the option whose exercise price is less than the market price of the underlying asset.

Over-the-Counter : It is most popularly known by the acronym OTC. A dealers' market in which transactions are made through telephone, telex, etc., as opposed to screen based trading. Although, a great flexibility of product design may be available, the lack of transparency is of course a point of doubt.

Par Grade : The specified quality of a commodity which can be delivered at the maturity of a futures contract in return for cash.

Participating Cap : A cap on interest rate where the buyer pays a lesser premium with an acceptance to pay the writer a percentage of the difference between the reference rate and ceiling rate if the ceiling rate is ruling above the reference rate on the date of maturity.

Philadelphia Stock Exchange (PHLX) : An exchange in the US, where the options on currencies, equities and on a number of stock indices are listed.

Pit : An octagonal area located in the trading floor of an exchange which is surrounded by a tier of steps. In this place, the traders and brokers gather together for trading in futures through open outcry.

Plain Vanilla : A financial instrument in the simplest form related to the first manifestation of the instrument (like plain vanilla swap, plain vanilla coupon bond, etc.)

Portfolio Insurance : An investment strategy where various financial instruments like equities and debts and derivatives for examples, options and futures are combined in such a way that degradation of portfolio value is protected.

Portfolio Investment : The strategy of investment of funds into a number of financial assets like equities, bonds, gilt-edged securities etc., to reduce the risk through diversification and to maximize the return.

Position : An active interest taken by an investor or a speculator by buying or selling any available contracts.

Position Limit : The maximum amount of contracts a speculator can hold is called as position limit. In USA, it is determined by the Commodity Futures Trading Commission and/or the exchange at which the contracts are traded.

Price Risk : A financial risk sustained by a company due to the fluctuations of the prices of the physical or financial assets, products or liabilities.

Prime Cap : An interest rate cap on the basis of the prime rate of interest of any commercial bank which it charges its best customers for the loans of shorter tenure.

Pure Yield Pick-up Swap	:	A form of bond swap where an investor exchanges one bond for another to obtain a higher yield over the long-term, with little attention paid to the near-term outlook of the bond's perspective.
Put Option	:	An option by which the holder gets the right to sell the underlying asset at a specified price on or before its maturity, while the writer is obliged to buy it as so.
Put-Call Parity	:	The relationship between the market price of a put and a call that have the same exercise price, expiration date and underlying stock.
Rate Anticipation Swap	:	A form of bond swap where an investor exchanges bonds that are expected to perform relatively poorly for those that are expected to perform relatively well, given an anticipated movement in interest rates.
Rate-capped Swap	:	A fixed for floating interest rate swap where the maximum floating rate is predetermined.
Rainbow Option	:	An option in which the best performance of two or more selected markets is considered. Such as, in case of a call option, the greatest appreciation of the FT-All Shares or S&P 500 is considered. Hence, it is also known as out performance option.
Replacement Swap	:	Designing a new swap by prematurely terminating a previous swap.
Repurchase Agreement (REPO)	:	It is a type of forward contract by which a party to a contract agrees to sell an asset and to buy it back on a predetermined future date at an agreed upon price. The difference between the selling price and repurchase price is known as the interest of money. The interest rate associated with such a transaction is known as repo rate.
Reverse Conversion	:	This strategy is taken by selling an asset, writing a put and buying a call on that asset with the same terms and conditions in order to make arbitraging profit.
Rho	:	Measure of the extent at which an option premium changes with respect to change in interest rate.
Risk Averse	:	A person who is not comfortable with risk.
Risk Premium	:	The percentage by which the forward exchange rate is expected to be more than the future spot rate at the maturity of the forward contract.
Risk Profile	:	Graphical representation of the financial losses followed by a change in the price level.
Roller Coaster Swap	:	A typical swap in which first the notional principal increases over a period of time and then gradually amortizes to zero during the remaining part of its tenure.
Rollover (Swap)	:	A typical swap in which case the purchase/sale and subsequent sale/purchase of a currency are separated by one business day.
Scenario Analysis	:	The testing the gain or loss to the protfolio under different situations or scenarios. It uses stress testing, Monte Carlo simulations or Value at Risk for analysis.

Settlement Date : It is applicable in the following ways:

i. In the trading of stocks, the day at which the cash and shares are exchanged.

ii. In futures trading, the day at which Index futures price is converged with that of the spot index.

iii. While for an interest rate contract, the day on which the cash transaction will be done.

Short-Index Arbitrage : A type of program trading that seeks to take advantage of discrepancies in the relative pricing of stock index futures contracts and the level of the stock index itself.

Short Sale : The sale of a security that is not owned by an investor but borrowed from a broker.

Sovereign Risk : The chance that a government may bar an issuer of equity or debt instrument to repatriate dividend or interest to any foreign country.

Spot Exchange Rate : The exchange rate quoted for immediate delivery (after two consecutive business days) of the currency to be bought or sold.

Speculator : A typical trader whose sole objective is to make profits by anticipating the future price movements.

Spread : It can be used to mean either of the following:

a. The difference between the buying and selling price of an asset like foreign currency, bonds, shares, etc.

b. Buying and selling put or call options of the same class but of different maturity periods simultaneously.

c. Taking short or long positions in futures against same type of asset but different maturity or different types of assets with same maturity.

d. The difference between the absolute yield on swaps and treasury yield.

Stock Index Futures : The futures contracts traded in the organized stock exchanges on the basis of the future value of stock indices. Such contracts are finally settled through cash on the closing day by converging the index futures value with that of the spot index value.

Straddle : A combined option position adopted by buying or selling a call option and a put option simultaneously.

Stress Testing : A form of scenario analysis that involves testing the effect of extreme movements in the underlying variables.

Strike Price : The price at which an option holder can buy or sell the underlying asset while the option writer is obliged to sell or buy.

Strip : A sequence of successive contracts of a particular class along with their corresponding price structures. Among all the strips, IMM strips are most familiar.

Substitution Swap : A form of bond swap where an investor exchanges one bond with a lower yield for another with a higher yield, yet both the bonds have the same characteristics.

Swap	:	The agreement through which a series of exchanges of periodic payments (both interest and principal) is done with a counterparty.
Swap Broker	:	An agent who helps his clients to get their matching partners to perform a swap deal in return for some commission.
Swap Coupon	:	The fixed rate of interest agreed to be paid by a party of the fixed rate side of a swap deal.
Swap Dealer	:	A financial intermediary who is the market maker of swap deal and earns profits through the bid-ask spread of the contracts transacted.
Swaption	:	An option on a swap where the buyer of the swaption (like the option holder) is entitled to perform a specific swap deal for a defined period of time.
Synthetic Instruments	:	The Collection of a set of instruments those are having the same features in terms of cash flow stream like that of the real instruments which are not included in the set. The said set constitutes the synthetic instruments.
Systematic Risk	:	The possibility of the fluctuation of the market price of a financial asset in comparison to that of the movement of the market of that type of assets in general.
Target Zone	:	The range within which the central bank of a country desires to keep the exchange rate of the home currency with respect to any particular foreign currency.
TED Spread	:	The difference between the interest rates of Treasury Bills and the Eurodollar deposits having the same period of maturity.
Theta	:	It measures the change in option premium due to one day change in the period of maturity.
Time Value	:	The amount of premium that investors are willing to pay for an option under the expectation that with the passage of time changes in the underlying asset will make the option increase in value. In other words, it is the difference between the total value and the intrinsic value of an option.
Tokyo International Financial Futures Exchange (TIFFE)	:	An exchange based on Tokyo, where contracts on currencies and interest rates are traded.
Treasury Bills	:	The short-term gilt-edged securities sold by US treasury at a discount from its face values to borrow funds. Also called as T-bills.
Treasury Bonds	:	The long-term coupon bearing gilt-edged securities sold at periodic auctions by the US treasury to fund its ongoing operations. The general maturity period of these bonds is about 30 days.
Treasury Notes	:	The medium-term coupon bearing gilt-edged securities sold through periodic auctions by US treasury to fund the ongoing operations. Also called as T-notes.
Treasury Receipts	:	A treasury based zero coupon bond which has been superseded by STRIPS programs.
US Treasury Securities	:	The debt instruments issued by the US treasury like T-bills, T-notes and T-bonds.

Uncovered Options : It is taken by writing an option – put or call – without owning the underlying asset.

Unsystematic Risk : The portion of a security's total risk that is not related to movements in the market portfolio and hence can be diversified.

Value at Risk : The measurement of loss which has a chance over a certain pre-decided confidence level of being exceeded. That means, if the confidence level is 99%, the value at risk will be the measurement of the possible loss over the balance 1%.

Variation Margin : The profit earned or losses sustained by a client in a futures contract is calculated through mark to the market. These profits or losses are credited or debited to the clients' accounts by the clearing member.

Vega : The percentage change in the price of an option against every percentage change in implied volatility (mathematically it is the derivative of option price with respect to volatility). Also referred to as Epsilon, Omega and Kappa.

Vertical Bear Spread : An option trading strategy where one buys the option with higher strike price and sells another of lower strike price.

Vertical Bull Spread : Also another option trading strategy, where long position is taken to the option of lower strike price and short position for the option of higher strike price.

Vertical Option Spread : It is a speculative strategy of trading with options. The speculator buys and sells put or call options of identical maturity but different exercise price.

Volatility : The extent at which the price of the asset fluctuates over a given period of time. Generally, it is measured by calculating the annualized standard deviation of daily return on the asset.

Writer of an Option : The seller of the option contract who is assuming the obligation to buy or sell the underlying asset at the strike rate on or before the maturity of the option contract.

Yield-to-Maturity : The rate of return is to be earned by an investor by investing in a debt instrument by holding it till maturity after assuming a zero default risk.