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PREFACE

Financial derivatives play a vital role in modern financial markets, offering investors, institutions, and corporations a means to manage risk, enhance returns, and improve market efficiency. This book provides a comprehensive exploration of financial derivatives, including their structure, pricing, and practical applications in various financial sectors. As global financial markets evolve, derivatives have become indispensable tools for hedging, speculation, and portfolio management. Understanding these instruments requires a deep knowledge of their mechanics, valuation models, and regulatory considerations. This book equips students, professionals, and financial practitioners with the theoretical and practical insights necessary to navigate the complexities of derivative markets effectively. The book systematically covers essential topics such as futures and forwards, options, swaps, credit derivatives, and risk management strategies. Each chapter integrates real-world examples, case studies, and quantitative models to bridge the gap between theory and practice. The goal is to enhance analytical skills and strategic decision-making in financial derivatives trading and risk management. We acknowledge the contributions of financial experts, academics, and industry professionals whose research and insights have advanced the understanding of derivatives. We also extend our gratitude to students and readers whose engagement and inquiries continue to drive the evolution of this field. We hope this book serves as a valuable resource in your study of financial derivatives, providing clarity and confidence in utilizing these instruments for effective financial management.

CONTENT

CHAPTER - I

FUNDAMENTALS OF FINANCIAL DERIVATIVES

Financial derivatives introduction

The past decade has witnessed the multiple growths in the volume of international trade and business due to the wave of globalization and liberalization all over the world. As a result, the demand for the international money and financial instruments increased significantly at the global level. In this respect, changes in the interest rates, exchange rates and stock market prices at the different financial markets have increased the financial risks to the corporate world. Adverse changes have even threatened the very survival of the business world. It is, therefore, to manage such risks; the new financial instruments have been developed in the financial markets, which are also popularly known as financial derivatives.

The basic purpose of these instruments is to provide commitments to prices for future dates for giving protection against adverse movements in future prices, in order to reduce the extent of financial risks. Not only this, they also provide opportunities to earn profit for those persons who are ready to go for higher risks. In other words, these instruments, indeed, facilitate to transfer the risk from those who wish to avoid it to those who are willing to accept the same. Today, the financial derivatives have become increasingly popular and most commonly used in the world of finance. This has grown with so phenomenal speed all over the world that now it is called as the derivatives revolution. In an estimate, the present annual trading volume of derivative markets has crossed US $ 30,000 billion, representing more than 100 times gross domestic product of India.

Financial derivatives like futures, forwards options and swaps are important tools to manage assets, portfolios and financial risks. Thus, it is essential to know the terminology and conceptual framework of all these financial derivatives in order to analyze and manage the financial risks. The prices of these financial derivatives contracts depend upon the spot prices of the underlying assets, costs of carrying assets into the

future and relationship with spot prices. For example, forward and futures contracts are similar in nature, but their prices in future may differ. Therefore, before using any financial derivative instruments for hedging, speculating, or arbitraging purpose, the trader or investor must carefully examine all the important aspects relating to them.

The first trade in derivatives was a culmination of legislative and legal efforts which had begun as early as 1995. In 1995, SEBI appointed a committee for exploring issues in introduction and creating a regulatory framework for a derivative market. After the committee report was tabled, the first action taken was to wet nurse the derivatives market by adopting the entire regulatory framework of securities. This was done simply by defining securities to include derivatives and removing certain prohibitions on forward and options trading. Thus, the entire framework of existing securities Regulations including anti-fraud and various disclosure obligations have become part of the regulations of derivatives in India. This is in sharp contrast to the introduction of futures on individual stocks in US. Their introduction took 20 years, endless bickering between the two regulators Securities Exchange Commission (SEC) and Commodity Futures Trading Commission (CFTC), a new Act which lays down several requirements for trading which should rightfully be in the bye-laws of the exchange/board of trade. By that standard, India managed to leapfrog as far as not just technology but also regulations. The introduction of new products has seen more of changes in the micro regulations like margining and default.

Definitions of Derivatives

The term "Derivative" indicates that it has no independent value, i.e., its value is entirely derived from the value of the underlying asset. The underlying asset can be securities, commodities, bullion currency, livestock or anything else. In other words, derivative means forward, futures, option or other hybrid contract of predetermined fixed duration, linked for the purpose of contract fulfilment to the value of a specified real or financial asset or to an index of securities.

The Securities Contracts (Regulation) Act 1956 defines "derivative" as under: "Derivative" includes:

1. Security derived from a debt instrument, share, loan whether secured or unsecured, risk instrument or contract for differences or any other form of security.

2. A contract which derives its value from the prices, or index of prices of underlying securities. The above definition conveys that:

1. The derivatives are financial products.

2. Derivative is derived from another financial instrument/contract called the underlying. In the case of Nifty futures, Nifty index is the underlying. A derivative derives its value from the underlying assets.

3. Accounting Standard SFAS 133 defines a derivative as, 'a derivative instrument financial derivative or other contract with all three of the following characteristics: It has

(i) (1) one or more underlying, and 2) One or more notional amount or payments provisions or both. Those terms determine the amount of the settlement or settlements.

(ii) It requires no initial net investment or an initial net investment that is smaller than would be required for other types of contract that would be expected to have a similar response to changes in market factors

(iii) Its terms require or permit net settlement. It can be readily settled net by means Notes outside the contract or it provides for delivery of an asset that puts the recipients in a position not substantially different from net settlement.

The term "financial derivative" relates with a variety of financial instruments which include stocks, bonds, treasury bills, interest rate, foreign currencies and other hybrid securities. Financial derivatives include futures, forwards, options, swaps, etc. Futures contracts are the most important form of derivatives, are in existence long before the term 'derivative' was coined. Financial derivatives can also be derived from a combination of cash market instruments or other financial derivative instruments. In fact, most of the financial derivatives are not revolutionary new instruments rather they are merely combinations of older generation derivatives and/or standard cash market instruments.

In the 1980s, the financial derivatives were also known as off-balance sheet instruments because no asset or liability underlying the contract was put on the balance sheet as such. Since the value of such derivatives depend upon the movement of market prices of the underlying assets, hence, they were treated as contingent asset or liabilities and such transactions and positions in derivatives were not recorded on the balance sheet. However, it is a matter of considerable debate whether off-balance sheet instruments should be included in the definition of derivatives. Which item or product given in the balance sheet should be considered for derivative is a debatable.

Features of financial derivatives

1. **It is a contract**: Derivative is defined as the future contract between two parties. It means there must be a contract-binding on the underlying parties and the same to be fulfilled in future. The future period may be short or long depending upon the nature of contract, for example, short term interest rate futures and long term interest rate futures contract.
2. **Derives value from underlying asset**: Normally, the derivative instruments have the value which is derived from the values of other underlying assets, such as agricultural commodities, metals, financial assets, intangible assets, etc. Value of derivatives depends upon the value of underlying instrument and which changes as per the changes in the underlying assets, and sometimes, it may be nil or zero. Hence, they are closely related.
3. **Specified obligation:** In general, the counter parties have specified obligation under the derivative contract. Obviously, the nature of the obligation would be different as per the type of the instrument of a derivative. For example, the obligation of the counter parties, under the different derivatives, such as forward contract, future contract, option contract and swap contract would be different.
4. **Direct or exchange traded**: The derivatives contracts can be undertaken directly between the two parties or through the particular exchange like financial futures contracts. The exchange-traded derivatives are quite liquid and have low transaction costs in comparison to tailor-made

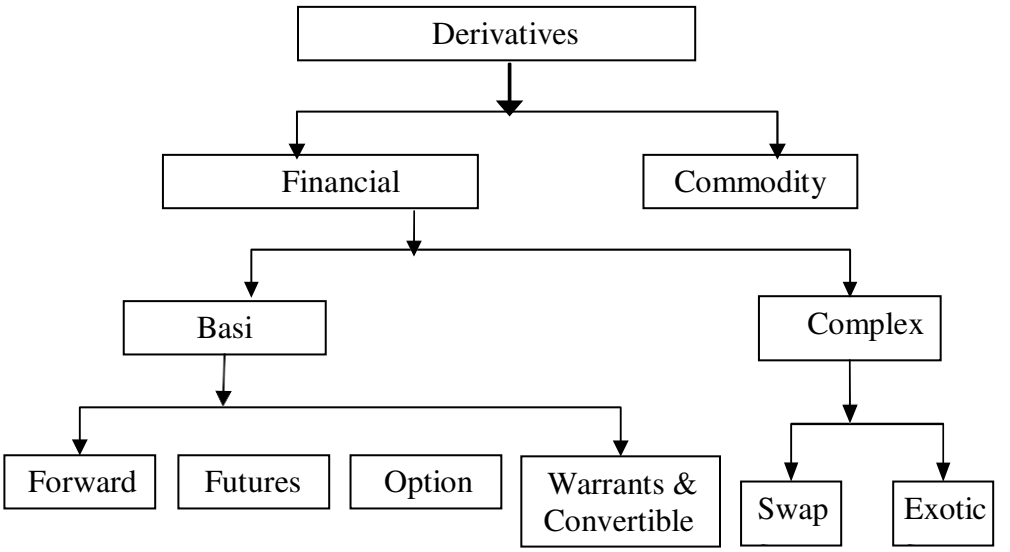
contracts. Example of exchange traded derivatives are Dow Jons, S&P 500, Nikki 225, NIFTY option, S&P Junior that are traded on New York Stock Exchange, Tokyo Stock Exchange, National Stock Exchange, Bombay Stock Exchange and so on.

5. **Related to notional amount:** In general, the financial derivatives are carried off-balance sheet. The size of the derivative contract depends upon its notional amount. The notional amount is the amount used to calculate the payoff. For instance, in the option contract, the potential loss and potential payoff, both may be different from the value of underlying shares, because the payoff of derivative products differ from the payoff that their notional amount might suggest.
6. **Delivery of underlying asset not involved:** Usually, in derivatives trading, the taking or making of delivery of underlying assets is not involved, rather underlying transactions are mostly settled by taking offsetting positions in the derivatives themselves. There is, therefore, no effective limit on the quantity of claims, which can be traded in respect of underlying assets.
7. **May be used as deferred delivery:** Derivatives are also known as deferred delivery or deferred payment instrument. It means that it is easier to take short or long position in derivatives in comparison to other assets or securities. Further, it is possible to combine them to match specific, i.e., they are more easily amenable to financial engineering.
8. **Secondary market instruments:** Derivatives are mostly secondary market instruments and have little usefulness in mobilizing fresh capital by the corporate world, however, warrants and convertibles are exception in this respect.
9. **Exposure to risk:** Although in the market, the standardized, general and exchange-traded derivatives are being increasingly evolved, however, still there are so many privately negotiated customized, over-the-counter (OTC) traded derivatives are in existence. They expose the trading parties to operational risk, counter-party risk and legal risk. Further, there may also be uncertainty about the regulatory status of such derivatives.
10. **Off balance sheet item:** Finally, the derivative instruments, sometimes, because of their off-balance sheet nature, can be used to clear up the

balance sheet. For example, a fund manager who is restricted from taking particular currency can buy a structured note whose coupon is tied to the performance of a particular currency pair.

Types of financial derivatives

Derivatives are of two types: financial and commodities.



Classification of Derivatives

One form of classification of derivative instruments is between commodity derivatives and financial derivatives. The basic difference between these is the nature of the underlying instrument or asset. In a commodity derivative, the underlying instrument is a commodity which may be wheat, cotton, pepper, sugar, jute, turmeric, corn, soya beans , crude oil, natural gas, gold, silver, copper and so on. In a financial derivative, the underlying instrument may be treasury bills, stocks, bonds, foreign exchange, stock index, gilt-edged securities, cost of living index, etc. It is to be noted that financial derivative is fairly standard and there are no quality issues whereas in commodity derivative, the quality may be the underlying matter. However, despite the distinction between these two from structure and functioning point of view, both are almost similar in nature.

Another way of classifying the financial derivatives is into basic and complex derivatives. In this, forward contracts, futures contracts and

option contracts have been included in the basic derivatives whereas swaps and other complex derivatives are taken into complex category because they are built up from either forwards/futures or options contracts, or both. In fact, such derivatives are effectively derivatives of derivative

Basic Financial derivatives

The most commonly used derivatives contracts are forwards, futures and options.

Forwards: A forward contract is a customized contract between two entities, where settlement takes place on a specific date in the future at today's pre-agreed price. For example, an Indian car manufacturer buys auto parts from a Japanese car maker with payment of one million yen due in 60 days. The importer in India is short of yen and suppose present price of yen is Rs. 68. Over the next 60 days, yen may rise to Rs. 70. The importer can hedge this exchange risk by negotiating a 60 days forward contract with a bank at a price of Rs. 70. According to forward contract, in 60 days the bank will give the importer one million yen and importer will give the banks 70 million rupees to bank.

Futures: A futures contract is an agreement between two parties to buy or sell an asset at a certain time in the future at a certain price. Futures contracts are special types of forward contracts in the sense that the former are standardized exchange-traded contracts. A speculator expects an increase in price of gold from current future prices of Rs. 9000 per 10 gm. The market lot is 1 kg and he buys one lot of future gold (9000 × 100) Rs. 9,00,000. Assuming that there is 10% margin money requirement and 10% increase occur in price of gold. the value of transaction will also increase i.e. Rs. 9900 per 10 gm and total value will be Rs. 9,90,000. In other words, the speculator earns Rs. 90,000.

Options: Options are of two types– calls and puts. Calls give the buyer the right but not the obligation to buy a given quantity of the underlying asset, at a given price on or before a given future date. Puts give the buyer the right, but not the obligation to sell a given quantity of the underlying asset at a given price on or before a given date.

Warrants: Options generally have lives of up to one year, the majority of options traded on options exchanges having maximum maturity of nine months. Longer-dated options are called warrants and are generally traded over-the-counter.

Leaps: The acronym LEAPS means long term equity anticipation securities. These are options having a maturity of upto three years.

Baskets: Basket options are options on portfolios of underlying assets.

The index options are a form of basket options.

Swaps: Swaps are private agreements between two parties to exchange cash flows in the future according to a prearranged formula. They can be regarded as portfolios of forward contracts. The two commonly used swaps are:

Interest rate swaps: These entail swapping only the interest related cash flows between the parties in the same currency

Currency Swaps: These entail swapping both principal and interest on different currency than those in the opposite direction.

Swaptions: Swaptions are options to buy or sell a swap that will become operative at the expiry of the options. Thus a swaptions is an option on a forward swap. Rather than have calls and puts, the swaptions market has receiver swaptions and payer swaptions. A receiver swaption is an option to receive fixed and pay floating. A payer swaption is an option to pay fixed and receive floating.

History of Derivative markets

In the beginning, these forward trading agreements were formed to buy and sell food grains in the future for actual delivery at the pre-determined price. Later on these agreements became transferable, and during the American Civil War period, Le., 1860 to 1865, it became common place to sell and resell such agreements where actual delivery of produce was not necessary. Gradually, the traders realized that the agreements were easier to buy and sell if the same were standardized in terms of quantity, quality and place of delivery relating to food grains. In the nineteenth century this activity was centred in Chicago which was the

main food grains marketing center in the United States. In this way, the modern futures contracts first came into existence with the establishment of the Chicago Board of Trade (CBOT) in the year 1848, and today, it is the largest futures market of the world. In 1865, the CBOT framed the general rules for such trading which later on became a trendsetter for so many other markets.

In 1874, the Chicago Produce Exchange was established which provided the market for butter, eggs, poultry, and other perishable agricultural products. In the year 1877, the London Metal Exchange came into existence, and today, it is leading market in metal trading both in spot as well as forward. In the year 1898, the butter and egg dealers withdrew from the Chicago Produce Exchange to form separately the Chicago Butter and Egg Board, and thus, in 1919 this exchange was renamed as the Chicago Mercantile Exchange (CME) and was reorganized for futures trading. Since then, so many other exchanges came into existence throughout the world which trade in futures contracts.

Although financial derivatives have been is operation since long, but they have become a major force in financial markets in the early 1970s. The basic reason behind this development was the failure of Bretton wood System and the fixed exchange rate regime was broken down. As a result, new exchange rate regime, i.e., floating rate (flexible) system based upon market forces came into existence. But due to pressure or demand and supply on different currencies, the exchange rates were constantly changing, and often, substantially. As a result, the business firms faced a new risk, known as currency or foreign exchange risk. Accordingly, a new financial instrument was developed to overcome this risk in the new financial environment. Another important reason for the instability in the financial market was fluctuation in the short-term interests. This was mainly due to that most of the government at that time tried to manage foreign exchange fluctuations through short-term interest rates and by maintaining money supply targets, but which were contrary to each other. Further, the increased instability of short-term interest rates created adverse impact on long-term interest rates, and hence, instability in bond prices, because they are largely determined by long-term interest rates.

The result is that it created another risk, named interest rate risk, for both the issuers and the investors of debt instruments.

Interest rate fluctuations had not only created instability in bond prices, but also in other long-term assets such as, company stocks and shares. Share prices are determined on the basis of expected present values of future dividend payments discounted at the appropriate discount rate. Discount rates are usually based on long-term interest rates in the market. So increased instability in the long-term interest rates caused enhanced fluctuations in the share prices in the stock markets. Further volatility in stock prices is reflected in the volatility in stock market indices which causes systematic risk or market risk.

In the early 1970s, it is witnessed that the financial markets were highly instable; as a result, so many financial derivatives have been emerged as the means to manage the different types of risks stated above, and also for taking advantage of it. Hence, the first financial futures market was the International Monetary Market, established in 1972 by the Chicago Mercantile Exchange which was followed by the London International Financial Futures Exchange in 1982. The Forwards Contracts (Regulation) Act, 1952, regulates the forward/futures contracts in commodities all over India. As per this the Forward Markets Commission (FMC) continues to have jurisdiction over commodity forward/futures contracts. However when derivatives trading in securities was introduced in 2001, the term 'security' in the Securities Contracts (Regulation) Act, 1956 (SCRA), was amended to include derivative contracts in securities. Consequently, regulation of derivatives came under the preview of Securities Exchange Board of India (SEBI). We thus have separate regulatory authorities for securities and Commodity derivative markets.

Uses of derivatives

Derivatives are supposed to provide the following services:

- **Risk aversion tools**: One of the most important services provided by the derivatives is to control, avoid, shift and manage efficiently different types of risks through various strategies like hedging, arbitraging, spreading, etc. Derivatives assist the holders to shift or modify suitably the risk characteristics of their portfolios. These are specifically useful in highly

volatile financial market conditions like erratic trading, highly flexible interest rates, volatile exchange rates and monetary chaos.

- **Prediction of future prices**: Derivatives serve as barometers of the future trends in prices which result in the discovery of new prices both on the spot and futures markets. Further, they help in disseminating different information regarding the futures markets trading of various commodities and securities to the society which enable to discover or form suitable or correct or true equilibrium prices in the markets. As a result, they assist in appropriate and superior allocation of resources in the society.
- **Enhance liquidity**: As we see that in derivatives trading no immediate full amount of the transaction is required since most of them are based on margin trading. As a result, large number of traders, speculators arbitrageurs operate in such markets. So, derivatives trading enhance liquidity and reduce transaction costs in the markets for underlying assets.
- **Assist investors:** The derivatives assist the investors, traders and managers of large pools of funds to devise such strategies so that they may make proper asset allocation increase their yields and achieve other investment goals.
- **Integration of price structure**: It has been observed from the derivatives trading in the market that the derivatives have smoothen out price fluctuations, squeeze the price spread, integrate price structure at different points of time and remove gluts and shortages in the markets.
- **Catalyze growth of financial markets**: The derivatives trading encourage the competitive trading in the markets, different risk taking preference of the market operators like speculators, hedgers, traders, arbitrageurs, etc. resulting in increase in trading volume in the country. They also attract young investors, professionals and other experts who will act as catalysts to the growth of financial markets.
- **Brings perfection in market**: Lastly, it is observed that derivatives trading develop the market towards 'complete markets'. Complete market concept refers to that situation where no particular investors can be better off than others, or patterns of returns of all additional securities are spanned by the already existing securities in it, or there is no further scope of additional security.

Critiques of Derivatives

Besides from the important services provided by the derivatives, some experts have raised doubts and have become critique on the growth of derivatives. They have warned against them and believe that the derivatives will cause to destabilization, volatility, financial excesses and oscillations in financial markets. It is alleged that they assist the speculators in the market to earn lots of money, and hence, these are exotic instruments. In this section, a few important arguments of the critiques against derivatives have been discussed.

Speculative and Gambling Motives

One of most important arguments against the derivatives is that they promote speculative activities in the market. It is witnessed from the financial markets throughout the world that the trading volume in derivatives have increased in multiples of the value of the underlying assets and hardly one to two percent derivatives are settled by the actual delivery of the underlying assets. As such speculation has become the primary purpose of the birth, existence and growth of derivatives. Sometimes, these speculative buying and selling by professionals and amateurs adversely affect the genuine producers and distributors.

Some financial experts and economists believe that speculation brings about a better allocation of supplies overtime, reduces the fluctuations in prices, make adjustment between demand and supply, removes periodic gluts and shortages, and thus, brings efficiency to the market. However, in actual practice, above such agreements are not visible. Most of the speculative activities are 'professional speculation' or 'movement trading' which lead to destabilization in the market. Sudden and sharp variations in prices have been caused due to common, frequent and widespread consequence of speculation.

Increase in Risk

The derivatives are supposed to be efficient tool of risk management in the market. In fact this is also one-sided argument. It has been observed that the derivatives market— especially OTC markets, as particularly customized, privately managed and negotiated, and thus, they are highly risky. Empirical studies in this respect have shown that

derivatives used by the banks have not resulted in the reduction in risk, and rather these have raised new types of risk. They are powerful leveraged mechanism used to create risk. It is further argued that if derivatives are risk management tool, then why 'government securities', a riskless security, are used for trading interest rate futures which is one of the most popular financial derivatives in the world.

Instability of the Financial System

It is argued that derivatives have increased risk not only for their users but also for the whole financial system. The fears of micro and macro financial crisis have caused to the unchecked growth of derivatives which have turned many market players into big losers. The malpractices, desperate behavior and fraud by the users of derivatives have threatened the stability of the financial markets and the financial system.

Price Instability

Some experts argue in favour of the derivatives that their major contribution is toward price stability and price discovery in the market whereas some others have doubt about this. Rather they argue that derivatives have caused wild fluctuations in asset prices, and moreover, they have widened the range of such fluctuations in the prices. The derivatives may be helpful in price stabilization only if there exist a properly organized, competitive and well-regulated market. Further, the traders behave and function in professional manner and follow standard code of conduct. Unfortunately, all these are not so frequently practiced in the market, and hence, the derivatives sometimes cause to price instability rather than stability.

Displacement Effect

There is another doubt about the growth of the derivatives that they will reduce the volume of the business in the primary or new issue market specifically for the new and small corporate units. It is apprehension that most of investors will divert to the derivatives markets, raising fresh capital by such units will be difficult, and hence, this will create displacement effect in the financial market. However, it is not so strong argument because there is no such rigid segmentation of

investors, and investors behave rationally in the market.

Increased Regulatory Burden

As pointed earlier that the derivatives create instability in the financial system as a result, there will be more burden on the government or regulatory authorities to control the activities of the traders in financial derivatives. As we see various financial crises and scams in the market from time to time, most of time and energy of the regulatory authorities just spent on to find out new regulatory, supervisory and monitoring tools so that the derivatives do not lead to the fall of the financial system. In our fast-changing financial services industry, coercive regulations intended to restrict banks' activities will be unable to keep up with financial innovation. As the lines of demarcation between various types of financial service providers continues to blur, the bureaucratic leviathan responsible for reforming banking regulation must face the fact that fears about derivatives have proved unfounded. New regulations are unnecessary. Indeed, access to risk-management instruments should not be feared, but with caution, embraced to help the firms to manage the vicissitudes of the market.

Forward Contract

A forward contract is a simple customized contract between two parties to buy or sell an asset at a certain time in the future for a certain price. Unlike future contracts, they are not traded on an exchange, rather traded in the over-the-counter market, usually between two financial institutions or between a financial institution and one of its client. In brief, a forward contract is an agreement between the counter parties to buy or sell a specified quantity of an asset at a specified price, with delivery at a specified time (future) and place. These contracts are not standardized, each one is usually customized to its owner's specifications.

Features of forward contract

The basic features of a forward contract are given in brief here as under:

Bilateral: Forward contracts are bilateral contracts, and hence, they are exposed to counter-party risk.

More risky than futures: There is risk of non-performance of obligation by either of the parties, so these are riskier than futures contracts.

Customized contracts: Each contract is custom designed, and hence, is unique in terms of contract size, expiration date, the asset type, quality, etc.

Long and short positions: In forward contract, one of the parties takes a long position by agreeing to buy the asset at a certain specified future date. The other party assumes a short position by agreeing to sell the same asset at the same date for the same specified price. A party with no obligation offsetting the forward contract is said to have an open position. A party with a closed position is, sometimes, called a hedger.

Delivery price: The specified price in a forward contract is referred to as the delivery price. The forward price for a particular forward contract at a particular time is the delivery price that would apply if the contract were entered into at that time. It is important to differentiate between the forward price and the delivery price. Both are equal at the time the contract is entered into. However, as time passes, the forward price is likely to change whereas the delivery price remains the same.

Synthetic assets: In the forward contract, derivative assets can often be contracted from the combination of underlying assets, such assets are often known as synthetic assets in the forward market. The forward contract has to be settled by delivery of the asset on expiration date. In case the party wishes to reverse the contract, it has to compulsorily go to the same counter party, which may dominate and command the price it wants as being in a monopoly situation.

Pricing of arbitrage based forward prices: In the forward contract, covered parity or cost-of-carry relations are relation between the prices of forward and underlying assets. Such relations further assist in determining the arbitrage-based forward asset prices.

Popular in forex market: Forward contracts are very popular in foreign exchange market as well as interest rate bearing instruments. Most of the large and international banks quote the forward rate through their ‘forward

desk' lying within their foreign exchange trading room. Forward foreign exchange quotes by these banks are displayed with the spot rates.

Different types of forward: As per the Indian Forward Contract Act-1952, different kinds of forward contracts can be done like hedge contracts, transferable specific delivery (TSD) contracts and non-transferable specific delivery (NTSD) contracts. Hedge contracts are freely transferable and do not specify, any particular lot, consignment or variety for delivery. Transferable specific delivery contracts are though freely transferable from one party to another, but are concerned with a specific and predetermined consignment. Delivery is mandatory. Non-transferable specific delivery contracts, as the name indicates, are not transferable at all, and as such, they are highly specific.

Forward markets and trading mechanism

The growth of futures markets followed the growth of forward market. In early years, there was no so much transporting facilities available, and hence, a lot of time was consumed to reach at their destination. Sometimes, it took so much time that the prices drastically changed, and even the producers of the goods had to sell at loss. Producers, therefore, thought to avoid this price risk and they started selling their goods forward even at the prices lower than their expectations. For example, a farmer could sell the produce forward to another party. And by the time the actual goods reached the market, he could have protected himself against the future unfavorable price movements. This is known as short selling. On the other hand, the long position holder agrees to buy the grain at a pre-specified price and at a particular date. For this trading, a middleman is needed who knows the expectations of buyers and sellers and he charges a fees for this purpose known as commission.

Forward contracts are very much popular in foreign exchange markets to hedge the foreign currency risks. Most of the large and international banks have a separate 'Forward Desk' within their foreign exchange trading room which is devoted to the trading of forward contracts. Let us take an example to explain the forward contract.

Suppose on April 10, 2002, the treasurer of an UK Multinational firm (MNC) knows that the corporation will receive one million US dollar after three months, i.e., July 10, 2002 and wants to hedge against the exchange rate movements.

In this situation, the treasurer of the MNC will contact a bank and find out that the exchange rate for a three-month forward contract on dollar against pound sterling, i.e., £I$ = 0.6250 and agrees to sell one million dollar. It means that the corporation has short forward contracts on US dollar. The MNC has agreed to sell one million dollar on July 10, 2002 to the bank at the future dollar rate at 0.6250. On the other hand, the bank has a long forward contract on dollar. Both sides have made a binding contract/commitment. Before discussing the forward trading mechanism, let us see some important terminology frequently used in the forward trading.

Long Position

The party who agrees to buy in the future is said to hold long position. For example, in the earlier case, the bank has taken a long position agreeing to buy 3-month dollar in futures.

Short Position

The party who agrees to sell in the future holds a short position in the contract. In the previous example, UK MNC has taken a short position by selling the dollar to the bank for a 3-month future.

The Underlying Asset

It means any asset in the form of commodity, security or currency that will be bought and sold when the contract expires, e.g., in the earlier example US dollar is-the underlying asset which is sold and purchased in future.

Spot-Price

This refers to the purchase of the underlying asset for immediate delivery. In other words, it is the quoted price for buying and selling of an asset at the spot or immediate delivery.

Future Spot Price

The spot price of the underlying asset when the contract expires is called the future spot price, since it is market price that will prevail at some futures date.

Delivery Price

The specified price in a forward contract will be referred to as the delivery price. This is decided or chosen at the time of entering into forward contract so that the value of the contract to both parties is zero. It means that it costs nothing to take a long or a short position. In other words, at the day on writing of a forward contract, the price which is determined to be paid or received at the maturity or delivery period of the forward contract is called delivery price. On the first day of the forward contract, the forward price may be same as to delivery price. This is determined by considering each aspect of forward trading including demand and supply position of the underlying asset. However, a further detail regarding this will be presented in forthcoming chapter.

The Forward Price

It refers to the agreed upon price at which both the counter parties will transact when the contract expires. In other words, the forward price for a particular forward contract at a particular time is the delivery price that would apply if the contract were entered into at that time. In the example discussed earlier, on April 10, 2002, 0.6250 is the forward price for a forward contract that involves the delivery of US dollar on July 10, 2002.

The Determination of Forward Prices

Forward contracts are generally easier to analyze than futures contracts because in forward contracts there is no daily settlement and only a single payment is made at maturity. Though both futures prices and forward prices are closely related, this will be described in the latter part of this chapter. It is essential to know about certain terms before going to determine the forward prices such as distinction between investment assets and consumption assets, compounding, short selling, repo rate and so on because these will be frequently used

in such computation. We are not discussing these here in detail but the traders must be aware about them thoroughly. A brief view of these terms is explained here as under:

An **investment asset** is an asset that is held for investment purposes, such as stocks, shares, bonds, treasury, securities, etc. **Consumption assets** are those assets which are held primarily for consumption, and not usually for investment purposes. There are commodities like copper, oil, food grains and live hogs.

Compounding is a quantitative tool which is used to know the lump-sum value of the proceeds received in a particular period. Consider an amount A invested for n years at an interest rate of R per annum. If the rate is compounded once per annum, the terminal value of that investment will be

Terminal value $=A (1 +R)^n$ and if it is compounded m times per annum then the terminal value will be Terminal value $=A (1 +R/m)^{mn}$ where A is amount for investment, R is rate of return, n is period for return and m is period of compounding.

Suppose A = ` 100, R = 10% per annum, n = 1 (one year), and if we compound once per annum (m = 1) then as per this formula, terminal value will be

$100(1 + 10)^1 = 100(1.10) =$ ` 110,

if m=2 then

$100(1 + 0.05)^{2x1} = 100 \times 1.05 \times 1.05 =$ ` 110.25 and so on.

Short selling refers to selling securities which are not owned by the investor at the time of sale. It is also called 'shorting', with the intention of buying later. Short selling may not be possible for all investment assets. It yields a profit to the investor when the price of the asset goes down and loss when it goes up.

For example, an investor might contract his broker to short 500 State Bank of India shares then the broker will borrow the shares from

another client and sell them in the open market. So the investor can maintain the short position provided there are shares available for the broker to borrow. However, if the contract is open, the broker has no shares to borrow, then the investor has to close his position immediate, this is known as **short- squeezed.**

The **repo rate** refers to the risk free rate of interest for many arbitrageurs operating in future markets. Further, the 'repo' or repurchase agreement refers to that agreement where the owner of the securities agrees to sell them to a financial institution, and buy the same back later (after a particular period). The repurchase price is slightly higher than the price at which they are sold. This difference is usually called interest earned on the loan. Repo rate is usually slightly higher than the Treasury bill rate.

Assumptions and Notations

Certain **assumptions** considered here for determination of forward or futures prices are:

- There are no transaction costs.
- Same tax rate for all the trading profits.
- Borrowing and lending of money at the risk free interest rate.
- Traders are ready to take advantage of arbitrage opportunities as and when arise. These assumptions are equally available for all the market participants; large or small.

Further, some **Notations** which have been used here are:

T = Time remained upto delivery date in the contract

S = Price of the underlying asset at present, also called as spot or cash or current K = Delivery price in the contract at time T
F = Forward or future price today

f = Value of a long forward contract today

r = Risk free rate of interest per annum today

t = Current or today or present period of entering the contract

Now, we will discuss the mechanism of determination of forward prices of different types of assets.

The Forward Price for Investment Asset (Securities)

Here we will consider three situations in case of investment assets:

1) Investment assets providing no income
2) Investment assets providing a known income
3) Investment assets providing a known dividend income

Forward Price for An Asset that Provides no Income

This is the easiest forward contract to value because such assets do not give any income to the holder. These are usually non dividend paying equity shares and discount bonds. Let us consider the relationship between the forward price and spot price with an example. Example: Consider a long forward contract to purchase a share (Non-dividend paying) in three- months. Assume that the current stock price is ` 100 and the three-month risk free rate of interest is 6% per annum. Further assume that the three months forward price is ` 105.

Arbitrageur can adopt the following strategy

Borrow ` 100 @ 6% for three months, buy one share at ` 100 and short a forward contract for ` 105. At the end of three months, the arbitrageur delivers the share for ` 105, the sum of money required to pay off the loan is 100e 0.06 x0.2 = ` 101.50, and in this way, he will book a profit of ` 3.50, (` 105—` 101.50). Further suppose that the three-month forward price is ` 99. Now, an arbitrageur can one share, invest the proceeds of the short sale at 6 percent per annum for three months, and a long position in a three-month forward contract. The proceeds of short sales will grow to $100_e^{0.006x0.25}$= ` 101.50, at the end of three months, the arbitrageur will pay ` 99 and takes the delivery of the share under forward contract, and uses it to close its short sale position. His net gain is ` 101.50— ` 99 = ` 2.5.

Generalization: We call from the previous example using the notations mentioned earlier for investment asset providing no income:

$$F = Se^{rT}$$

where F is forward price of the stock, S is spot price of the stock, T is maturity period (remained), r is risk- free interest rate.

If $F > Se^{rT}$ then the arbitrageur can buy the asset and will go for short forward contract on the asset.

If $F < Se^{rT}$ then he can short the asset and go for long forward contract on it.

Forward Prices for Security that Provides a Known Cash Income

We will consider forward contracts on such assets which provides a known cash income, for example, coupon bearing bonds, treasury securities, known dividend, etc. Let us explain with an example:

Example

Consider a long forward contract to purchase a coupon bond whose current price is ` 900 maturing 5 years. We assume that the forward contract matures in one year, so that the forward contract is a contract to purchase a four-year bond in one year. Further assume that the coupon payment of ` 40 are expected after six months and 12 months, and six-month and one-year risk free interest rate are 9 percent and 10 percent respectively.

In first situation, we assume that the forward price is high at ` 930. In this case, can arbitrageur can borrow ` 900 to buy the bond and short a forward contract. Then the first coupon payment has a present value of $40_e^{-09 \text{ x } 0.5}$ = ` 38.24. So the balance amount ` 861.76 (900-38.24) is borrowed @ 10% for year. The amount owing at the end of the year is 861.76_e^{01} x = ` 952.39. The second coupon provides ` 40 toward this amount, and ` 930 is received for the bond under the terms of the forward contract. The arbitrageur will earn

= (` 40 + ` 930) — ` 952.39 = ` 17.61

Similarly, in the second situation, we may assume the low forward price at ` 905, then in that case the arbitrageur can short the bond and outer into long forward contract. Likewise above, the arbitrageur will earn:

` 952.39— (` 40 + 905) = ` 7.39

Generalization: From the above example, it can be generalized that such assets which provide known income (i.e. I) during the life of a forward contract, then forward price would be as follows:

$$F = (S - I)e^{rT}$$

In the earlier example, S = ` 900, I = 40, r = 0.09 and 0.1 and T= *1*. *I* is calculated as:

$$I = 40_e{}^{-0.09} + 40_e{}^{-0.10x1} = ` 74.433$$

$$\text{Then } F = (900 — 74.333)^{0.10x1} = ` 912.39$$

This can be an agreement with our calculation, and it applies to any investment asset that provides a known cash income. So we can generalized from the above: If $F > (S - I)_e{}^{rT}$, the investor can earn the profit by buying the asset and shorting a forward contract on the asset. If $F < (S - I)_e{}^{rT}$, an arbitrageur can earn the profit by shorting the asset and taking a long position in a forward contract. Further, if there is no short sale, the arbitrageur who owns the asset will find it profitable to sell the asset and go long forward contract.

Forward Price where the Income is a Known Dividend Yield

A known dividend yield means that when income expressed as a percentage of the asset life is known. Let us assume that the dividend yield is paid continuously as a constant annual rate at q then the forward price for a asset would be $F = S_e{}^{(r-q)T}$

Example

Let us consider a six-month forward contract on a security where 4 percent per annum continuous dividend is expected. The risk free rate of interest is

10 percent per annum. The asset's current price is ` 25. Then we can calculate the forward price as:

$$F = S_e^{(r-q)T}$$

$$F = 25_e^{(0.10-0.04)x0.5} = ` 25.76$$

If $F > S_e^{(r-q)T}$ then an investor can buy the asset and enter into a short forward contract to lock in a riskless profit. If $F < S_e^{(r-q)T}$ then an investor can enter into a long forward contract and short the stock to earn riskless profit. Further, if dividend yield varies during the life of a forward contract the q should be set equal to the average dividend yield during the life of the contract.

Valuing Forward Contracts

On the basis of generalization in different situations, we can find out the value of a forward contract. As we know that the value of a forward contract at the time it is first written (entered) into is zero. However, at later stage, it may prove to have a positive or negative value. In general, the value of a forward contract can be determined as follows:

$$f = (F - K)_e^{-rT}$$

Where f is value of a forward contract, F is forward price (current) of the asset, K is delivery price of the asset in the contract, T is time to maturity of contract and *r* is risk free rate of interest.

Let us examine the equation

We compare a long forward contract that has a delivery price of F with an otherwise identical long forward contract with a delivery price of K. As we know that the forward price is changing with the passage time, and that is why later on, F and K may not be equal which were otherwise equal at the time of entrance of the contract. The difference between the two is only in the amount that will be paid for the security at time T. Under the first contract, this amount is F, and under the second

contract, it is K. A cash outflow difference of F- K at time T translates to a difference of $(F - K)_e^{-rT}$ today. Therefore, the contract with a delivery price F is less valuable than the contract with a delivery price K by an amount $(F - K)_e^{-rT}$. The value of contract that has a delivery price of F is by definition, zero.

Similarly, the value of a short forward contract with the delivery price K is $f= (F - K)_e^{-rT}$

Example

Consider a six-month long forward contract of a non-income-paying security. The risk free rate of interest is 6 percent per annum. The stock price is ` 30 and the delivery price is ` 28. Compute the value of forward contract.

Forward price

$F = 30_e^{0.06x05}$ = ` 30.90 Value of forward contract $f= (F - K)_e^{-rT}$

$= (30.90 - 28)_e^{-0.06x0.5}$

= ` 2.90-0.09 = 2.8* (app.)

Alternatively, using the other equation:

$f = 30 - 28^{-0.06x0.5}$

f= 30 - 27.16 = 2.84 (app.)

*The above difference is due to annual compounding.

Using the earlier equation of value of forward contract, we can show the value of long forward contract in all the three situations, which are as under:

a. Asset with no income: $f= S - K_e^{-rT}$
b. Asset with known income (l):$f= S - I - K_e^{-rT}$
c. Asset with known dividend yield at the rate q: $f= S_e^{-qT} - K_e^{-rT}$

Note that in each case the forward price F is the value of K which makes f equal to zero.

Forward Prices versus Futures Prices

Whether the forward prices are equal to futures prices, this is very important and debatable issue. It is argued that if risk free interest rate is constant and the same for all maturities, in such market situations, lie forward price will be same as the futures price for the contract. However, in actual practice, the interest rates do not remain constant and usually vary unpredictably, then forward prices and futures prices no longer remain the same. We can get sense of the nature of the relationship by considering the situation where the price of the underlying asset is strongly positively correlated with interest rates.

Since in futures contracts, there is daily settlement, so if current price(s) increases, an investor who holds a long future position, makes an immediate profit, which will be reinvested at a higher than average rate of interest. Similarly when current price(s) decreases, the investor will incur immediate loss, and this loss will be financed at a lower than average rate of interest. However, this position does not arise in the forward contract because there is no daily settlement and interest rate movements will not have any affect till maturity.

It is further argued that when spot (current) prices are strongly positively correlated with the interest rates, futures prices will tend to higher than the forward prices, similarly if spot prices are strongly negatively correlated with the interest rates then forward prices will tend to higher than the futures prices. It is further observed that though there may be theoretical difference between forward prices and futures prices due to various factors like taxes, transaction costs, treatment of margin and default risk, but this difference is very small which may be ignored. Thus, in our further discussion in various chapters, both forward contracts and futures contracts are assumed to be the same and the symbol F will be used to represent both futures price and forward price same at time zero.

CHAPTER II

OPTIONS AND SWAPS

Introduction

Portfolio investments normally include mutual funds stocks and bonds. The type of securities not end here , as options present a world of opportunity to sophisticated investors, as another type of security with their veracity. Options can be as speculative or as conservative as one wants. They are complex securities and can be extremely risky. But at the same time ignorant of this type of investment places one in a weak position. Without knowledge about options, one would not only forfeit having another item in ones investing toolbox but also lose insight into the workings of some of the world's largest corporations. Whether it is to hedge his risk of foreign-exchange transactions or to give employees ownership in the form of stock options, most multi- nationals today use options in some form or another. Options-Meaning An option is a contract whereby one party (the holder or buyer) has the right, but not the obligation, to exercise the contract (the option) on or before a future date (the exercise date or expiry). The other party (the writer or seller) has the obligation to honor the specified feature of the contract. Since the option gives the buyer a right and the seller an obligation, the buyer has received something of value. The amount the buyer pays the seller for the option is called the option premium

Because this is a security whose value is determined by an underlying asset, it is classified as a derivative. The idea behind an option is present in everyday situations. For example, you discover a. Because the owner sold you the option, he is obligated to sell you the house for Rs. house that you'd love to purchase. Unfortunately, you won't have the cash to buy it for another three months. You talk to the owner and negotiate a deal that gives you an option to buy the house in three months for a price of Rs.200, 000. The owner agrees, but for this option, you pay a price of Rs.3, 000. Now, consider two theoretical situations that might arise: 1.It's discovered that the house is actually the true birthplace of a great man. As a result, the market value of the house skyrockets to Rs.1 crore200, 000. In the end,

you stand to make a profit ofRs.97, 97,000(Rs.1 Crore–Rs.200, 000 –Rs.3, 000). 2. While touring the house, you discover not only that the walls are chock-full of asbestos, but also that a ghost haunts the master bedroom; furthermore, a family of super-intelligent rats have built a fortress in the basement. Though you originally thought you had found the house of your dreams, you now consider it worthless. On the upside, because you bought an option, you are under no obligation to go through with the sale. Of course, you still lose the Rs.3, 000 price of the option. This example demonstrates two very important points. First, when you buy an option, you have a right but not an obligation to do something. You can always the expiration date go by, at which point the option becomes worthless. If this happens, you lose 100% of your investment, which is the money you used to pay for the option. Second, an option is merely a contract that deals with an underlying asset. For this reason, options are called derivatives, which mean an option derives its value from something else. In our example, the house is the underlying asset. Most of the time, the underlying asset is a stock or an index.

Option may be defined as a contract between two parties where one gives the other the right (not the obligation) to buy or sell an underlying asset as a specified price within or on a specific time. The underlying may be commodity, index, currency or any other asset. As an example, suppose that a party has 1000 shares of Satyam Computer whose current price is Rs. 4000 per share and other party agrees to buy these 1000 shares on or before a fixed date (i.e. suppose after 4 month) at a particular price say it is become Rs. 4100 per share. In future within that specific time period he will definitely purchase the shares because by exercising the option, he gets Rs. 100 profit from purchase of a single share. In the reverse case suppose that the price goes below Rs. 4000 and declines to Rs. 3900 per share, he will not exercise at all the option to purchase a share already available at a lower rate. Thus option gives the holder the right to exercise or not to exercise a particular deal. In present time options are of different varieties like- foreign exchange, bank term deposits, treasury securities, stock indices, commodity, metal etc. Similarly the example can be explained in case of selling right of an underlying asset.

Features of options

The following features are common in all types of options.

Contract: Option is an agreement to buy or sell an asset obligatory on the parties.

Premium: In case of option a premium in cash is to be paid by one party (buyer) to the other party (seller).

Pay off: From an option in case of buyer is the loss in option price and the maximum profit a seller can have in the options price.

Holder and writer Holder of an option is the buyer while the writer is known as seller of the option. The writer grants the holder a right to buy or sell a particular underlying asset in exchange for a certain money for the obligation taken by him in the option contract.

Exercise price There is call strike price or exercise price at which the option holder buys (call) or sells (put) an underlying asset.

Variety of underlying asset The underlying asset traded as option may be variety of instruments such as commodities, metals, stocks, stock indices, currencies etc.

Tool for risk management Options is a versatile and flexible risk management tools which can mitigate the risk arising from interest rate, hedging of commodity price risk. Hence options provide custom-tailored strategies to fight against risks.

Types of options

There are various types of options depending upon the time, nature and exchange of trading. The following is a brief description of different types of options:

- Put and call option
- American and European option
- Exchange traded and OTC options.

Put option is an option which confers the buyer the right to sell an underlying asset against another underlying at a specified time on or before a predetermined date. The writer of a put must take delivery if this

option is exercised. In other words put is an option contract where the buyer has the right to sell the underlying to the writer of the option at a specified time on or before the option's maturity date. Assume that share of ITC is currently trading at ` 180. An investor, John, in possession of the share (it is not necessary to have the share to enter into an options contract) believes that the share is likely to fall to ` 150 in the immediate future of the next three months. John is not sure of the fall but would like to exit from his investment at ` 175.

He is seeking protection against the heavy fall in the price. Another investor, Mohammad, holding contrary views believes that the pessimism of John is exaggerated. He is willing to buy the share at ` 175 since he feels that is the lowest it can go. John believes ITC is a good long-term buy but is unsure when the scrip would show its potential. He does not want to exit unnecessarily. Under these circumstances John can buy a put option (the right to se4 to Mohammad stating that he has a right to sell a share of ITC to at a price of ` 175 at any time during the next three months. In case John decides to sell the share (exercise the option) he would receive ` 175, the strike/exercise price in the next three months. John has the option, which he may or may not exercise, but Mohammad has no such choice and he stands committed to pay the agreed price and claim the share. Like in the call option, Mohammad would not grant such a right for free and charge some fee, called option premium. This premium is determined inter alia by the price of the underlying asset, the ITC share.

John would exercise his option only when it is profitable to do so. The option would become profitable when the actual price of the ITC share falls below ` 175 (the exercise price). Imagine that it has moved to ` 160. By exercising the option John stands to gain immediately ` 15 by placing the share to Mohammad and realize ` 175 from him and using the proceeds to acquire a share of ITC from the market at ` 160. This keeps his earlier position intact and yet gives ` 15 as profit. Logically, John would not exercise the option if the price remains above ` 175. However, under all circumstances he loses the premium paid.

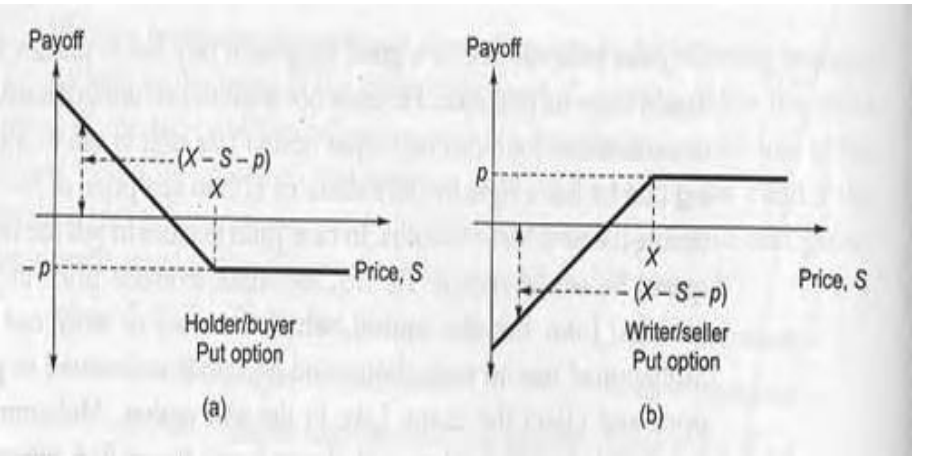
We may generalize the outcome of a put option in the following manner.

As long as the price of the security remains below the strike price the buyer of the option will exercise it because he stands to gain; otherwise his loss would be limited to the premium paid on the put option p.

When S< X Buyer exercises the option
Gain= X— S—p When S= X Buyer is indifferent
Loss = premium, p When S> X Buyer lets the contract expire
Loss = premium, p
Value of the put option = Max (0, X— S) – p

The graphical view of the payoff for put option, holder and writer is shown in Figure (a) and (b).

The payoff diagrams for call and put options as depicted in Figures and respectively, reveal that the payoff of options is not linear. While it may be unbounded at one end the other end is limited to loss/gain equal to the premium of option. This non-symmetrical non-linear payoff results from feature of 'right but no obligation' and makes options different from other derivative products.



Call option is an option which grants the buyer (holder) the right to buy an underlying asset at a specific date from the writer (seller) a particular

quantity of underlying asset on a specified price within a specified expiration/maturity date. The call option holder pays premium to the writer for the right taken in the option.

Assume that share of ITC is currently trading at ` 180. An investor, John, believes that share is going to rise at least to ` 220 in the immediate future of the next three months. John does not have adequate funds to buy the shares now but is expecting to receive substantial money in the next three months. He cannot afford to miss an opportunity to own this share. Waiting for three months implies not only a greater outlay at a later point of time, but also means foregoing of substantial potential gains. Another investor, Mohammad, holds contrary views and believes that optimism of John is exaggerated. He is willing to sell the share.

What can John do under these circumstances where he cannot buy the shares on an outright basis now? He possibly could borrow to acquire the stock of ITC. This is fraught with risk of falling prices. Amongst the many alternatives that may be available to John is included an instrument called call option. He can instead buy a call option from Mohammad (assuming he is willing to confer the same) stating that John has a right to buy a share of ITC from Mohammad at a price of, say, ` 190 at any time during the next three months. This would be a call option (the option to buy). John is the holder of the option, while Mohammad is the writer/seller of the option. In case John decides to buy the share (exercise the option) he would pay 190, the strike/ exercise price. The period up to which John can exercise this option is three months. Note that John has the option, which he may not exercise, but Mohammad has no such choice and he stands committed to deliver the share and receive `190 from John, irrespective of the price of ITC share at that time. Naturally, Mohammad would not provide such a right for free as he is obligated to perform at the option of another. Therefore, Mohammad would charge some fee, called option premium, to grant this right to John. This premium is determined inter alia by the price of the underlying asset, the ITC share. We shall discuss later how this premium is decided.

We now discuss the circumstances when John would exercise his option.

He would use this right only when the actual price of the ITC share has gone beyond ` 190 (the exercise price). Imagine it has moved to ` 200. By exercising the option he stands to gain immediately 10, as he gets one share from Mohammad by paying ` 190 and sells immediately in the market at ` 200. Logically, John would not exercise the option if the price remained below` 190. In any case he loses the premium paid. If the price remains below ` 190, Mohammad would not be asked to deliver and the upfront premium he received would be his profit.

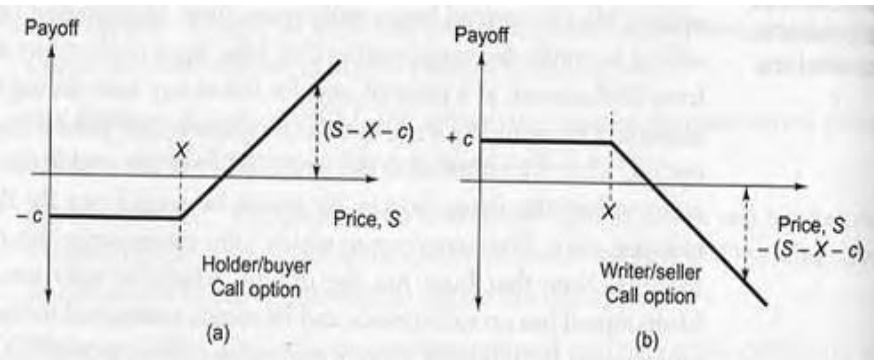
We may generalize the outcome of a call option in the following manner.

As long as the price of the underlying asset, S, remains below the strike price, X the buyer of the call option will not exercise it; and the loss of the buyer would be limited to the premium paid on the call option c and if the price is more than exercise price the holder exercises the option and generates profit equal to the difference of the two prices. Alternatively,

When	S <XBuyer lets the call expire	Loss = premium c
	S=XBuyer is indifferent	Loss = premium c
	S>XBuyer exercises the call option	Gain = S- X— c

= Max (0, S— X) - c

A graphical depiction of the payoff of the holder and the writer of the call option is easier to comprehend and is presented in Figure



American option provides the holder or writer to buy or sell an underlying asset, which can be exercised at any time before or on the date of expiry of the option. On the other hand a European option can be exercised only on the date of expiry or maturity.

This is clear that American options are more popular because there is timing flexibility to exercise the same. But in India, European options are prevalent and permitted.

Exchange traded options can be traded on recognized exchanges like the futures contracts. Over the counter options are custom tailored agreement traded directly by the dealer without the involvement of any organized exchange. Generally large commercial bankers and investment banks trade in OTC options. Exchange traded options have specific expiration date, quantity of underlying asset but in OTC traded option trading there is no such specification and terms are subjective and mutually agreed upon by the parties. Hence OTC traded options are not bound by strict expiration date, specific limited strike price and uniform underlying asset. Since exchange traded options are guaranteed by the exchanges, hence they have less risk of default because the deals are cleared by clearing houses. On the other side OTC options have higher risk element of default due to non-involvement of any third party like clearing houses. Offsetting the position by buyer or seller in exchange traded option is quite possible because the buyer sells or the seller buys another option with identical terms and conditions. Hence, the rights are transferred to another option holder. But due to unstandardized nature of OTC traded options the OTC options cannot be offset. Margin money is required by the writer of option but there is no such requirement for margin funds in OTC optioning. In exchange traded option contracts, there is low cost of transactions because the creditworthiness of the buyer of options is influencing factor in OTC-traded options.

The standardization of option contract would be in at the discretion of the exchange and is done in terms of ***Quantity of Underlying Asset*** Only specific quantity of the underlying asset could be traded on the exchange and need to be predetermined.

Strike Prices

Only specific strike prices can be handled in a standardized product traded on the exchanges. OTC products can have any strike price as agreed by the two contracting parties.

Expiration Dates

Like strike price the expiration dates too must be known before trading can take place in options at the exchanges. Nature of Exercise of Option Whether the options are American or European in nature too must be known to traders in options.

Ways of Settlement

Options can be settled either by delivery of underlying asset or by cash settlement, which is closing out by exchanging the differential of price at initiation and closing out. Cash settlement at the expiry is done by exchanging difference between the exercise price and price of the underlying asset. It can also be settled by the cancellation of the contract by entering into an equal and opposite contract to the original one.

Nature of Underlying Assets

Like forwards and futures, options too can have any asset as underlying. Options on stocks, indices, commodities, currencies, and interest rates are available either OTC or on exchanges. Though not available in India as of now, options on commodities are traded internationally on agricultural products, live stock, food products, energy, and metals. Options are also available on various currencies, such as US dollar, euro, yen, pound, etc. in major exchanges in the USA and Europe as also other parts of the world. Options on currencies are mostly OTC.

Besides, options are also traded on the exchanges on futures contracts rates. Options on futures have futures contract as underlying asset, which give the buyer a right to buy (call) or sell (put) the specified futures contract within or at specified time. Naturally, the expiry of the futures contract must extend beyond that of option contract.

Similarly, options can also be traded on interest rates, either on

cash assets such as treasury bonds and notes, or on interest rate futures contracts. These options serve the same purposes as do the options on stocks and indices. Options on stocks and stock indices are most common. Several exchanges across the world offer options on indices and stock. National Stock Exchange (NSE) in India offers options on several indices such as Nifty, a broad-based index of 50 stocks from banking, information technology, infrastructure, etc.

Presently these options cover limited exercise prices and cover periods up to three months. However, internationally options for longer periods of up to two to three years are also available. NSE attempts to provide minimum j five strike prices—two ITM, one ATM, and two OTM at any point of time).

Naked (Uncovered) and Covered Option

Naked or uncovered options are those which do not have offsetting positions, and therefore, are more risky. On the other hand, where the writer has corresponding offsetting position in the asset underlying (he option is called covered option. Writing a simple uncovered (or naked) call option indicates toward exposure of the option writer to unlimited potential losses. The basic aim is to earn the premium. In period of stable or declining prices, call option writing may result in attractive profits by capturing the time value of an option. The strategy of writing uncovered calls reflects an investor's expectations and tolerance for risk.

A covered option position involves the purchase or sale of an option in combination with an offsetting (or opposite) position in the asset which underlies the option. As observed earlier, the writer of the call option incurs losses when stock prices rise, and put writers incur losses when prices fall. In such situation, the writer can cover the short put with a short position and short call with a long position in the underlying asset.

This can be stated as: Covered call sale = Short call + Long futures
Covered put sale = Short put + Short futures

The Underlying Assets in Exchange-Traded Options

Various assets, which are actively traded on the recognized exchanges, are stocks, stock indices, foreign currencies and futures contracts. These have been explained in brief here as under:

Stock Options

Options on individual shares of common stock have been traded for many years. Trading on standardized call options on equity shares started in 1973 on CBOE whereas on put options began in 1977. Stock options on a number of over-the-counter stocks are also available. While strike prices are not because of cash dividends paid to common stock holders, the strike price is adjusted for stock splits, stock dividends, reorganization, recapitalizations, etc. which affect the value of the underlying stock.

Stock options are most popular assets, which are traded on various exchanges all over the world. For example, more than 500 stocks are traded in United States. One contract gives the holder the right to buy or sell 100 shares at the specified strike price. In India, the National Stock Exchange and Bombay Stock Exchange have started option trading in certain stocks from the year 2001.

Foreign Currency Options

Foreign currency is another important asset, which is traded on various exchanges. One among these is the Philadelphia Stock Exchange. It offers both European as well as American option contracts. Major currencies which are traded in the option markets are US dollar, Australian dollar, British pound, Canadian dollar, German mark, French franc, Japanese yen, Swiss franc, etc. The size of the contract differs currency to currency. This has been explained in more detail in the chapter on currency option.

Index Options

Many different index options are currently traded on different exchanges in different countries. For example, the S&P 100 index at CBOE and Major Market Index at AMEX are traded in the US options markets. Similarly, in India, such index options have been started on

National Stock Exchange and Bombay Stock Exchange. Like stock option, index option's strike price is the index value at which the buyer of the option can buy or sell the underlying stock index. The strike index is converted into dollar (rupee) value by multiplying the strike index by the multiple for the contract. If the buyer of the stock index option intends to Exercise the option then the stock must be delivered. It would be complicated to settle a stock index option by delivering all the stocks that make up that particular index. Hence, instead, stock index options are cash settlement contracts. In other words, if the option is exercised, the exchange assigned option writer pays cash to the option buyer, and there will be no delivery of any share.

The money value of the stock index underlying an index option is equal to the current cash index value multiplied by the contracts multiple. This is calculated as: Rupee value of the underlying index = Cash index value x Contract multiples

For example, the contract multiple for the S&P 100 is $100. So, assume, the cash index value for the S&P 100 is 750 then the dollar value of the S&P 100 contracts is 750x 100 = $75,000.

Futures Options

In a futures option (or options on futures), the underlying asset is a futures contract. An option contract on futures contract gives the buyer the rights to buy from or sell to the writer a specified future contract at a designated price at a time during the life of the options. If the futures option is a call option, the buyer has the right to acquire a long futures position. Similarly, a put option on a futures contract grants the buyer the right to sell one particular future contracts to the writer at the exercise price. It is observed that the futures contract normally matures shortly after the expiration of the option. Futures options are now available for most of the assets on which futures contracts are on the Euro dollar at CME and the Treasury bond at the CBOT.

Interest Rate Options

They are another important options contract, which are popular in the international financial markets. Interest rate options can be written on

cash instruments or futures. There are various debt instruments, which are used as underlying instruments for interest rate options on different exchanges. These contracts are referred to as options on physicals. Recently, these interest rate options have also gained popularity on the over-the-counter markets like on treasury bonds, agency debentures and mortgage backed-securities. There are governments, large banking firms and mortgage-backed-securities dealers who make a market in such options on specific securities.

Leaps Options

These options contracts are created for a longer period. The longest time before expiration for a standard exchange traded option is six-months. However, Long Term Equity Anticipated Securities (LEAPS) are option contracts designed to offer with longer period maturities even up to 39 months. These LEAPS options are available on individual stocks and some indexes. Usually, they are designed for a particular purpose.

Flex Options

It is a specific type of option contract where some terms of the option have been customized. The basic objective of customization of some terms is to meet the wide range of portfolio strategy needs of the institutional investors that cannot be satisfied through the standard exchange-traded options. FLEX options can be created for individual stocks, stock indexes, treasury securities, etc. They are traded on an option exchange and cleared and guaranteed by the clearing house of that exchange. The value of FLEX option depends upon the ability to customize the terms on four dimensions, such as underlying asset, strike price, expiration date and settlement style (i.e., American vs European). Moreover, the exchange also provides a secondary market to offset or alter positions and an independent daily marking of prices.

Exotic Options

The option contracts through the OTC market can be customized in any manner desired by an institutional investor. For example, if a dealer can reasonably hedge the risk associated with

opposite side of the option sought, it will design an option as desired by the customer. OTC options are not limited to only European or American type of options, rather a particular option can be created with different exercise dates as well as the expiration date of the option. Such options are also referred to as limited exercise options, Bermuda options, Atlantic options, etc. Thus, more complex options created as per the needs of the customers are called exotic options which ma' be with different expiration dates, exercise prices, underlying assets, expiration date and so on.

Determinants of option pricing: The value of an option is determined by a number of variables relating to the underlying asset and financial markets.

Understanding option pricing (Option Premium Explained)

Option pricing is the amount per share you have to pay to trade an option. The price of an option is also known as the premium. The buyer of an option needs to pay the premium amount to the seller to earn the rights granted by the option. Option premiums are priced per share Since options are available in lots of shares called lot size, you need to pay:

Total Premium Amount= (premium price per share) X (lot size)

For example, say TCS option with a strike price of □2,500 is available at a premium of □20 per share for a lot size of 100 shares. To buy the option, you need to pay a premium amount of □20 X 100 = □2,000. The premium paid is non-refundable whether you choose to exercise your option or not.

What are the main factors determining an Option's Price or Premium?

There are many factors that influence the price of an option:

1. Value of the option's underlying asset

As we know, options are derived from underlying instruments like shares, gold, currency etc. The current value or price of the option's underlying

instrument has a direct effect on the price of the call or put option. If the value of the underlying instrument is on the rise then the call option price will increase and put option price will decrease. If the price of the underlying instrument decreases then call option price will decrease and put option price will increase.

2. Intrinsic Value of an Option

Intrinsic value refers to the value of the option if it were exercised today. It is calculated as a difference between the price of the underlying instrument from which the option is derived and strike price. The strike price is the price at which a buyer and a seller decided to enter the contract.

For call options, intrinsic value is calculated as-

Intrinsic Value = Spot Price - Strike Price

For put options, intrinsic value is calculated as-

Intrinsic Value = Strike Price - Spot Price

The intrinsic value of an instrument can only be positive and zero. It cannot be negative. The intrinsic value of an option helps you in determining the profit advantage in case you wish to exercise the option immediately. It can be also called as the minimum value of an option.

3. Time Value of an Option

It is calculated as the difference between premium and intrinsic value.

Time Value = Premium-Intrinsic Value

The time value is directly related to how much time an option has until it expires. Generally, the longer the time for an option to expire, the higher is the premium. And it decreases as you come closer to the expiry date of the option.

4. Volatility

Volatility is the probability of the price fluctuation (up or down) of the underlying instrument in the market. The higher the volatility of the

underlying instrument, the higher the premium. It is because highly volatile stocks have a higher possibility of bringing profits to investors in a short time. Volatility is of two types- historical and implied. Historical volatility measures the fluctuations observed in an underlying instrument in the past. Implied volatility predicts the fluctuations in the future.

5. Interest Rates

Normally interest rates have nominal influence on options pricing. But it can be a factor if you are trading in options of large size. There is no direct effect of interest rates on options pricing. Its effect is related to the cost of funds. Let's assume that to trade in a large options contract, you decide to borrow money from banks or use funds from your savings that are earning some interest rates. Whichever way you go, you are paying interest on the loan or losing interest in case of savings. So the cost of your funds now is invested amount plus the interest on it. If the interest rate is high then the cost of money invested is also high. So when interest rates are high, the premium falls and vice versa.

6. Dividends on underlying stocks

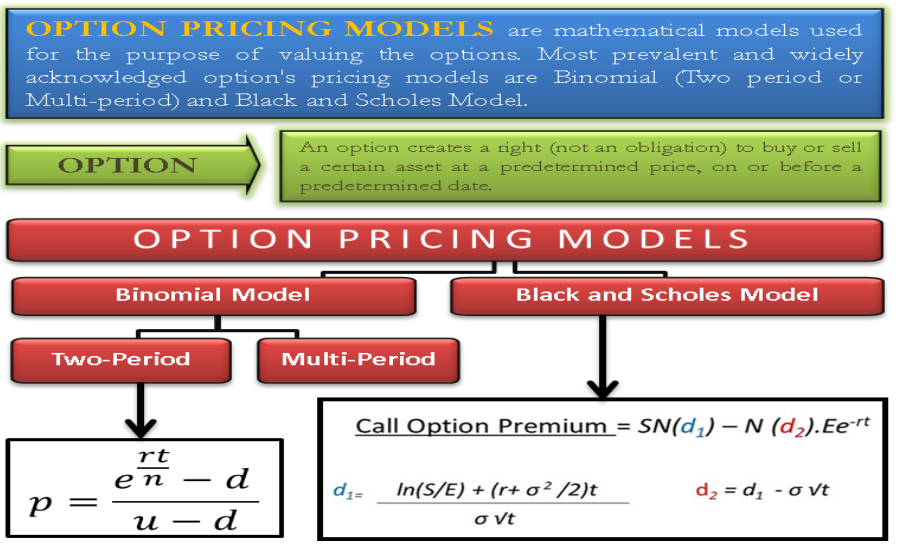
In the event of dividend announcements during the life of an option, the exchanges adjust the option positions. As per regulations by SEBI, if the value of the dividend is more than 10% of the spot price of the option on the date the dividend is announced, then the strike price of the options are reduced by the dividend amount on ex-dividend dates. For dividends announced lower than 10% of the spot price, there is no adjustment by the exchange. Dividend announcement decreases the value of the option as the stock value decreases on the ex-dividend date.

Effect of market factors on call option price and put option price

Factors Affecting Option Premium	**Effect on Call Option Price/Premium**	**Effect on Put Option Price/Premium**
Increase in the value of the underlying	Increase	Decrease

Factors Affecting Option Premium	Effect on Call Option Price/Premium	Effect on Put Option Price/Premium
instrument		
Increase in intrinsic value	Decrease	Increase
Increase in Time Value	Increase	Increase
Increase in Volatility	Increase	Increase
Increase in Interest rates	Increase	Decrease
Increase in Dividends	Decrease	Increase

Option Pricing Models



Consider the following situations

OUT OF THE MONEY

The actual price of the mangoes is $4. Thus, the option held is rendered worthless. (Why would you pay $5 for an article currently worth $4?) However, the maximum loss is capped at $1 (option price)

AT THE MONEY

The actual price of mangoes is $6. This will be the price you pay when you don't exercise the option. When exercised, total cost borne equals ($1+$5, i.e., the option price plus the exercise price). In this situation, you end up in a break even or indifferent position.

IN THE MONEY

The actual price turns out to be $8. In this situation exercising the option makes complete sense. You would be able to purchase the mangoes at a price point of $5($6 in total considering the option price) in a market where the prevailing price is $8. Therefore, you will be in a position of obvious advantage as compared to the rest of buyers.

CALL AND PUT OPTIONS

Another concept which needs to be crystal clear before going understanding an option pricing model is that of call and put options.

CALL OPTION

An option contract that casts a right (not an obligation) to buy the underlying asset at a predetermined price in or before expiry.

PUT OPTION

An option contract that casts a right (not an obligation) to sell an underlying asset at a predetermined price on or before expiry.

OPTION PRICING MODELS

There exist several option pricing models. It is nearly impossible to traverse the length and breadth of the entire volume of option pricing

theories. Through this article, an attempt is made to condense and explain the most prevalent and widely acknowledged option pricing models.

BINOMIAL MODEL

A binomial model is an option pricing model that is easily understandable and less complex when compared to black and Scholes model or a Monte Carlo simulation. As per the binomial option pricing model, the price of an option is equal to the difference between the present value of the stock (as computed through a binomial tree) and the spot price.

ASSUMPTIONS IN BINOMIAL MODEL

The following assumptions in a binomial option pricing model

- Based on the efficient markets hypothesis.
- There exist only two possible prices for the forthcoming period, hence the name binomial.
- The two prices are the ones realized on an uptick or downtick.
- No arbitrage is possible.
- The rate of interest remains unchanged throughout the period under consideration.
- The investors are risk neutral.
- There does not exist any transaction cost.

TWO-PERIOD BINOMIAL MODEL

There exists an asset with a spot price of S_0. Now, in one years time , the price of this asset will either increase by u%(uptick) or fall by d% (downtick). The probability of uptick is indicated by "p" and that of downtick by "1-p".

FORMULA

The formula is expressed as follows:

$$p = \frac{e^{\frac{rt}{n}} - d}{u - d}$$

Where

$u = e^{\sigma\sqrt{(t/n)}}$, $d = e^{-\sigma\sqrt{(t/n)}}$

4 variables have already been bought up! Do not get overwhelmed. The derivation of each of them is here below.

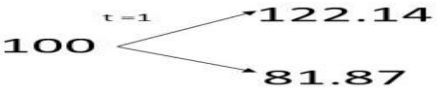
Formula keys: $e^{\wedge(rt/n)}$= Risk Free Rate, e= exponential, σ = Standard deviation, √t/n= time period

Let us construct a binomial option pricing model

The current spot price of the asset (S_0) = \$100, RFR= 10%, and Standard Deviation σ = 20%

Therefore,

Uptick = e0.0.20√1 = **1.**2214
Downtick = 1/u = 1/1.2214 = **0.8187**
Therefore, probability of uptick (p) = (1+10%)-0.8187/1.2214-0.8187
=0.698 or **0.7**
Therefore probability of downtick (1-p) = 1-0.7=**0.3**
The first branch of the binomial tree will look like this. The prices at either end of the node indicate the two possible and only outcomes given the set of assumptions.



Since we are studying a two-period binomial model, we shall further build branches for one more period. After the values for every node at the end of year 2 are derived, they are multiplied by their respective probabilities. The relevant probabilities are the product of probability value for every branch. For example, Branch 1 with a node value of \$149.18 has arrived through two branches (uptick * uptick). Therefore the relevant probability is (0.7*0.7). So on and so forth for the remaining branches.

The price of stock derived is two years hence. Therefore, the present value of the stock as per binomial model is derived. The same will be computed as follows.
= 121.1282/ (1.10)2
=$100.10
Therefore, the maximum price of the option equals $(100.10 -100)
= 10 cents

BLACK AND SCHOLES OPTION PRICING MODEL

This model is particularly used to value European options that are held to maturity. This formula was derived by Fischer Black and Myron Scholes who went on to win the Nobel Prize for this discovery. Before the discovery of this formula, options trading was considered as a gamble having no mathematical or scientific basis. It was this formula which explained the rationale behind option trading. Immediately following the release of this formula, a dramatic surge in the volume of options trading was noticed. Though dated, present-day analysts and brokers borrow heavily from the B&S option pricing model. This is a testimony to its accuracy and precision behind the formula.

ASSUMPTIONS IN B&S MODEL

CONSTANT VOLATILITY

This option pricing model assumes the volatility (amplitude of movement in stock prices) to be constant through the life of the option. While in the short term the volatility may oscillate around a small range, in the long run, it is highly unlikely for the volatility to remain constant. This is also a limitation of the B&S model. Since it does not account for the movement in one of the most significant variables of the B&S model.

CONSTANT RISK-FREE INTEREST RATE

Like the volatility, the B&S option pricing model also assumes a constant risk-free interest rate. Constant implies the same rate for borrowing and lending which is highly improbable in practice. However, the magnitude of the impact of this assumption is not as large as that of assuming constant volatility. This is because the two rates differ only by a few basis points. Moreover, the interest is not subject to widespread changes in the long run.

RANDOM WALK

This price of the underlying asset is assumed to be moving in accordance with the random walk theory. The random walk theory states that at any given moment, the price of an asset may move up or down with equal probability. Implicitly, the price of underlying at time (t+1) is completely independent of its price at time (t).

NORMALLY DISTRIBUTED RETURNS

The returns on the underlying risky asset are said to follow a normal distribution. A normal distribution is nothing but a bell curve when translated graphically. A bell curve in this context represents that the probability of smaller changes in price in the near future is greater than extreme changes in price. Thus, the bell shape of the curve.

Further, owing to the normal distribution of returns and the undeniable relationship between the returns and prices, the price of underlying tends to be log normally distributed.

FORMULA OF BLACK & SCHOLES MODEL

$$\text{Call Option Premium} = SN(d_1) - N(d_2).Ee^{-rt}$$

$$d_1 = \frac{\ln(S/E) + (r + \sigma^2/2)t}{\sigma\sqrt{t}} \qquad d_2 = d_1 - \sigma\sqrt{t}$$

S= Current Spot Price

N= Cumulative Std Normal Distribution

E= Option Strike price

e = Exponential Term

r = Risk Free Interest Rate

t= Time to Expiry

σ= Standard Deviation

Ln= Natural Log

Example: Let us go through a simple B&S problem to crystallize the concept in our mind.

Following information is available for Co X's shares and Call Options:

Current Price (S)= $185, Option Exercise Price (E)= $170, Risk Free Rate = 7%, Time to expiry = 3 years and σ= 0.18

Computing the Value of Option

d1= {ln(S/E) + (r+ σ 2 /2)t} / σ √t

= {ln(185/170) + (0.07+ 0.182/2) 3}/0.18√3

= (0.08452 + 0.2586)/0.18√3 = 0.34312/0.31177 = 1.1006

Therefore, d1 = 1.1006

d2 = d1 – σ √t

=1.1006 – 0.31177 = 0.7888

N(d1) = 0.8644 (from table)

N(d2) = 0.7848

Value of option = SN(d1) – N (d2).Ee-rt

=185(0.8644) – 170/e 0.21 (0.7848)

= 159.914 – 170/1.2336 * 0.7848

=159.91-108.15 = $51.76

Basics of Swaps

In the recent past, there has been integration of financial markets world-wide which have led to the emergence of some innovative financial instruments. In a complex world of variety of financial transactions being taken place every now and then, there arises a need to understand the risk factors and the mechanism to avoid the risks involved in these financial transactions. The recent trends in financial markets show increased volume and size of swaps markets.

Financial swaps are an asset liability management technique which permits a borrower to accessone market and then exchange the liability for another type of liability. Thus, investors can exchange one asset to another with some return and risk features in a swap market. In this lesson an attempt has been made to get the students acquainted with the mechanism

of swaps markets and the valuation of the swap instruments.

Meaning of swaps

The dictionary meaning of 'swap' is to exchange something for another. Like other financial derivatives, swap is also agreement between two parties to exchange cash flows. The cash flows may arise due to change in interest Rate or currency or equity etc. In other words, swap denotes an agreement to exchange payments of two different kinds in the future. The parties that agree to exchange cash flows are called 'counter parties'. In case of interest rate swap, the exchange may be of cash flows arising from fixed or floating interest rates, equity swaps involve the exchange of cash flows from returns of stocks index portfolio. Currency swaps have basis cash flow exchange of foreign currencies and their fluctuating prices, because of varying rates of interest, pricing of currencies and stock return among different markets of the world.

Features of swaps

The following are features of financial swaps:

Counter parties: Financial swaps involve the agreement between two or more parties to exchange cash flows or the parties interested in exchanging the liabilities.

Facilitators: The amount of cash flow exchange between parties is huge and also the process is complex. Therefore, to facilitate the transaction, an intermediary comes into picture which brings different parties together for big deal. These may be brokers whose objective is to initiate the counterparties to finalize the swap deal. While swap dealers are themselves counter partied who bear risk and provide portfolio management service.

Cash flows: The present values of future cash flows are estimated by the counterparties before entering into a contract. Both the parties want to get assurance of exchanging same financial liabilities before the swap deal.

Less documentation: is required in case of swap deals because the deals are based on the needs of parties, therefore, fewer complexes and less risk consuming.

Transaction costs*:* Generating very less percentage is involved in swap agreement.

Benefit to both parties: The swap agreement will be attractive only when parties get benefits of these agreements.

Default-risk: is higher in swaps than the option and futures because the parties may default the payment.

Types of financial swaps

The swaps agreement provide a mechanism to hedge the risk of the counter parties. The risk can be- interest rate, currency or equity etc.

Interest rate swaps

It is a financial agreement to exchange interest payments or receipts for a predetermined period of time traded in the OTC market. The swap may be on the basis of fixed interest rate for floating interest rate. This is the most common swap also called 'plain vanilla coupon swap' which is simply in agreement between two parties in which one party payments agrees to the other on a particular date a fixed amount of money in the future till a specified termination date. This is a standard fixed-to-floating interest rate swap in which the party (fixed interest payer) makes fixed payments and the other (floating rate payer) will make payments which depend on the future evolution of a specified interest rate index. The fixed payments are expressed as percentage of the notional principal according to which fixed or floating rates are calculated supposing the interest payments on a specified amount borrowed or lent. The principal is notional because the parties do not exchange this amount at any time but is used for computing the sequence of periodic payments. The rate used forcomputing the size of the fixed payment, which the financial institution or bank are willing to pay if they are fixed ratepayers (bid) and interested to receive if they are floating rate payers in a swap (ask) is called fixed rate.

A US dollar floating to fixed 9-year swap rate will be quoted as:8 years Treasury (5.95%) + 55/68.It means that the dealer is willing to make fixed payments at a rate equal to the current yield on 8-years T-note plus 55 basis points (0.55%) above the current yield on T-note (i.e. 5.95+ 0.45 = 6.40%) and willing to receive4fixed rate at 68 basis points above (i.e. 5.95 + 0.68 = 6.63%) the Treasury yield.

Another example to understand the concept: Suppose a bank quotes a US dollar floating to a fixed 6-years swap rate as: Treasury + 30 BP/Treasury + 60 BP vs. six months LIBOR Here this quote indicates that the bank is willing to pay fixed amount at a rate equal to the current yield on 6-years T-note plus 30 basis point (0.30%) in return for receiving floating payments say at 9 six months LIBOR.

The bank has offered to accept at a rate equal to 6-year T-note plus 60 BP (0.60%) in return for payment of six-month LIBOR. Similarly floating rate is one of the market indices such as LIBOR, MIBOR, prime rate, T-bill rate etc. and the maturity of the underlying index equal the time period/interval between payment dates. The fixed rate payments are normally paid semi- annually or annually

E.g. example March 1 and Sept. 1. On trade date the swap deal is concluded and the date from which the first fixed and floating payments start accruing is known as Effective Date. For example, a 5-year swap is traded on Aug 30, 2006, the effective date may be Sept 1, 2006 and ten payments dated from2007 to Sept 1, 2011. Floating rate payments in a standard swap are October in advance paid in arrears, i.e. the floating rate applicable to any period is fixed at the start of the period but the payments occur at the end of the period.

There are three dates relevant to the swap floating payments' (s) in the setting date at which the floating rate applicable for the next payment is set. D (1) is the date from which the next floating payment starts to accrue and D (2) is the date on which payment is due. Fixed and floating rate payments are calculated as: Fixed payment = P × Rfx × Ffx= P × Rfl × Ffl5Where P = Notional principal, Rfx is the fixed rate Rfl is the float ingrate set on reset date. Ffx is fixed rate day count fraction" and Ffl is "floating day count fraction". No calculate interest, the last two time periods are. For floating payments in is (D2 – D1)/360. Hence in a swap only are exchanged and not the notional principal.

Illustration:

Suppose a financial institution gives 50 BP higher on floating interest rate (LIBOR) on its deposits and pays floating interest rate to housing society at a fixed rate of 14%. To hedge against the risk involved due to non-payment of interest to the depositor, it enters in to a swap agreement with a dealer and makes that it will receive from the dealer Floating rate (LIBOR) + 100 BP and will pay 14% fixed interest on the same notional amount. In this process the financial institution gets a profits of(0.5%) on notional amount. The dealer enters into another swap contract with a bank with whom it agrees to pay a (LIBOR + 125 BP) and receives 14%interest on notional principal. In this way, every participant gets profit due to this swap transaction which can be shown by the following diagram:

Currency swaps

In these types of swaps, currencies are exchanged at specific exchange rates and at specified intervals. The two payments streams being exchange dare dominated in two different currencies. There is an exchange of principal amount at the beginning and a re-exchange at termination in a currency swap. Basic purpose of currency swaps is to lock in the rates (exchange rates).As intermediaries large banks agree to take position in currency currency suppose 'pounds' and the other party raises the funds at fixed rate in currency suppose US dollars. The principal amount is equivalent at the spot market exchange rate. In the beginning of the swap contract, the principal amount is exchanged with the first party handing over British Pound to the second, and subsequently receives US dollars as return. The first party pays periodic dollarpayment to the second and the interest is calculated on the dollar principal while it receives from the second party payment in pound again computed as interest on the pound principal. At maturity the British pound and dollar principals are re-exchanged on a fixed-to-floating currency swaps or cross-currency-coupon swaps, the following possibilities may occur:

(a) One payment is calculated at a fixed interest rate while the other in floating rate.
(b) Both payments on floating rates but in different currencies.
(c) There may be contracts without and with exchange and exchange of principals.

The deals of currency swaps are structured by a bank which also routes the payments from one party to another. Currency swaps involve exchange of assets and liabilities. The structure of a currency swap agreement can be understood with the help of the following illustration. Supposea company 'A 'operating in US dollar wants to invest in EUR and the company 'B' operating in EUR wants to invest in US dollars. Since company 'A' having revenue in EUR and both have opposite investment plans. To achieve this objective, both the companies can enter into acurrency swap agreement. The following structure describes the investment plans of the company A and B Operations

Fixed to fixed currency swaps:

In this swap agreement the currencies are exchanged at a fixed rate. A fixed to floating currency swap involves the combinations of a fixed-to-fixed currency swap and floating swap. One party pays to the another at a fixed rate in currency say 'A' and the other party makes the payment at a floating rate in currency say 'B'. In a floating to-floating swap the counter parties will have payment at floating rate indifferent currencies.

Valuation of swaps

The value of a swap depends upon so many factors such as the nature of swap, interest rate risks,expiry time, value at expiration, fixed and floating rates of interest, the principal amount and many more. Let's discuss the valuation aspect of an interest rate swap.

Valuation of interest rate swap

At the initiation stage the worth of an interest swap is zero or nearly zero. With the passage of time, this value may be positive or negative. The fixed rate interest swap is valued by treating the fixed rate payments as cash flows on a traditional bond and the floating rate swap value is quite equivalent to a floating rate note (FRN). If there is no default risk, the value of an interest swap can be computed either as a long position in one bond combined with a short position in another bond or as a portfolio of forward contracts. Since in a swap agreement the principal is not exchanged. Some financial intermediaries act as market makers and they are ready to quote a bid and an offer for the fixed rate which they will

exchange for floating. The is the fixed rate in a contract where the market maker will pay fixed and receive floating while the offer rate in a swap the market maker will receive fixed and pay floating. These rates are quoted for the number of maturities and number of different currencies

Valuation of a currency swap

The currency swaps can be valued as the difference between the present values of the conventional bonds. The computation of a currency swap is just equivalent to the valuation of interest rate swaps.

Rationale behind swapping

To avoid risk of fluctuation in forex, interest rates, stock indices investors attitude etc. the swap market has merged now to explain that why firms and people want to enter into swap agreement. The rationale can be explained by the following points:

- Market in perfection and inefficiency
- Different risk preferences
- Government regulation
- Funding at low cost
- Demand supply imbalance
- To improve financial records

Imperfect market: As you know that the swap agreements are meant for transforming financial claims to reduce risk. Since there lie different reasons for the growth in swap market and the most important to the imperfection and inefficiency in the markets. The swap agreements are required in order to investigate market imperfections, difference of attitude of investors, information asymmetry, tax and regulatory structure by the government, various kinds of financial norms and regulations etc. Had there been a uniformity of standards and norms and perfect market conditions, swaps could not have generated much enthusiasm. Hence due to imperfect capital market conditions, swaps give opportunity to the investors for hedging the risk.

Differing risk profiles: The basis of credit rating of bonds by financial institutions, banks and individual investor is quitedifferent. In other words, the computation of risks are different from point of view of individual,

institutional and other types of investor, thereby changing the risk profile. Based on this, the investor has to take decision to hedge, speculate or arbitrage opportunity. In some markets, the company can raise funds at lower cost and can swap for a particular market. A low credit rated firm can raise funds from floating rate credit market and enjoy comparative advantage over highly rated company because it pay a smaller risk premium. The differing interest rates in different markets can be arbitraged and disbursed between the counter parties.

Regulation by government: The regulatory practices of government of different nations can make attractive or unattractive the swap markets. Sometimes the government restricts the funding by foreign companies to protect the interest of the domestic investors. It may also happen that to attract foreign companies the government opens the domestic markets. This phenomenon of the government rule and regulations influence the growth of swap agreements.

Funding at low cost:: In some businesses suppose export financing, there exists subsidized funding and currency swap agreements can take advantage of this situation. The company can swap the exchange risk by entering into a favorable currency swap.

Demand and supply forces: Depending on the needs of the country and its development plans, the central bank squeezes the reserve requirements there by increasing the supply of the funds because of resultant lowering of interest rates. Definitely the borrowers will be interested in those markets where there is a sufficient supply of funds. Thus the borrowers can take arbitrage opportunity in his favor due to different economic conditions

Matches Asset-Liability: The counter parties involved in swap sometimes desire to make the match between asset and liability. For this purpose they take the help of swap and funds can be tapped as per the requirements of the companies. Therefore, differing rates of interests indifferent markets and over time changes in the same provide arbitrage opportunities which canbe tapped by currency swap agreements.

CHAPTER III

FUNDAMENTALS OF FUTURES MARKET

Introduction

A futures contract, or simply called futures, is a contract to buy or sell a stated quantity of a commodity or a financial claim at a specified price at a future specified date. The parties to the futures have to buy or sell the asset regardless of what happens to its value during the intervening period or what happens to be the price on the date when the contract is implemented. Both the parties to the futures have a right to transfer the contract by entering into an offsetting futures contract. If not transferred until the settlement/specified date, then they have obligations to fulfill the terms and conditions of the contract. Futures are traded on the exchanges and the terms of the futures contracts are standardized by the exchange with reference to quantity, date, units of price quotation, minimum change in price (tick), etc.

Futures can be in respect of commodities such as agricultural products, oil, gas, gold, silver, etc., or of financial claims such as shares, debentures, treasury bonds, share index, foreign exchanges, etc.

In a futures contract, the parties fix the terms of the transaction and lock in the price at which the transaction will take place between them at future date. The futures contract, as they appear to be, providing for the physical delivery of the asset, however, in practice most of the futures are settled by and offsetting futures contract. If a particular futures is not settled by the party himself then it will be settled by the exchange at a specified price and the difference is payable by or to the party. The basic motive for a future is not the actual delivery but the hedging for future risk or speculation. Further, in certain cases, the physical asset does not exist at all. For example, in case of Stock Index Futures, the Index is the weighted average price and cannot be delivered. So, such futures must be cash settled only.

Futures are traded at the organized exchanges only. Some of the

centers where futures are traded are Chicago Board of Trade, Tokyo Stock Exchange, London International Financial Futures Exchange (LIFFE), etc. The exchange provides the counter-party guarantee through its clearing house and different types of margins system. Futures contracts are marked to market at the end of each trading day. Consequently, these are subject to interim cash flows for adverse or favorable price movement. With reference to trading in Stock Index Futures, SEBI has provided that the participating parties have to deposit an initial cash margin as well as that difference in traded price and actual price on daily basis. At the end of the settlement period or at the time of squiring off a transaction, the difference between the traded price and settlement price is settled by cash payment. No carry forward of a futures contract is allowed beyond the settlement period. National Stock Exchange (NSE) has issued the Futures and Options Regulations, 2000 which are applicable to the derivative contracts (both futures and options) traded at the NSE.

Suppose a farmer produces rice and he expects to have an excellent yield on rice; but he is worried about the future price fall of that commodity. How can he protect himself from falling price of rice in future? He may enter into a contract on today with some party who wants to buy rice at a specified future date on a price determined today itself. In the whole process the farmer will deliver rice to the party and receive the agreed price and the other party will take delivery of rice and pay to the farmer. In this illustration, there is no exchange of money and the contract is binding on both the parties. Hence future contracts are forward contracts traded only on organized exchanges and are in standardized contract-size. The farmer has protected himself against the risk by selling rice futures and this action is called short hedge while on the other hand, the other party also protects against-risk by buying rice futures is called long hedge.

Features of financial futures contract

Financial futures, like commodity futures are contracts to buy or sell, financial aspects at a future date at a specified price. The following features are there for future contracts:

Future contracts are traded on organized future exchanges. These are forward contracts traded on organized futures exchanges.

Future contracts are standardized contracts in terms of quantity, quality and amount.

Margin money is required to be deposited by the buyer or sellers in form of cash or securities. This practice ensures honor of the deal.

In case of future contracts, there is a dairy of opening and closing of position, known as marked to market. The price differences every day are settled through the exchange clearing house. The clearing house pays to the buyer if the price of a futures contract increases on a particular day and similarly seller pays the money to the clearing house. The reverse may happen in case of decrease in price.

Types of financial future contracts

Financial futures contracts can be categorized into following types:

Interest rate futures: In this type the futures securities traded are interest bearing instruments like T-bills, bonds, debentures, euro dollar deposits and municipal bonds, notional gilt-contracts, short term deposit futures and Treasury note futures.

Stock index futures: Here in this type contracts are based on stock market indices. For example in US, Dow Jones Industrial Average, Standard and poor's 500 New York Stock Exchange Index. Other futures of this type include Japanese Nikkei index, TOPIX etc.

Foreign currency futures: These future contracts trade in foreign currency generating used by exporters, importers, bankers, FIs and large companies.

Bond index futures: These contracts are based on particular bond indices i.e. indices of bond prices. Municipal Bond Index futures based on Municipal Bonds are traded on CBOT (Chicago Board of Trade).

Cost of living index future: These are based on inflation measured by CPI and WPI etc. These can be used to hedge against unanticipated

inflationary pressure.

Evolution of futures market in India

The sequential and chronological detail of futures market development in India is as follows:

- Organized futures market evolved in India by the setting up of Bombay Cotton Trade Association Ltd in 1875. In 1893, a separate association called "The Bombay Cotton Exchange Ltd." was constituted, following conflicts between mill owners and merchants.
- In 1900, futures trading in oilseeds was started with the setting up of Gujarati Vyapari Mandali. In 1913, a future exchange for wheat was set up in Hapur. A second exchange, the Seeds Traders' Association Ltd., trading oilseeds such as castor and groundnuts, was set up in 1926 in Mumbai. Then, many other exchanges trading in jute, pepper, turmeric, potatoes, sugar, and silver, followed.
- Futures market in bullion began at Mumbai, in 1920.
- In 1919, Calcutta Hussein Exchange Ltd., was established for trading in raw jute and jute goods.
- In 1927, East India Jute Association was set up for organized trade in jute.
- In 1940s, trading in forwards and futures was made difficult through price controls till 1952.
- Forward contracts (Regulation) Act was enacted in 1952, while in 1953 Forwards Market Commission (FMC) was established.
- During the 1960s and 70s, the Central Government suspended trading in several commodities like cotton, jute, edible oilseeds, etc. as it was felt that these markets helped increase prices for commodities.

Two committees that were appointed–Datawala Committee in 1966, and Khusro Committee in 1980, recommended the reintroduction of futures trading in major commodities, but without much result.

Recent development in futures market: One more committee on Forwards market, the Kabra Committee was appointed in 1993, which recommended futures trading in wide range of commodities and also up

gradation of futures market. The Kabra Committee recommended the following:

- Strengthening of FMC and Forward Contracts (Regulation) Act, 1952
- Networking of future exchange for better and efficient functioning.
- Stringent vigilance and surveying norms.
- FMC to act as watch dog to monitor the activities of commodity exchanges.
- Some of commodity exchanges need to be upgraded to international levels.

Traders in Futures Market in India

Usually financial derivatives attract three types of traders which are discussed here as under:

Hedgers: Generally there is a tendency to transfer the risk from one party to another in investment decisions. Put differently, a hedge is a position taken in futures or other markets for the purpose of reducing exposure to one or more types of risk. A person who undertakes such position is called as 'hedger'. In other words, a hedger uses futures markets to reduce risk caused by the movements in prices of securities, commodities, exchange rates, interest rates, indices, etc. As such, a hedger will take a position in futures market that is opposite a risk to which he or she is exposed. By taking an opposite position to a perceived risk is called 'hedging strategy in futures markets'. The essence of hedging strategy is the adoption of a futures position that, on average, generates profits when the market value of the commitment is higher than the expected value. For example, a treasurer of a company knows the foreign currency amounts to be received at certain futures time may hedge the foreign exchange risk by taking a short position (selling the foreign currency at a particular rate) in the futures markets. Similarly, he can take a long position (buying the foreign currency at a particular rate) in case of futures foreign exchange payments at a specified futures date.

Hedgers are exposed to risk of a price change. They may be initiating long or short position for a good and would therefore experience

losses in case of unfavourable prices. Suppose an oil company in Britain purchases oil to export to India but during transportation period, oil prices fall thereby creating risk of lower prices. To avoid this loss, this firm can sell oil futures contracts to hedge. If the oil price declines, the trading company will lose money on the inventory of oil (spot position) but will make money in the futures contracts that were sold. This is an example of short hedge. Another company may enter into a contract fearing rise in prices which is known as long hedge. Another example of hedging can be illustrated by taking two parties: one is manufacturer of gold ornaments and the other one is retailer. In this case supposing the manufacturer of ornaments signs a deal in June 2006 agreeing to deliver gold ornaments in November 2006 at a fixed price. It is interesting to note that the manufacturer does not have enough store or cash to buy gold today and does not wish to buy gold till Sept. 2006. The manufacturer is exposed to risk that the gold prices will rise between June to Sept. Hence to counter this risk, he should hedge by buying gold futures contracts.

The hedging strategy can be undertaken in all the markets like futures, forwards, options, swap, etc. but their *modus operandi* will be different. Forward agreements are designed to offset risk by fixing the price that the hedger will pay or receive for the underlying asset. In case of option strategy, it provides insurance and protects the investor against adverse price movements. Similarly, in the futures market, the investors may be benefited from favorable price movements.

Speculators: A speculator is a person who is willing to take a risk by taking futures position with the expectation to earn profits. Speculator aims to profit from price fluctuations. The speculator forecasts the future economic conditions and decides which position (long or short) to be taken that will yield a profit if the forecast is realized. For example, suppose a speculator forecasts that price of silver will be Rs 3000 per 100 grams after one month. If the current silver price is Rs 2900 per 100 grams, he can take a long position in silver and expects to make a profit of Rs 100 per 100 grams. This expected profit is associated with risk because the silver price after one month may decrease to Rs 2800 per 100 grams, and may lose Rs 100 per 100 grams Speculators usually trade in the futures markets to earn profit on the basis of difference in spot and

futures prices of the underlying assets. Hedgers use the futures markets for avoiding exposure to adverse movements in the price of an asset, whereas the speculators wish to take position in the market based upon such expected movements in the price of that asset. It is pertinent to mention here that there is difference in speculating trading between spot market and forward market. In spot market a speculator has to make an initial cash payment equal to the total value of the asset purchased whereas no initial cash payment except the margin money, if any, is made to enter into forward market. Therefore, speculative trading provides the investor with a much higher level of leverage than speculating using spot markets. That is why, futures markets being highly leveraged market, minimums are set to ensure that the speculator can afford any potential losses.

Speculators are of two types: day traders and position traders. Position speculator uses fundamental analysis of economic conditions of the market and is known as fundamental analyst, whereas the one who predicts futures prices on the basis of past movements in the prices of the asset is known as technical analyst. A speculator who owns a seat on a particular exchange and trades in his own name is called a local speculator. These, local speculators can further be classified into three categories, namely, scalpers, pit traders and floor traders. Scalpers usually try to make profits from holding positions for short period of time. They bridge the gap between outside orders by filling orders that come into the brokers in return for slight price concessions. Pit speculators like scalpers take bigger positions and hold them longer. They usually do not move quickly by changing positions overnights. They most likely use outside news. Floor traders usually consider inter commodity price relationship. They are full members and often watch outside news carefully and can hold positions both short and long. Day traders speculate only about price movements during one trading day.

Arbitrageurs: Arbitrageurs are another important group of participants in futures markets. They take advantage of price differential of two markets. An arbitrageur is a trader who attempts to make profits by locking in a riskless trading by simultaneously entering into transactions in two or more markets. In other words, an arbitrageur tries to earn riskless profits from discrepancies between futures and spot prices and among different

futures prices. For example, suppose that at the expiration of the gold futures contract, the futures price is Rs 9200 per 10 grams, but the spot price is Rs 9000 per 10 grams. In this situation, an arbitrageur could purchase the gold for Rs 9000 and go short a futures contract that expires immediately, and in this way making a profit of Rs 200 per 10 grams by delivering the gold for Rs 9200 in the absence of transaction costs.

The arbitrage opportunities available in the different markets usually do not last long because of heavy transactions by the arbitrageurs where such opportunity arises. Thus, arbitrage keeps the futures and cash prices in line with one another. This relationship is also expressed by the simple cost of carry pricing which shows that fair futures prices, is the set of buying the cash asset now and financing the same till delivery in futures market. It is generalized that the active trading of arbitrageurs will leave small arbitrage opportunities in the financial markets. In brief, arbitrage trading helps to make market liquid, ensure accurate pricing and enhance price stability.

Functions of Futures Market

Apart from the various features of different futures contracts and trading, futures markets play a significant role in managing the financial risk of the corporate business world. Recently, financial executives and treasurers are frequently using the various tools available to control their corporate risks and exposures. Financial derivatives instruments, in this respect, have been very useful, popular and successful innovations in capital markets all over the world. Recently, it is noted that financial futures markets have been actively functioning in both developed as well as developing countries.

Futures markets like any other market or industry serve some social purposes. In the past section of this chapter, we have seen that futures markets have been recognized as meeting the needs of some important users like hedgers, speculators, arbitrageurs, spreaders, etc. In the light of those, we will discuss the uses of financial futures market in the society as a whole in the context of risk transference, price stabilization, price discovery, price registration, etc.

Hedging

The primary function of the futures market is the hedging function which is also known as price insurance, risk shifting or risk transference function. Futures markets provide a vehicle through which the traders or participants can hedge their risks or protect themselves from the adverse price movements in the underlying assets in which they deal. For example, a farmer bears the risk at the planting time associated with the uncertain harvest price his wheat will command. He may use the futures market to hedge this risk by selling a futures contract. For instance, if he is expected to produce 1000 tons of wheat in next six months, he could establish a price for that quantity (harvest) by selling 10 wheat futures contracts, each being of 100 tons. In this way, by selling these futures contracts, the farmer intends to establish a price today that will be harvested in the futures. Further, the futures transactions will protect the farmer from the fluctuations of the wheat price, which might occur between present and futures period.

Not only this, this futures market also serves as a substitute for a cash market sale because a cash market sale was impossible since the wheat was not in existence. In this example, we see that the farmer (trader) sells wheat in the futures market which is a temporary substitute of a futures anticipated cash market transaction. In this way, the futures market also serves as substitute futures anticipated futures cash market transactions.

Such above-said examples can be quoted for futures financial markets like interest rate futures contracts which protect the financial institutions such as commercial banks, insurance companies, mutual funds, pension funds, etc. from the adverse changes in the values of their assets and liabilities due to interest rates movements. Similarly, currency futures contract protect the exporters, importers and others who deal in the foreign exchange market, against exchange rate fluctuations. Stock index futures contracts protect the other investors from the adverse changes in portfolio value.

In brief, futures markets hedging activities are very much useful for society since they control, shift, avoid, reduce, eliminate and manage efficiently various types of risks. Further, derivatives enable the investors to modify suitably the risk characteristics of their portfolios, or to shift risk on to those who are willing to assume it for higher profits. In the absence of futures markets, the cost of risk to economy could be higher and might be worse off.

Price Discovery

Another important use of futures market is the price discovery which is the revealing of information about futures cash market prices through the futures market. As we know that in futures market contract, a trader agrees to receive or deliver a given commodity or asset at a certain futures time for a price which is determined now. It means that the futures market creates a relationship between the futures price and the price that people expect to prevail at the delivery date. In the words of M.J. Powers and D. Vogel, as stated in their book entitled, "Inside the Financial Futures Market", futures markets provide a mechanism by which diverse and scattered opinions of the futures are coalesced into one readily discernible number which provides a consensus of knowledgeable thinking. It is evident from this statement that futures prices provide an expression consensus of the today's expectations about a specified future time. If these expectations are properly published then they also perform an information or publicity function for the users and the society. By using the information about the futures prices today, the different traders/observers in the market can estimate the expected spot price in the future time of a given asset. In this way, a user of the futures prices can make consumption or investment decisions more wisely.

Further, price discovery function of the futures market also leads to the inter temporal inventory allocation function. According to this, the traders can compare the spot and futures prices and will be able to decide the optimum allocation of their quantity of underlying asset between the immediate sale and futures sale. The uses of price discovery function can be explained by an example, supposing, a mine operator is trying to take a decision whether to reopen a

marginally profitable gold mine or not. If, we assume that the gold ore in the mine is not of the best quality and so the yield from the mine will be relatively low. The decision will depend upon the cost incurred on mined and refined of gold and the price of the gold to be obtained in futures. Hence, the crucial element in this decision is the futures price of gold. The miner can analyze the gold prices quoted in the futures market today for determining the estimate of the futures price of the gold at a specified futures period. In this situation, the miner has used the futures market as a vehicle of price discovery. It is evident from the above that price discovery function of futures market is very much useful for producers, farmers, cattle ranchers, wholesalers, economic agents, etc. who can use futures market estimates information of futures cash prices to guide their production or consumption decisions.

Financing Function

Another important function of a futures market is to raise finance against the stock of assets or commodities. Since futures contracts are standardized contracts, so, they make it easier for the lenders about the assurance of quantity, quality and liquidity of the underlying asset. Though this function is very much familiar in the spot market, but it is also unique to futures markets. The reason being the lenders are often more interested to finance hedged asset stock rather than un-hedged stock because the hedged asset stock are protected against the risk of loss of value.

Liquidity Function

As we see that the main function of the futures market deals with such transactions which are matured in the future period. They are operated on the basis of margins which are determined on the basis of rides involved in the contract. Under this the buyer and the seller have to deposit only a fraction of the contract value, say 5 percent or 10 percent, known as margins. It means that the traders in the futures market can do the business a much larger volume of contracts than in a spot market, and thus, makes market more liquid. That is why the volume of the futures markets is much larger in comparison to the

spot markets. This is also known as gearing or leverage factor. It means that a trader in the futures markets can gear up his capital 10 times and 20 times if the margin/deposit is 10 percent and 5 percent respectively, resulting in his profit or loss, as a proportion of his capital is 10 times or 20 times magnified. Gearing is the British term and in American parlance it is known as leverage. This is explained by the following example:

Example

A speculator estimates a price increase in the silver futures market from the current futures price of ` 7500 per kg. The market lot being 10 kg, he buys one lot of futures silver for ` 75,000 (7500x 10). Assuming the 10 percent margin, the speculator is to deposit only` 7500. Now supposing that a 10 percent increase occurs in the price of silver to ` 8250 per kg. The value of transaction will also increase, i.e., ` 82,500, and hence, incurring profit of ` 7500(82,500-75,000) on this transaction. In other words, the speculator earns in this transaction ` 7500 on the investment of ` 7500, being 100 percent profit on investment, and vice-versa.

From the above example, it is evident that futures markets operations are highly risky due to gearing effect. So they are more attractive for the speculators.

Price Stabilization Function

Another important function of a futures market is to keep a stabilizing influence on spot prices by reducing the amplitude of short term of fluctuations. In other words, futures market reduces both the heights of the peaks and the depth of the troughs. The major causative factors responsible for such price stabilizing influence are such as, speculation, price discovery, tendency to panic, etc. A detail discussion on price stabilization function of futures market will be made in the forthcoming chapters.

Disseminating Information

Apart from the aforementioned functions of the futures markets like risk- transference (hedging), price discovery, price stabilization, liquidity, and financing, this market is very much useful to the economy

too. Futures markets disseminate information quickly, effectively and inexpensively, and, as a result, reducing the monopolistic tendency in the market. Further, such information disseminating service enables the society to discover or form suitable true/correct/equilibrium prices. They serve as barometers of futures in price resulting in the determination of correct prices on spot markets now and in futures. They provide for centralized trading where information about fundamental supply and demand conditions are efficiently assimilated-and acted on.

The financial futures markets have generated employment opportunities by creating a significant number of jobs and attracted a considerable volume of transactions from non-residents. Indirectly, it is another way of generating foreign exchange for the countries. Further the futures markets act as 'starter form of investment resulting in a wider participation in the securities markets. They attract young investors and act as catalysts to the growth of securities markets. They enable individuals and managers of funds to devise or design strategies for proper assets allocation, yield enhancements and reducing risks. For example, futures markets quotations are also useful to other sectors of society besides speculators and hedgers. Which goods or commodities are to be produced and in which financial assets the investment is to be made, such decisions are assisted by the futures market prices.

Further, some individuals may not engage in certain clearly beneficial forms of economic activity if they were forced to bear all of the risks of that activity themselves. Futures markets enable the society to reach the position of pare to optimality by developing complete markets. It means that in financial markets, no other set of securities can make some investors better off without making at least one other investor worse off. In other words, the securities market is said to be complete if the patterns of returns can be created whose returns a portfolio of existing securities cannot duplicate. In brief, the futures markets enhance economic activities in the society in general, resulting in growth of economic development of the country.

Basic Mechanism of a Futures Contract

A futures contract calls for the delivery of the specified quantity at the specified rate on specified date. Or, before the maturity date it can be squarred off. In India, the financial derivatives (futures) are compulsorily squarred off on the maturity date. However, in case of commodities futures, delivery is made, if required, by the transfer of warehouse receipt. An investor can buy (a long position) or sell (a short position) a futures contract. The profit or payoff position of a futures contract depends on the differences between the specified price (of the futures contract) and the actual market price prevailing on the maturity date. For example, if an investor has purchased a futures contract in HLL at the rate of ` 300 and one contract in for 500 shares. The value of the contract is ` 1,50,000 (` 300 x 500). Now, on the maturity date the rate is ` 310. The value of the contract is ` 1,55,000 and his profit is ` 5,000. Similarly, if the rate is ` 296, then his loss is ` 2,000. Further, that if the investor has sold initially, then his loss and profit position would be ` 5,000 and ` 2,000 respectively. This can be summarized as follows

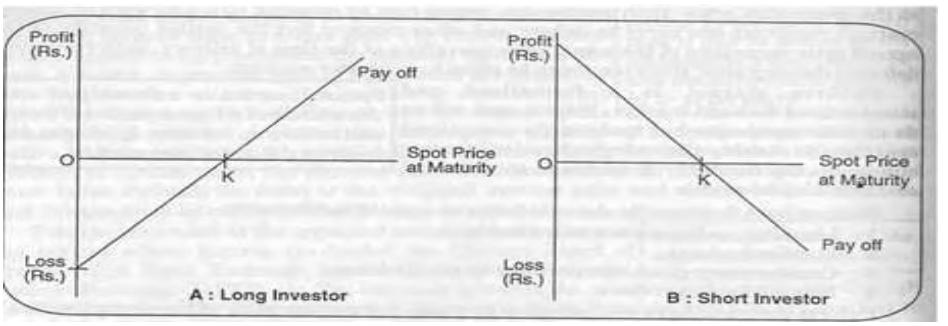
For Long investor: Profit = Spot price at Maturity – Futures Price

Loss = Futures Price – Spot Price at Maturity

For Short investor:Profit = Futures price – Spot Price at Maturity

Loss = Spot Price at Maturity – Futures Price

A futures contact is zero sum game. Profit to one party is the loss of the other party. Simple reason being that every long position is represented by a short position in the market. The pay off positions of the long investor and short investor in futures are shown in Figure



In Figure (A), K is the strike price. The figure shows that as the spot price at maturity increases, the profit of the long investor also increases. This break-even level is one when spot price is equal to strike price. Similarly, Figure (B) shows that maximum profit to short investor appears if the spot price is 0.

Thus profit decreases and Loss increases as the spot price increases. The breakeven appears when the spot price is equal to the strike price. The diagrams for buyer and seller are mirror image of each other.

Financial futures can be classified into Shares and Shares Indices Futures, Bond Futures, Currency Futures and Interest Rate Futures. Discussion on Shares and Shares Indices Futures is taken up first, followed up by currency futures and interest rate futures.

Contract Size of Futures Contracts

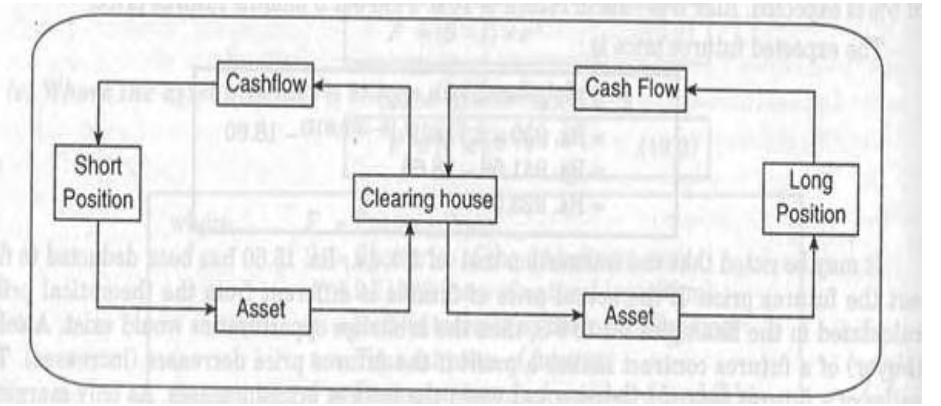
One contract of futures includes a specific number of units of underlying asset. For example, at present, a futures contract in NIFTY is consisting of 100 units. So, if NIFTY Futures is traded at 3,750, then the value of one contract is ` 3, 75,000. In case of stock futures, the value of one futures contract need not be less thaw ` 2, 00,000. Number of shares included in one futures contact is changing from time to time.

Futures Trading and Role of Clearing House

Futures are traded at computerized on-line stock exchanges and there is no one- to-one contact between the buyers and sellers of futures. In case of default by either party, the counter-guarantee is provided by the exchange. In this scenario, the role of the stock exchange clearing house becomes imperative.

Unlike shares trading, where position of the defaulting party is actioned and the loss is recovered through the broker of the party, the situation in futures trading is different. When a deal by a seller or buyer of a particular contract is finalized, on the basis of quotes, etc., the clearing

house emerges but invisibly. Impliedly, the clearing house becomes the seller to a long offer and buyer to a short offer. The clearing house is required to perform the contract to both the parties i.e., to deliver the underlying asset to the long positions holder and to pay to the short position holder, The net position of the clearing house always remains zero because it does not trade on its own but only on behalf of other parties. So, the clearing house becomes a party to two contracts at a time and is bound to perform its obligation under both the contracts. The position of the clearing house is shown in Figure.



Figures show that the position of the clearing house is only neutral and provides a link between the buyers and sellers. Clearing house makes it possible for buyers and sellers to easily square off their positions and to make the net position zero. The zero net position of a party means that neither the original position nor the squaring off is to be fulfilled. As the clearing house is obligated to perform to both parties, it protects its interest by imposing margins on the parties.

Initial Margin and Mark to Market

In the discussion on payoff positions in futures, it has been shown that the ultimate profit or loss position of a party to a futures contract depends on the spot price of the underlying asset on the maturity date. As the parties are betting on the future spot price of the asset, their expectations may not come true and they may suffer loss. In view of this position, SEBI has provided that the buyer as well as the seller, both have to deposit an initial margin with the stock exchange broker on the date of

the transaction. If the initial value of the futures contract is ` 1,50,000 and the initial margin is 10%, then buyer and seller both have to deposit ` 15,000 each with their respective brokers. From the date of the transaction till the squaring off date or maturity date, the futures price may rise or fall, as a result of which a partly may incur loss. The futures contracts are to be mark to market on daily basis i.e., additional margin money is to be deposited with the broker in view of the loss occurring till a particular date. For example, in the above case, the value of contract falls to ` 1, 45,000 next day, and then mark to market margin of ` 5,000 is to be deposited. So, instead of waiting until the maturity date for the parties to book losses, SEBI requires all positions to recognize losses on daily basis as these accrue. This daily setting is called mark to market, where the maturity date does not govern the accrual of losses. Margin system is one basic difference between the forwards and futures. The forwards are simply kept till the maturity date without any intervening cash flows whereas the futures follow pay-as-you-go system.

Convergence Property

As futures contracts mature and are compulsorily settled on the specified maturity date, the futures price and the spot price of the underlying asset on that date must converge. This may be called the convergence property. If the two prices are not equal then every investor would like to make profit by capitalizing the opportunity. But then, who will lose? On the date of the settlement, the two prices would almost be same.

For example, an investor takes a long position in Nifty Futures (1 month) and holds that position till maturity. The sum of daily settlements (mark to market) would be equal to FT - F0 where F0 is initial futures price at contract time and FT is futures price on maturity. As explained above, FT will be equal to ST due to convergence property, where ST is spot price of asset on maturity. So, the profit on maturity is S - F0 and it tracks changes in the price of the underlying asset. In Table, the convergence property and its effect on profit/loss on NIFTY futures have been shown.

Gradual Profit/Loss on Futures Contracts

Day	Futures Price	Profit / Loss	Cumulative Profit
0	3650	-	-
1	3680	30	30
2	3685	5	35
3	3695	10	45
4	3685	-10	35
5	3690	5	40
6	3692	2	42

Due to the convergence property, the spot price of NIFTY on Day 6 could be 3692 and profit at settlement is (3692-3650) i.e., ` 42 per unit. The same profit is also shown by column 3 and 4. The net receipts in mark to market are also ` 42. So, the convergence property states that the futures prices and spot prices are equal on the maturity date. However, before maturity, the futures prices may differ substantially from current spot prices. So, from the point of view of the investor, if the futures contract and the asset are held until maturity, he bears no risk because on the maturity date, the asset value is equal to the current future price. Risk is eliminated because on that day, the futures prices and spot prices are equal. However, if the futures contract and assets are to be liquidated earlier, the investor in this case bears 'basis risk'. The reason being that future price and spot price are not in perfect lock up position at all times before maturity, and the profit/loss on one may not perfectly offset the loss/profit on the other.

Open Interest

In case of futures contracts, for every long position, there is simultaneously a short position. Open interest is a technical term used to refer to the number of contracts outstanding. In order to find out the open interest, the long and short are not added, rather the total long or short contracts are defined as open interest. The net position of the clearing house is always zero. Calculation of open interest is made in a

very special way. Suppose, A, B, C, D, E and F are different investors. '+' refers to buying a futures contract and a '-' refers to selling of a futures contract on the same underlying asset. Different cases of

Transactions and the calculations of open interest [Oil have been shown in Table.]

Calculation of Open Interest in Futures

Case I	Case II	Case III	Case IV	Case V	Case VI
+A, -B	+A, -B	+A, -B	+A, -B	+A, -B	+A, -B
	+C, -D	+C, -A	+B, -A	+C, -D	+C, -D
				+E, -F	+E, -C
OI = 1	OI = 2	OI = 1	OI = 0	OI = 3	OI = 2

In practice, when trading in particular futures begins, the 01 is zero. As time passes and more and more transactions take place, net OI positions fluctuate. As maturity date approaches, most of the parties square off their transactions and the net 01 position may become zero. It may come down to zero even before the maturity date. If still some positions are left, these will be cash settled or delivery settled as the case may be, on the maturity date.

Futures Pricing

If an investor wants to acquire shares in a particular company, he can acquire these shares today itself at the current price or he can take a long position in futures. In either case, he will be having the asset on some date in future. No doubt, the market determined cost of acquiring the asset in either of these strategies must be equal. So, there is some relationship between the current price of the asset, cost of holding it in future and the futures prices today. This relationship can be explained by taking cash flow positions at time O and time 't' in both strategies. Say, S in the spot rate, F is the futures price and r is the risk-free rate of interest, the position can be shown as follows:

		Initial Cash Flow	Cash Flow at Time 'T'
Strategy I:	Buy Asset now :	$-S_0$	S_T
Strategy II:	1 Long Futures :	—	$S_T - F_0$
	Invest $F_0/(1+r)^t$:	$-F_0/(1+r)^t$	F_0
	Net Position :	$-F_0/(1+r)^t$	S_T

Table shows that the cash flow position at time 't' is same in both strategies. However, the initial cash flow positions are -S0 and -F0(1 + r)t. In order to eliminate the arbitrate opportunities; these two values should also be same, S.

$S_0 = F_0/(1 + r)^t$ $F_0 = S_0 \times (1+r)^t$

This gives the relationship between the current spot price and the futures price. This is known as Spot-Futures Parity or Cost of Carry Relationship. The expected dividend (income) from the asset during the futures period can also be incorporated in the analysis. So, pricing of futures contract depends on the following variables:

(i) Price of the underlying asset in the cash market,

(ii) Rate of return expected from investment in the asset, and

(iii) Risk-free rate of interest.

The mechanism of pricing of futures can be explained as follows: Suppose,

(i) In cash market, the underlying asset X is selling at `100.

(ii) The expected return from the asset is 3% per quarter.

(iii) The risk free rate of borrowing or lending is 8% p.a. or 2% per quarter.

(iv) The futures contract period is also a quarter.

What should be the price of futures?

say,S = Current spot price of the asset F Futures price

r = % Financing cost per futures period

y = % Yield on investment per futures period Now, F =S+S(r-y)

Suppose, the investor borrows funds to purchase one unit of asset 'X' resulting in no initial cash outlay for his strategy. At the end of 3 month's period, ` 3 will be received from holding the asset 'X and would be required to pay interest (financing cost) of ` 2.

In the example given above,
F = 100 + 100 (.02 -.03)

= ` 99
So, the futures price should be ` 99. What happens if the futures price is ` 92 or ` 107? The position can be explained as follows:

In case, the futures contracts are available at ` 92 (i.e., less than the theoretical price of ` 99), the investor should buy one future contract for ` 92 and should sell one unit of asset X for ` 100 and invest the money @ 8% p.a. for 3 months. After 3 months, he will receive the proceeds of ` 102 (` 100 + ` 2). He will spend ` 92 to purchase an asset (out of futures contract). Besides, he will not receive the yield of ` 3 from the asset. So, his cost is ` 95 (92 + 3). His gain would be ` 7 (` 102 - 95).
Similarly, if the futures contract price is ` 107, he should sell the futures contract at 107 and should borrow ` 100 now to buy one unit of asset 'X in the spot market. After 3 months, his proceeds would be ` 110 (107 + 3) and payment would be ` 102 (100 + 2). He would be able to make a profit of ` 8.

So, if the futures price is other than the theoretical price of ` 99, it would give rise to arbitrage opportunities. In case of price of ` 92 or ` 107, investors can look for a riskless arbitrage profit of ` 7 or ` 8. The demand and supply forces would react to this arbitrage opportunity and the futures price would settle around the equilibrium level of ` 99.

In the above analysis, the cost of carry (i.e., the interest amount) has been considered in an over simplified way. In the pricing of futures, the interest effect is taken up on the basis of continuous compounding.

The procedure for pricing the futures can be standardized in 3 different situations as follows:

When the asset provides no income:

$F = S \times e^{rt}$

Where the asset provides known dividend:

$F = (S - I) \times e^{rt}$

Where the asset provides a known dividend yield:

$F = S \times e^{(r - q)t}$ Where,

F = Futures Price

S = Spot price of the underlying asset. e = 2.71828 (base of natural logarithm)
r = Rate of interest on borrowing/lending t = Time duration of futures
I = Present value of expected dividend @'r' q = Dividend yield.

Differences between Forwards and Futures

Apparently, forwards contracts and futures contracts seem to be similar, Both relate to a contract to be fulfilled on a future date at the Pre specified rate for a specific quantity. However, there are a number of differences between the forwards and the futures. The forwards contracts are private bilateral contracts. These are traded off-exchanges and are exposed to default risk by either party. Each forward contract is unique in terms of size, time and types of assets, etc. The price fixation may not be transparent and is not publicly disclosed. A forward contract is to be settled by delivery of the asset on the specified date.

On the other hand, futures contract is a contract to buy or sell a specified quantity of a commodity or a specified security at a future date at a price agreed to between the parties. Since these contracts are traded only at organized exchanges, these have built-in safeguard against default risk, in the form of stock brokers or a clearing house guarantee.

The idea behind futures contracts is to transfer future changes in

the prices of commodities from one party to another. These are trade able and standardized contracts in terms of size, time and other features. These contracts are transparent, liquid and trade able at specified exchanges. Futures also differ from forwards in that former are subject to daily margins and fixed settlement period. Both forwards and futures contracts are useful in cases where the future price of the commodity is volatile. For example, in case of agricultural products, say sugarcane, the peasant's revenue is subject to the price prevailing at the time of harvesting. Similarly, the sugar-mill is not sure whether it will be able or not to procure required quantity of sugarcane at the reasonable price.

Both parties can reduce risk by entering into a forward or futures contract requiring one party to deliver and other party to buy the settled quantity at the agreed price regardless of the actual price prevailing at the time of delivery. Both result in a deferred delivery sale. However, it can be offset by a counter contract. Futures market is a formalized and Futures market is a formalized and standardized forward market. Players and sellers do no meet by chance but trade in the centralized market. No doubt, the standardization process eliminates the flexibility available in the informal contacts (i.e., forwards).

Futures have four specific characteristics as against the forwards:

1. Liquidity, as futures are transferable.
2. Standard volume.
3. Counter-party guarantee provided by the Exchange.
4. Intermediate cash flows.

Futures contracts have evolved out of forwards and possess many of the characteristics of forwards. In essence, futures are like liquid forward contracts. As against forwards, futures as a technique of risk management, provide several services to the investors and speculators as follows

(i) Futures provide a hedging facility to counter the expected movements in prices.

(ii) Futures help indicating the future price movement in the mart.

(iii) Futures provide an arbitrage opportunity to the speculators.

The Operation of Margin

In addition to the clearing house, there are some other safeguards for futures contracts, important among these are requirements for margin and daily settlement. In this section, we will discuss the margin requirement applicable in case of investor and as a trader of the clearing house. As we know that two parties are directly trading an asset in the futures market for a certain prices there are obvious risks for backing out of any of the parties to the contract. It is also possible that one of them may not have the financial resources to honor the contract. That is why one of the important roles of the exchange is to organize the futures trading in such a way that the default risk will be minimum. This is why margins come into picture.

The Concept of Margin

Before entering into a futures contract, the prospective trader (investor) must deposit some funds with his broker which serves as a good faith deposit. In other words, an investor who enters into a futures contract is required to deposit funds with the broker called a margin. The basic objective of margin is to provide a financial safeguard for ensuring that the investors will perform their contract obligations. The exchanges set minimum margins but the brokers may require larger margins if they are concerned about an investor's financial situation because they are ultimately responsible for their clients' losses. The amount of margins may vary from contract to contract and even broker to broker. The margin may be deposited in different forms like cash, bank's letter of credit and treasury securities. Normally the investor who posts this margin retains the title of the securities deposited as margin. The margin account may or may not earn interest. Some brokers may simply pay them money 'market interest rates on their margin account. However, most of the brokers usually do not pay interest on margin in money. This loss of interest is the cost of margin requirement.

Types of Margin

There are three types of margin such as initial margin, maintenance margin and variation margin. The initial margin is the

original amount that must be deposited into account to establish futures position. It varies from stock to stock. To determine the initial margin, the exchange usually considers the degree of volatility of price movements in the past of the underlying the asset. After that, the exchange sets the initial margin so that the clearing house covers losses on the position even in most adverse situation. The initial margin approximately equals the maximum daily price fluctuation permitted by the exchange for that underlying asset. The exchange has the right to increase or decrease the quantum of initial marginal depending upon the likely anticipated changes in the futures price. For most of the futures contracts, the initial margin may be 5 percent or less of the underlying asset's value. After proper completion of all the obligations associated with a investor's futures position, the initial margin is returned to trader.

The Maintenance Margin

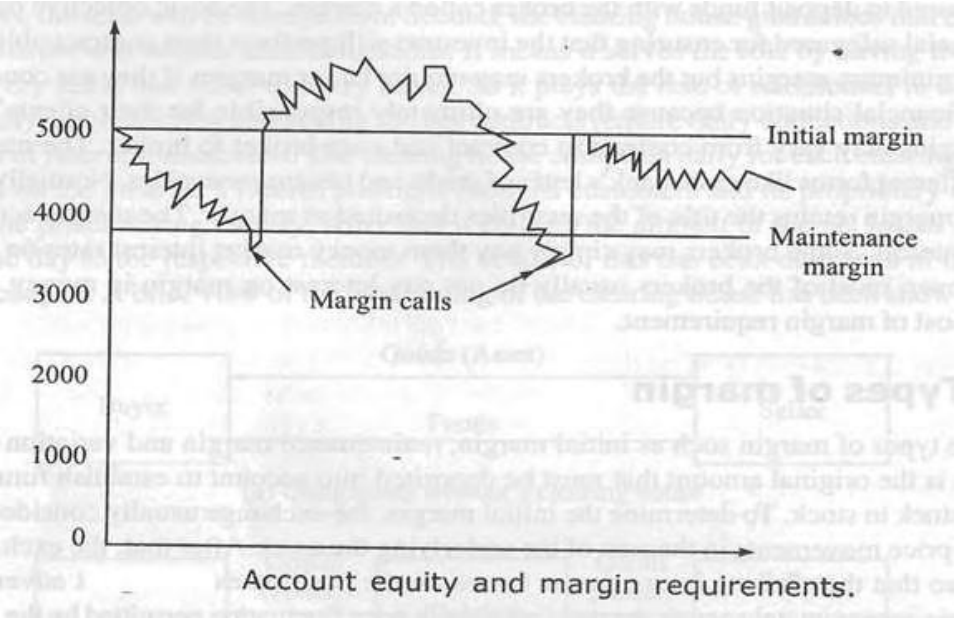
The maintenance margin is the minimum amount which must be remained (kept) in a margin account. In other words, so much minimum, balance in the margin account must be maintained by the investor. This is normally about 75 percent of the initial margin. if the futures prices move against the investor resulting in falling the margin account below the maintenance margin, the broker will make a call, i.e., asking the client to replenish the margin account by paying the variation. Hence, the demand for additional fund is known as a margin call.

For example, assume that the initial margin on a futures contract is ` 5,000 and the maintenance margin ` 3,750 (75% of the initial margin). The next day assume that the party has sustained a loss of ` 1,000, reducing the balance in margin to ` 4,000. Further assume that on the next day the price decreased and sustained loss is ` 500. Thus, the balance remained in the margin account to ` 3,500, below the maintenance margin. In this situation, the broker will make a call (margin call) to replenish the margin account to ` 5,000, the level of initial margin.

The Variation Margin

It refers to that additional amount which has to be deposited by the trader with the broker to bring the balance of the margin account to

the initial margin level. For instance, in the above mentioned example, the variation margin would be ` 1500 (` 5000— ` 3500), i.e., the difference of initial margin and the balance in the margin account, the same has been shown in Fig. If the investor does not pay the initial margin immediate, the broker may proceed to unilaterally close out the account by entering into an offsetting futures position.



Margins and Marking-to-Market (Daily Settlement)

It has been observed that the initial margin, sometimes, is even less than 5 percent which seems to be very small considering the total value of the futures contract. This smallness is reasonable because there is another safeguard built in the system, known as daily settlement marking-to-market. In the futures market, all the transactions are settled on daily basis. Thus, the system of daily settlement in the futures market is called marking- to-market. The traders realize their gains or losses on the daily basis to understand this process of daily settlement, let us see Table.

If we examine Table, it is observed that on June 11, the balance in the margin account falls $340 below the maintenance margin level. This requires a margin call to the participant for depositing an additional margin of$ 1340. The Table assumes that the trader does in fact provide this margin by close of the trading on June 12. It is also noted that on June 12, 19, 20 and 21, trader has excess margin. The Table also assumes that excess margin is not withdrawn. On June 24, the trader decides to close out the position by shorting the two contracts, being futures price on that day $392.30, and the trader has suffered accumulative loss of $1 S40 in this contract.

The basic purpose of the mark-to-marking is that the futures contracts should be daily marked or settled and not at the end of its life. Every day, the trader's gain (loss) is added or (subtracted), the margin on the case may be. This brings the value of the contract back to zero. In other words, a futures contract is closed out and rewritten at a new price every day.

Operation of Margins for a Long Position in Two Gold Futures Contracts

Day	**Futures price ($)**	**Daily gain (Loss) ($)**	**Cumulative gain (Loss) ($)**	**Margin account balance ($)**	**Margin call ($)**
June 3	400.00				
June 3	397.00	(600)	(600)	4,000	
June 4	396.00	(180)	(780)	3,400	
June 7	398.20	420	(360)	3,640	
June 8	397.10	(220)	(580)	3,420	
June 9	396.70	(80)	(660)	3,340	
June 10	395.40	(260)	(920)	3,080	
June 11	393.30	(420)	(1,340)	2,660	1,340
June 14	393.60	60	(1,280)	4,060	
June 15	391.80	(360)	(1,640)	3,700	
June 16	392.70	180	(1,460)	3,880	

June 17	387.00	(1,140)	(2,600)	2,740	1,260
June 18	387.00	0	(2,600)	4,000	
June 21	388.10	220	(2,380)	4,220	
June 22	388.70	120	(2,260)	4,340	
June 23	391.00	460	(1,800)	4,800	
June 24	392.30	260	(1,540)	5,060	

The initial margin is $2000 per contract or $4000 in total and the maintenance margin is $1500 per contract or $3,000 in total. The contract is entered into on June 3 at $400 and closed out on June 24 at $392.30. The numbers in column 2, except the first and the last, are the futures price at the close of trading.

Closing a Futures Position (Settlement)

There are four ways to close the futures position, namely, physical delivery, cash settlement, offsetting and exchange of future for physicals (EFP).

Physical Delivery

One way of liquidating of futures position is by making or taking physical delivery of the goods/asset. The exchange has provided alternatives as to when, where and what will be delivered. It is the choice of the party with a short position. When the party is ready to deliver, it will send a notice of intention to deliver to the exchange. The price is settled which normally most recent with a possible adjustment for the quality of the asset and chosen delivery location. After that, the exchange selects a party with an outstanding long position to accept delivery. Let us see how physical delivery works.

Let us take an example of particular futures contract: Silver traded on COMEX where a short-trader is required to make delivery of 5000 troy ounce (6 percent more or less) of refined silver bar cost in heights of 1000 to 1100 ounces each and at 0.999 fineness. Which should bear the serial number and identifying stamp of a refiner approved by the COMEX exchange? At the beginning of the delivery month on the exchange-designated notice days, say, December 99 contract, exchange

rules requires that all traders having open positions in December 1999 contract notify their member brokers to take or make delivery for this. In turn, the brokers will inform to the clearing house of their customer's intention. After this notification, the clearing house matches longs and shorts usually by matching the oldest short to the oldest long position, until all short quantities are matched. Delivery notices are then to all the traders through their brokers indicating to whom their delivery obligations runs and when, where and in what quantities is to be made. Some exchanges impose heavy penalty in case of default by any party. When delivery is satisfactory made then the clearing house notify and accord the same. In case of financial futures, delivery is usually made by wire transfer.

Cash Settlement/Delivery

This is relatively new procedure followed for setting futures obligations is through cash delivery. This procedure is a substitute of physical delivery and hence, do not require physical delivery. The exchange notifies about this where cash delivery as the settlement procedure. There are certain financial futures like stock indices futures, certain treasury securities, euro-dollar, time deposits, municipal bonds, etc. When a cash settlement contract expires, the exchange sets its final settlement price equal to the spot price of the underlying asset on that day. In other words, it is simply marked-to-market at the end of the last trading day to handover the underlying assets. Since cash settlement contracts are settled at the spot price, their futures prices are converged to the underlying spot prices. Therefore, the prices of cash settlement contracts behave just like the prices of delivery contracts at their expiration period.

Offsetting

The most common and popular method of liquidating the open futures position is to effect an offsetting futures transaction or via a reversing trade which reverses the existing open position. For example, the initial buyer (long) liquidates his position by selling (going short) an identical futures contract (which means same delivery month and same underlying asset). Similarly, the initial seller (short) goes for buying

(long) an identical futures contract. After executing these trades, these are reported to the clearing house then both trade obligations are extinguished on the books of the brokers and the clearing house. No doubt, the clearing house plays a significant role in facilitating settlement by offset. In comparison to the physical delivery, this method is relatively simple which requires good liquidity in the market, and entails only, the usual brokerage costs. For example, there are two parties X and Y. X has an obligation to the clearing house to accept 10,000 bushels of cotton in September and to pay ` 180 per bushels. For them at that time. X does not wish to actually receive the oats and want to exit the futures market earlier.

Similarly, Y has a obligation to the clearing house to deliver 10,000 bushels of cotton in September and to receive ` 180 per bushels. Both party can reverse or offset their position in that way whereby buyer becomes seller and seller becomes the buyer. Before the due date i.e., September, X will sell September contract for cotton at ` 190 per bushels Y will buy at 190 per bushels.

Exchange of Futures for Physicals (EFP)

This is another method of liquidating the futures contract in a form of physical delivery, called exchange of futures for physicals. In this method, a party who holds a futures contract may like to liquidate his position that is different from those the exchange offers. For example, a party may like to deliver the assets before the specified futures period, or may deliver the asset at different place, or deliver outside the normal trading hours, etc. In simple terms, the contracts fulfilled by the parties on non-contract terms under this technique. For example, a party with a long gold futures position may wish to take delivery in Los Angels rather than in New York, as the contract specifies. Further, the EFP system permits to exchange a futures position for a cash position that meets both the parties' preferences, of course, for EFP, the party must find another party willing to make the trade. The exchanges allow the parties to deliver under non-contract terms, and without going through the trading pits. However, both the short and the long in an EFP transaction must notify the exchange and the clearing house of the said EFP agreement so that the clearing house can make proper book

entries to extinguish the respective short and long positions on its books.

The Exchange of Futures for Physicals (EFP) differs in certain respects from the offsetting method. First, the trader actually exchanges the asset in physical form. Second, such agreements are not performed/closed by a transaction on the floor of the exchange. Third, the two trades negotiate privately the price and other terms of the contract which are usually different from the specifications. Since these agreements are negotiated outside the trading pit, so they are also called ex-pit transaction. Further, regulatory authorities and exchange rules require that all the futures trading be liquidated in the pit, hence, the EFP is the one recognized exception to this general rule. These contracts are also known as against actual or versus cash transactions.

Example

Delivery using an Exchange of Futures for physicals, A is holding long January Comdex Metal futures contract and B is holding short January Comex Metal futures. Both A and B live in Chicago and prefer to close out their positions with delivery in Chicago rather than New York as specified in Comex metal contract. Under EFP A will transfer his long futures position to B at a price $400 per ounce. Broker of both parties submit an EFP order with information to Comex. At the same time B agrees to sell 100 ounces of metal in Chicago at a price $400 per ounce. B delivers the 100 ounces of gold at 2.00 am, if A and B wish, transaction will be recorded in Exchange next morning.

Theories of Futures Pricing

There are several theories which have made efforts to explain the relationship between spot and futures prices. A few important there are as follows:

The Cost-of-Carry Approach

Some top economists like Keynes and Hicks, have argued that futures prices essentially reflect the carrying cost of the underlying assets. In other words, the inter- relationship between spot and futures prices

reflects the carrying costs, i.e., the amount to be paid to store the asset from the present time to the futures maturity time (date). For example, food grains on hand in June can be carried forward to, or stored until, December. Carrying costs are of several types, important among these are:

1. Storage costs
2. Insurance costs
3. Transportation costs
4. Financing costs

Storage Costs refer to those expenses which are done on storing and maintaining the asset in safe custody. It includes rent of the warehouse and others expenses associated with like deterioration, pilferage, normal wastage, etc. In case of financial instruments, the costs incurred on keeping the securities in a bank vault or with custodians.

Insurance Costs refer to amount incurred on safety of the assets against fire, accidents and others. For example, stored wheat be protected against fire, water damage, weather, natural disaster, etc. So insurance is necessary for protection against such hazards. Thus, premium and other costs incurred on insurance is called insurance costs. In some cases, carrying costs also include the transportation costs. When the futures contract matures the delivery of the assets is given at a particular place which may be far away from the warehouse of stored goods. Obviously, transportation costs will be different from location to location and also to the nature of the commodities.

The Cost-of-Carry Model in Perfect Market Another important carrying cost is cost of financing the underlying asset. For example, if gold costs ` 5000 per 10 grams and the financing rate are one percent per month then the financing charge for carrying the gold forward is ` 50 per month (1% of 5000). Apart from the carrying cost on an underlying asset, there can be possibility of earning a yield on storing the asset. Such yield is known as 'convenience yield' from holding stocks. For example, in case of wheat, there could arise extra yield due to low production of wheat due to bad weather in futures.

Thus, up to a certain level, stock holding has a yield in the event of stock out and unanticipated demand. This may be termed as a negative carrying cost. Hence, the net marginal carrying cost for any given asset may be expressed as:

$$C_t = C_{gt} - Y_t$$

Where, C_T is net carrying cost of that quantity, C_{gt}, is gross carrying cost of that quantity, Y_t, is convenience yield of that quantity and t is time period of storage.

The following formula describes a general cost-of-carry price relationship between the cash (spot) price and futures price of any asset:

Futures price = Cash (spot) price + Carrying cost

In addition, the formula assumes the conditions of perfect competition which are as under:

1. There are no information or transaction costs associated with the buying and selling the asset.
2. There is unlimited capacity to borrow and lend.
3. Borrowing and lending rates are the same.
4. There is no credit risk. No margin is required on buying and selling the asset.
5. Goods can be stored indefinitely without loss to the quality of the goods.
6. There are no taxes.

Before discussing the various rules of carrying cost, let us see cash-and-carry arbitrage. In this, the trader buys the goods at the cash price and carries it to the expiration of the futures contract. Let us take an example as given in Table.

Cash-and-Carry Gold Arbitrage Transactions

Prices for the analysis	(`)
Spot price of gold (per 10 grams)	5,000
Futures price of gold (for delivery 6 months) Interest rate 8% per annum	5,300
Other carrying cost assumes	NIL
Transaction	**Cash flows (`)**
t = 0 Borrow ` 5,000 for six months @ 8% p.a.	+5,000
Buy 10 grams of gold at the spot rate	-5,000
Sell a futures contract for ` 5,300 for delivery after six months	0
Total Cash flows	0
T = 1 Remove the gold from storage	0
Deliver the gold against the futures contract	+5,300
Repay loan including interest for 6 months (5000 + 200)	-5,200
Total cash flows	100

(r = 0 & T = 1 refer to present and future period respectfully)

Some financial experts have suggested certain rules relating to cost-of-carry which have briefly given as follows: Rule I. The futures price must be less than or equal to the spot price of the asset plus the carrying charges necessary to carry the spot asset forward to delivery. Mathematically, we can express it as follows:

$$F_{0.t} \leq S_0 \ (1 + C)$$

Where F_{0t}, is the futures price at t = 0 for delivery at t = 1, S_0 is the spot price at t = 0 and C is the cost-of carry, expressed as fraction proportion of the spot price.

Rule 11. The futures price must be equal to or greater than the spot price plus the cost-of- carrying the goods to the futures delivery date.

Mathematically,

$F_{0.t} \geq S_0 (1 + C)$

If the prices do not obey this rule, there will be arbitrage opportunity. Both the above rules are opposite to each other which are also known as cash and carry arbitrage, and reverse cash and carry arbitrage. Together above two rules, it implies to Rule III.

Rule lII. The futures price must equal the spot price plus the cost-of-carrying the spot commodity forward to the delivery date of the futures contract.

Mathematically,

$F_{0.t} = S_0 (1 + C)$

This is applicable under the conditions of the perfect market.

Rule IV The distant futures price must be less than or equal to the nearby futures price plus the cost- of-carrying the asset from the nearby delivery date to the distant delivery date.

Mathematically,

$F_{0.d} \leq F_{0.n} (1 + C)$ d > n

Where $F_{0.d}$ is the futures price at t = 0 for the distant delivery contract maturing at t = d, $F_{0.n}$ is the futures price at t= 0 for the nearby delivery contract maturing at t=n and C is the percentage cost-of-carrying the asset from r = n to t = d.

It is observed that if this relationship did not hold then a trader may purchase the nearby futures contract and sell the distant contract. He will then accept the delivery on nearby contract and carry the asset until the delivery of the distant contract, and thereby earning a profit.

Rule V. The nearby futures price plus the cost-of-carrying the asset from the nearby delivery date to the distant delivery date cannot exceed the distant futures price.

Mathematically,

$F_{0.d} \geq F_{0.n} (1 + C)$ d > n

Following the same pattern of argument for spot and futures prices, we may use for above also.

Rule VI. The distant futures price must equal the nearby futures price plus the cost-of- carrying the asset from the nearby to the distant delivery date.

Mathematically,

$F_{0.d} = F_{0.n} (1 + C)$ d > n

It should be noted that if above relationships are not fulfilled or violated, the traders would immediately recognize all the arbitrage opportunities until prices are adjusted. However, the basic rules (Rule III and VI) developed above provide a very useful framework for analyzing the relationship between cash and futures prices and spreads between futures prices.

The Cost-of-Carry Model In Imperfect Market

We have seen the relationship between the spot price and futures price in the conditions of perfect market which is rare in actual practice. There are various imperfections in real markets which disturb the relationship of Rule III and Rule VI. Among the various imperfections, five are important which have been discussed here in after:

Direct Transaction Cost

In actual practice, when a trader makes the spot or futures transactions he has to pay a fee; known as brokerage fee or commission. In other words, transaction costs refer to all such costs which have to be borne by the trader to buy or sell a particular asset for spot or futures. These costs are transaction fees, exchanges charges and fee, fee for arranging funds, etc. It is also called as the round- trip fee.

Unequal or Differential Borrowing and Lending Rates

It refers to that market situation where the rates of interest on borrowing and lending are different and they are not equal. Normally, in real market, borrowing rates are higher than the lending rate. These differentials of borrowing and lending rates serve to widen the no-arbitrage boundaries.

Restriction on Short- Selling

This is another market imperfection. Earlier, we have assumed that traders can sell assets short and use the proceeds from the short sale without any restrictions. Due to inherent risks in short sales, there are restrictions on short selling virtually in all markets.

Bid-Ask Spread

It is another market imperfection because we see in actual practice that the trader tries to sell the asset at higher price than to purchase the same. The difference between bid price and ask price is called bid-ask spread.

Storage Problem

It is another market imperfection because except gold, most of the commodities cannot be stored very well at all. The storability of a commodity is very important in futures market trading. If a commodity cannot be stored then full arbitrage opportunity will not be available in the market.

Let us see the futures prices after adjusting the above market imperfections. After transaction cost, equation will be

(a) $F_{0.t} \leq S_0 (1 + T) (1 + C)$

(Where T is transaction cost in cash and carry arbitrage)

(b) $F_{0.t} \geq S_0 (1 + T) (1 + C)$

(Reverse cash and carry arbitrage) Combining the above equations, we get

$S_{0.n} (1 - T) (1 + C) \leq F_{0.t} \leq S_0 (1 + T) (1 + C)$

There will be no-arbitrage bounds. Which means within which the futures price must remain to prevent arbitrage. If the futures price goes

beyond these boundaries, arbitrage is possible. Hence, the futures price can wonder within the bounds without offering arbitrage opportunities. For example, in our earlier example; if transaction cost is 3 percent and carrying cost is 8 percent then

(a) $F_{0.t}$ = 5000 (1 -0.03) (1 + 0.08) = ` 5562 and

(b) $F_{0.t}$ = 5000(1 -0.03) (1 + 0.08) = ` 5238.

This is shown in Table and in Fig.
Illustration on No-arbitrage Bounds Price for analysis:

Spot Price of Gold

(10 grams) = 5000 Interest rate @ 8% (p.a.) = 8%
Transaction cost (1) = 3%

No arbitrage futures price in perfect markets (one year basis):

$F_{0.t} = S_0(1 + C)$=5000+400=5400

Upper no-arbitrage bound with transaction cost (one year):

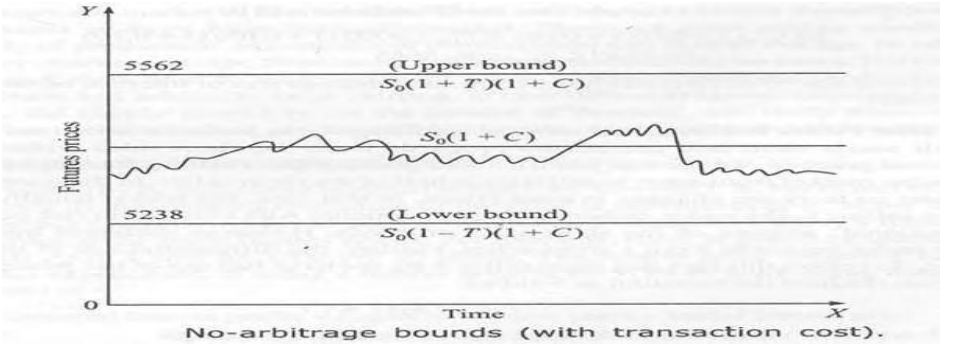
$F_{0.t} \leq S_o (I + T) (1 + C)$

= 5000 (103) (1.08) = ` 5562

Lower no-arbitrage bound with transaction cost (one year):

$F_{0.t} \geq S_o (1 + t)(1 + C)$

= 5000 (1 -0.03) (10.08) = ` 5238



No-arbitrage bounds (with transaction cost).

If the futures price stays between the bounds, no arbitrage is possible. If the futures price crosses the boundaries the traders will immediate act in the market to exploit arbitrage opportunities. For example, if the futures price is too high then the arbitrageurs will buy the spot and sell the futures. This action will raise the price of spot goods relative to futures price, as a result, the futures price will drive back within the no-arbitrage boundaries. Sometimes, we see in the market that transaction costs are not equal for all the investors. For example, for a retail investor, the transaction cost may be higher, even double than an arbitrageur, floor trader or a member of an exchange. Let us presume that for a retail investor, the transaction cost is double, i.e., 2T instead of T, then for this trader, the no-arbitrage bounds would be twice and much wider.

Differences in transaction costs will give rise to the concept of quasi-arbitrage. Those traders which have lower transaction costs than others, are called quasi-arbitrageurs. They have relatively lower bounds than the others. Thus, in actual practice, futures prices move within the no-arbitrage bounds of the lowest transaction cost trader. in other words, the traders with higher transaction costs will not be able to exploit any arbitrage opportunities.

Adjusting the Equal Borrowing and Lending Rates

As we have seen in the perfect capital market conditions that all the traders can borrow and lend at the risk free rate, but in real market, this is not possible, and even the borrowing rate and lending rates of interest are also different. Thus, if these borrowing and lending rates are not same and are different, then they require adjustment to reflect the fact. Normally, we assume that for a trader, the borrowing rate will be higher than lending rate, hence, we assume, lending rate to be C_L and borrowing rate is C_B.

Now, the equation will be with different rates of interest:

$$S_{0.n} (1 - T) (1 + C_L) \leq F_{0.t} \leq S_0 (1 + T) (1 + C_B)$$

These differential rates will serve to widen the no-arbitrage boundaries, for example, assuming C_B =10% and C_L = 6% in our earlier example then the boundaries will be

$$5000(1 - 0.03)(1 + 0.06) \leq F_{0.t} \leq S_0 \leq 5000(1 + 0.03)(1 + 0.10)$$

$$` 5147 \leq F_{0.t} \leq ` 5665$$

It is evident that due to differential borrowing and lending rates of interest, no- arbitrage boundaries have been widened.

Adjusting the Restrictions on Short Selling

In perfect market, we have assumed that traders can sell assets short and use all the proceeds from the short sales without any restriction. However, in actual practice, we see that when a trader goes for short selling then his broker has to arrange the assets from the market from other to sell it on behalf of the short seller, in that case, the risk of broker increases. If later on there are changes in asset prices. In that case, the broker usually does not give full amount of short selling to the trader, rather keeps some amount with himself for risk point of view. This is known as 'fractional' amount of the short sales proceeds. However, different traders face different restrictions on using proceeds from a short seller. Further, the differential use of those funds leads to quasi-arbitrage. To reflect this fact that short seller does not have full use of the proceeds, but only some fraction f, we can readjust the equation as follows:

$$F_{0.t} \geq fS_0 (1 + C)$$

Where f is the fraction of usable funds derived from the short sales ranging between I to 0. With restrict short sales, our no-arbitrage bounds will be

$$fS_{0.t} (1 + C) \leq F_{0.t} \leq S_o (1 + C)$$

The Concept of a Full-Carry-Market

The concept of a full-carry-market refers to the degree of restriction

relating to the underlying asset. For example, nature of restriction on short selling, supply of goods, non-seasonal production and consumption, etc. will determine the degree of full-carry- market. So it varies asset to asset and market to near-market. There are five main factors that affect market prices and move them towards or away from full-carry-market. These are short selling conditions, supply condition, seasonality of production, and seasonality of consumption and ease of storage. In other words, to promote the full-carry-market concept, these restrictions/conditions should be eased. For example, short selling to be fully eased; there must be large supply of goods, in case of seasonal production, there must be ample stock of goods and subject to large shifting, in case of non-seasonal consumption goods like petroleum products, the supply should be on the pattern of demand, and lastly there must be high storability capacity in case of seasonal goods to make regular supply without any interruption.

The Expectation Approach

This approach is advocated by distinguished luminaries like J. M. Keynes, J. R. Hicks and N. Kalidor who argued the futures price as the market expectation of the price at the futures date. Many traders/investors, especially those using futures market to hedge, would like to study how today's futures prices are related to market expectations about futures prices. For example, there is general expectation that the price of the gold next April 1 will ` 5200 per 10 grams. The futures price today for July 1 must be somewhat reflects this expectation. If today's futures price is ` 5180 of gold, going long futures will yield an expected profit of

Expected futures profit = Expected futures price - Initial futures price

` 20 = ` 5200 - ` 5180

Any major deviation of the futures prices from the expected price will be corrected by speculative activity. Profit seeking speculators will trade as long as the futures price is sufficiently far away from the expected futures spot price. This approach may be expressed as follows:

$$F_{0.t} = E_0 (S_t)$$

Where $F_{0.t}$. is Futures price at time t = 0 and E_0 (S_t) is the expectation at t = 0 of the spot price to prevail at time t. The above equation states that the futures price approximately equals the spot price currently expected to prevail at the delivery date, and if, this relationship did not hold, there would be attractive speculative opportunities. In simple terms, the futures price are influenced to some extent on expectations prevailing at the current time. Under this hypothesis, if markets are operating properly then

Current futures price = Expected futures spot price

This is also known as hypothesis of unbiased futures pricing because it advocates that the futures price is an unbiased predictor of the futures spot price, and on an average, the futures price will forecast the futures spot price correctly. We have seen above that on an average' or 'approximately' words have been used to equalize the current futures price with the expected futures spot price. Why does this relationship hold only approximately? There are two arguments to the question. Firstly, it is due to transaction costs, and secondly due to risk aversion of the traders. Transaction costs can keep the futures price from exactly equaling the expected futures spot price. This has already been discussed in detail in the previous section of this chapter.

Futures Prices and Risk Aversion

In this section, we will discuss the 'Risk Aversion' in more detail with its two theories, namely the theory of Normal Backwardation and Theory of Capital Asset Pricing Model (CAPM). Traders in futures markets can be classified roughly into two categories, i.e., hedgers and speculators. Hedgers have a preexisting risk associated with the asset and enter the market to cover that risk. Speculators, on the other hand, trade in the market in the hope to earn profit which is a risky venture. In general, all the investors are risk averse; however, they incur risk willingly only if the expected profit from bearing the risk will compensate them from risk exposure.

The Theory of Normal Backwardation

Backwardation, in general, refers to a market in which the futures price is less than the cash (spot price). In such case, the basis is positive, i.e., basis is cash price - futures price. This situation can occur only if futures prices are determined by considerations other than, or in addition, to cost-of-carry factors. Further, if the futures prices are higher than the cash prices, this condition is usually referred to as a 'cantongo' market; and the basis is negative. Normal backwardation is used to refer to a market where futures prices are below expected futures spot prices.

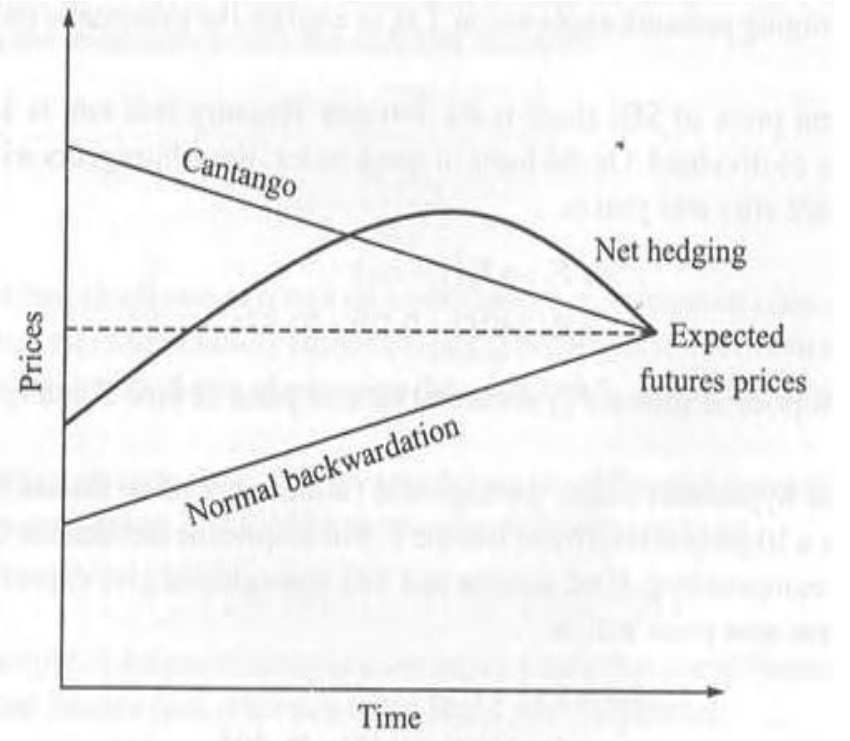
Another way of describing the can tango and backwardation market is that the former (can tango) is one in which futures prices are reasonably described most of time by cost-of-carry pricing relationship, whereas later (backwardation) is one in which futures prices do not fit a full cost-of-carry pricing relationship. In other words, futures prices are consistently lower than those predicted by the cost-of-carry pricing formula. It has been observed in many futures markets that the trading volume of short hedging (sales) exceeds the volume of long hedging (purchases), resulting in net short position. In such situation, Keynes has argued that, in order to induce long speculator to take up the net-short-hedging volume, the hedgers had to pay a risk premium to the speculators. As a result, the futures price would generally be less than the expected futures spot price, by the amount of risk premium which can be stated in equation as:

$$F = E - r$$

Where, F is futures price for a futures date, E is expected price at that date and r is risk premium. In brief, the theory of normal backwardation state that futures prices should rise overtime because hedgers tend to be net-short and pay speculators to assume risk by holding long positions.

Figure illustrates the price patterns of futures which is expected under different situations. If the traders correctly assess the futures spot price so that the expected futures spot price turns out to be the actual spot

price at the maturity. If the futures price equals the expected futures spot price then it will lie on the dotted line. However such situations, sometimes, do not occur, and alternative conceptions exist like normal backwardation and can tango. If speculators are net long then futures prices must rise over the life of the contract if speculators to be compensated for bearing risk. Futures prices then follow the path as labelled normal backwardation in Fig. It is to be noted that this line will terminate at the expected futures spot price.



Patterns of futures prices.

If speculators are net short and are compensated for bearing the risk then the futures prices must follow the path of can tango as shown in Fig. The fall in futures prices will give the short speculators the compensation that induced them to enter the market. Final possibility, as shown in Fig., is known as net hedging hypothesis. According to it, net position of the hedgers might change over the life of the futures contract. In the beginning, the hedgers are net short and the speculators

are net long, then the futures price lies below

the expected futures spot price. Later on, over-time the hedgers gradually change their net position, being net long, and hence, requiring the speculators to be net short. In such situation for having their compensation for risk, by the speculators, the futures price must lie above the expected futures spot-price, as it did in can tango shown in Fig.

An Integrated Approach

The various theories presented earlier, sometimes, present controversial view, e.g. one theory states that futures price are based on carrying costs whereas other one argues purely on expectations or forecast. A number of empirical studies have attempted to verify the reliability of these theories and have resulted in greater clarity and better applicability. In this section, an attempt is made to integrate the various stands of these theories here in brief:

1. Futures prices of those assets which have continuous production or continuous storage capacity broadly follow the carrying cost approach.
2. Those goods or assets which are of discontinuous production or storage nature (perishable nature) should follow expectation approach.
3. It was also observed that the expectations also influence the futures prices of continuous production or storage products. It was seen that the carry cost approach determines the maximum limit of spread but not the minimum limit. Further, fluctuations within the maximum limit are often related to expectation approach.
4. It is also observed that expectations may predominate, sometimes, even in continuous production or storage markets, for such periods indicated in the present by some futures events like ongoing strike, railway disruption, futures labor unrest weather conditions, expected election, etc. which are expected to change the market situation.
5. It is also noticed that the normal backwardation approach tends to exist in those markets which are relatively thin, where speculators are induced to enter in the market.

Comparison of Forward and Futures Contracts

S. No.	Forwards	Futures
1	Private contracts between the two parties; bilateral contracts	Traded on organized exchanges
2	Not standardized (customized)	Standardized contract
3	Normally one specified delivery date	Range of delivery dates
4	Settled at the end of maturity. No cash exchange prior to delivery date	Daily settled. Profit/Loss are paid in cash
5	More than 90 percent of all forward contracts are settled by actual delivery of assets	Not more than 5 percent of the futures contracts are settled by delivery
6	Delivery or final cash settlement usually takes place	Contracts normally closed out prior to the delivery
7	Usually no margin money required	Margins are required of all the participants
8	Cost of forward contracts based on bid-ask spread	Entail brokerage fee for buy and sell orders
9	There is credit risk for each party. Hence, credit limits must be set for each customer	The exchange's clearing house becomes the opposite side to each futures contract, thereby reducing credit risk substantially

CHAPTER IV

HEDGING AND STOCK INDEX FUTURES

Hedging strategy using futures

Today, the corporate units operate in a complex business environment. Managers often find that the profitability of their organizations heavily depends upon on such factors which are beyond their control. Important among these are external influences like commodity prices, stock prices, interest rates, exchange rates, etc. As a result, modern business has become more complex, uncertain and risky. So, it is essential for the executives of the firms to control such uncertainty and risk so that the business can be run successfully. An important function of futures market is to permit managers to reduce or control risks by transferring it to others who are willing to bear the risk. In other words, futures markets can provide the managers certain tools to reduce and control their price risks. So the activity of trading futures with the objectives of reducing or controlling risk is called hedging. In this chapter, we will discuss the nature of hedging, fundamentals of hedging and how futures hedges can be tailored to the need of the hedger. In other words, we will consider here different issues associated with the way the hedges are set up. When is a short futures position appropriate? When is a long futures position appropriate? Which futures contract should be used? What is the optimal size of the futures position appropriate?

Example 1: Firm A is a manufacturer of automobile cars of different gradation. For this A requires auto parts which he imports from USA. A is of the view that the prices of imported parts will increase in futures, thereby increasing the cost of cars, which can have significant affect on the profit profile of this firm. So there is a considerable risk that prices will raise in future. Consequently the firm wants to avoid such risk which it bears from increasing the price of imported parts. So he want to hedge this risk in futures by entering into derivative market. In derivative market, he can lock today for futures prices of the imported parts and can hedge the risk which he bears.

Example 2: A farmer expects that there will be 5000 quintals of food grains, which he will harvest in coming month. But he fears that price of grain could fluctuate in coming month. So farmer suspects of heavy losses in coming month. He can enter into derivative/futures market today and sell the grain for delivery in next month at an acceptable price and can hedge the price fluctuation risk. This kind of hedging is known as anticipating hedging.

Example 3: A corporate treasurer intends to borrow money in middle of March for a three-month period. The treasurer may fear that interest rates will have risen by the date of borrowing. Rise in interest rate would add to the cost of borrowing. A futures position is taken so that there would be an offsetting profit in the event of rise in interest rates. So, in this example, treasurer can do hedging by selling three- month interest rate futures.

Hedging Concepts

Hedging, in its broadest sense, is the act of protecting oneself against futures loss. More specifically in the context of futures trading, hedging is regarded as the use of futures transactions to avoid or reduce price risk in the spot market. In other words, a hedge is a position that is taken as a temporary substitute for a later position in another asset (or liability) or to protect the value of an existing position in an asset (or liability) until the position is liquidated. According to this concept, the firm seeks hedging whether it is on the asset side or on the liability side of the balance sheet.

Example: In the month of March, 2003, a Jute mill anticipates a requirement of 10,000 candies of Jute in the month of July, 2003. Current price of jute is ` 1000 per candy. Based on this price, the company has entered into other financial arrangements. It is of great importance to the mill that, at the time of jute is actually purchased, price is not changed substantially higher than ` 1000 per candy. To avoid this, it buys 10,000the jute futures market, where current price of jute is ` 1050 per candy. In the month of July, the price of jute has risen sharply with the current spot price being ` 1500 per candy. The corresponding futures price for July jute is found to be ` 1470 per candy.

At this point of time jute mill has two options:

It can sell its futures contract on market at prevailing rate of ` 1470, and buys its requirement from spot market. Profit/Loss profile of this transaction will be as follows: Jute purchased =` 1000 per candy Sale proceeds = ` 1470 per candy. Profit from sale = ` 470 per candy and current price of jute ` 1500 per candy to be paid and lid cost of candy to mill is ` 1030 per candy. So futures transaction has ensured the minimization of upward price risk a mere for ` 30 per candy. The mill could take delivery of jute directly from futures market. In this case the mill would pay ` 1000 per candy, but for taking delivery there may be possibilities of not delivery of same variety of jute. It is observed from the above example that by buying futures the firm has hedged against the upward price risk.

The Multi-Purpose Concept of Hedging

Earlier hedging was taken to be only one kind (known as routine or naive hedging), whereby the trader always hedged all his transactions purely for covering all the price risks. However, this concept was challenged by Hollbrook Working, in his article "New Concepts Concerning Futures Markets and Prices" and propounded the multi-purpose concept of hedging which is widely accepted. According to this concept, the hedging can be used for many other purposes

Carrying Charge Hedging

According to this approach, the stockist watch the price spread between the spot and futures prices, and if the spread covers even carrying costs then the stockiest buy ready stocks. It means that the traders may go for hedging if the spread is adequate to cover carrying costs whereas earlier view was that hedges are used to protect against loss on stock held. Thus, according to H. Working, "it is not primarily whether to hedge or not, but whether to store or not".

Operational Hedging

According to this view, hedgers use the futures market for their operations and use the same as substitute for cash or forward

transactions. They think that the futures markets are more liquid and have lower difference between 'bid' and 'ask' prices.

Selective or Discretionary Hedging

As per this concept, the traders do not always (in routine) hedge themselves but only do so on selected occasions when they predict adverse price movements in futures. Here the objective is to cover the risk of adverse price fluctuation rather to avoid price risk. So they use hedging technique selectively at the time of adverse price movements.

Anticipatory Hedging

This is done in anticipation of subsequent sales or purchases. For example, a farmer might hedge by selling in anticipation of his crop while a miller might hedge by buying futures in anticipation of subsequent raw material needs. In brief, it is evident that now hedging is not used only for reducing or controlling the price risk but it also serves other purposes for the market participants. However, largely, the hedging is used to eliminate or reduce the price risk in our further discussion.

The Perfect HedgingModel

The perfect hedge is referred to that position which completely eliminates the risk. In other words, the use of futures or forward position to reduce completely the business risk is called perfect hedge, for example, a jewellery manufacturer wants to lock in a price for purchasing silver for the coming June. This he can do by going long June silver futures, if silver prices rise, the risk of increased cost of silver will be offset by the profits earned on the futures position. Similarly, if the silver prices fall, the savings on the silver purchase will he offset by futures losses. In either case, the net silver cost is locked in at the futures price. However, it should be noted that only price risk is covered and not the quantity risk—the uncertainty about the quantity that will be sold or purchased at some futures date. No doubt, availability of quantity of the asset at futures date may also influence the determination of futures prices. **Example:** Suppose a firm has an inventory of 100 kg of silver and it intends to sell in June. The current spot price of silver is ` 7500 per kg but firm is worried that the price of silver will fall between now and June. To hedge itself against this

possibility, the firm enters into 100 kg of short position in June silver futures at a futures price of ` 7600 per kg. Firm is now protected against falling silver prices because the futures position will protect the firm and firm will gain if silver prices do fall. To see how the firm is hedged, consider what happens to its revenue under two price scenarios:

- In first scenario, spot silver price rise to ` 7700 per kg.
- In second scenario, silver falls to ` 7400 per kg in June.

Silver Inventory and Sales Revenue

Scenario (P_T)	Silver revenues (Q_T x P_T)	Profit / loss [$Q_T(F_{tT} - P_T)$]	Net Revenue
I. ` 7700	` 7,70,000	100(` 7600 – `7700) = - ` 10,000(Loss)	` 7,60,000
I. ` 7400	` 7,40,000	100(` 7600 – `7400) = ` ` 20,000(Profit)	` 7,60,000

In both the scenarios, firm locks in today's futures price of ` 7600 per kg. When silver prices rise, there will be an off-setting futures loss; when silver prices fall, an off- setting gain will occur. But it is to be noticed that the firm does not lock in current spot price of ` 7500 per kg. Short inventory hedge can also be shown in general terms

Scenario	Revenues	Profit / loss	Net Revenue
P_T	$Q_T P_T$	$Q_T(F_{tT} - F_{T.T})$ = $Q_T(F_{tT} - P_T)$	$Q_T F_{t.T}$

We assume in this illustration that the firm sells its inventory at silver in the spot market. The firm would get the same result if it delivered its silver into futures market to fulfill its short position; because the futures settlement price at expiration equals to spot price (NT) due to convergence effect on the prices. Above examples shows the two basic steps in futures hedging:

1. Hedger determines how its profits are affected by change in commodity price, security price interest rate or exchange rate.
2. Hedger enters into a futures position with the opposite exposure. As a result, risk is eliminated.

Several conditions must be fulfilled before a perfect hedge is possible. In brief, these are as under:

3.The business firm must know exactly the effect of change in price on the profit, and further this relationship must be linear.

4.There must be futures or forward contracts available in the market with the following features.

1.It is written on the underlying asset which will affect the firm's profit.

2.The expiration date of the contract should be the same on which the firm's profits will be affected by the price of the said asset.

3.It specifies a quantity equal to which will affect the firm.

How a Perfect Hedge Works

Let us denote t is today period (present), T is date in June on which purchased will be effected, QT is the quantity of silver to be purchased, PT'S price at the time T, FTT is futures price at the time T and FT is futures price at time t. Here $P_{TT} = F_{t.T}$ because delivery date convergence, and Net silver cost = Silver costs – Futures profit

$$Q_T F_{tT} = Q_T P_T - Q_T (P_{tT} - F_{t.T})$$

It is observed that the above hedge meets all the requirements of a perfect hedge. The manufacturer know that silver cost at T(June) will be $Q_T P_T$ which is linear function of the silver price because every rupee change in the silver price will change $Q_T P_T$ by Q_T. By entering into the long futures at time t, the manufacturer establishes that his costs at time Twill be $Q_T F_{tT}$ He,

thus, locks in today's futures price for his silver purchase. Note that, here the gain or losses have been computed on the futures position as it were a forward position.

The Basic Long and Short Hedges

Basically, the hedging refers to by taking a position in the futures that is opposite to a position taken in cash market or to a future cash obligation that one has or will incur. Thus, the hedges can be classified into two categories: short hedges and long hedges.

Short Hedge

A short hedge (or a selling hedge) is a hedge that involves short position in futures contract. In other words, it occurs when a firm/trader plans to purchase or produce a cash commodity sells futures to hedge the cash position, in general sense, it means being short' having a net sold position, or a commitment to deliver', etc. Thus, here the main objective is to protect the value of the cash position against a decline in cash prices. A short hedge is appropriate when the hedger already owns all and expects to sell it at sometime in the futures. Once the short futures position is established, it is expected that a decrease (increase) in the value of the cash position will be fully or partially compensated by a gain (loss) on the short futures position.

Example:

A US exporter who knows that he will receive German mark in three months from a German company. Exporter will realize gain if the mark increases its value in relation to the US dollar and a loss if the mark decreases its value relative to the US dollar. A short futures position leads to a loss if mark increases in value and a gain if it decreases in value. It has the effect of offsetting the exporter's risk.

Example:

A miner, who is manufacturer of silver and having a mine, wants to take a decision whether to open the mine or not. It is based upon the price of silver in futures because production of silver takes two months. He wants to plan his profitability for his firm. If the silver prices fall, he may suspend production of silver. Today is June 10. The price of silver in spot market on June 10 is ` 1050 Per kg and August ` 1060 per kg will be satisfactory price for him. To establish the price of ` 1060 per kg, the miner decides to enter in silver futures market. By hedging, he can avoid the risk that silver prices might fall in next two months. Anticipating the sale to be 50,000 kg silver in two months, he sells ten 5000 kg. futures contracts for August delivery at ` 1060 per kg.

Short Hedge Position of Silver Manufacturer

Spot market	Futures market
June 10 Anticipate the sale of 50,000 kg silver in two months and expected to receive ` 1060 per kg or ` 53,00,000 for total contract	June 10 Sell ten futures contract for August delivery at ` 1060 per kg
August 10 Spot price of silver is now ` 1070 per kg, the miner sells 50,000 kg silver ` 5,35,000 for whole contract Profit = ` 5,00,000	August 10 Buys futures contract at ` 1070 amounting to ` 5,35,00,000 Futures loss = ` 5,00,000

In this example, the miner has hedged his risk perfectly by selling futures in June for delivery in August on the maturity/delivery date he sells in spot market and earn a profit of ` 5,00,000 and in futures market miner has a loss of same amount thereby offsetting and prices hedging against price fall risk.

Long Hedge

Oil other hand, a long hedge (or a buying hedge) involves where a long position is taken in a futures contract. The basic objective here is to protect itself against a price increase in the underlying asset prior to purchasing it in either the spot or forward market. A long hedge is appropriate when a firm has to purchase a certain asset in futures and wants to lock in a price 110w. It is also called as being long' or having a net bought position or an actual holding of the asset. It is also known as inventory hedge because the firm already holds the asset in inventory.

Example: A fund manager anticipates to receipt of $1 million on January 10 and intends to use it to buy a balanced portfolio of UK equities. He fears that one month later, stock prices will rise before the money is received. He can go in futures market and buy today futures contract at 2200, current index (I TSE 100) is at 2200. He can close out his position by selling March 18, FTSE contract.

Long Hedge using Futures

Spot market	Futures market
December 10 Anticipate receipt of $1 million on January 10 Current FTSE 100 index is at 2200 fears a rise in the index	**December 10** Buys March 18 ETSE index futures contract at a price of 2200. He thereby commits him- self to pay (2200 x £ 18 x £ 25) = £9,90,000. Stock in futures date
January 10 The new FTSE index at 2300 Requires additional £ 45000 in order to buy the stock that $1 million would have been bought on December 10 Loss = £45000 in spot market	Close out position by selling at a price of 2300. He notionally receipt of £10,35,000 upon maturity of contract profit from futures £45,000 Profit £45,000 in futures market.

In the above example, fund managers used stock index futures to hedge his risk of price fluctuation in coming one month. The terms 'long' and 'short' apply to both spot and futures market and are widely used in the futures trading. A person who hold stocks of an asset is obviously regarded as 'being long' in the spot market but it is not necessary to actually hold stock. Similarly, it is in the case of 'short', where one who has made a forward sale, regarded as 'being short' on the spot market. In brief, the position of long and short hedges is shown in Table.

Long Vs Short Hedging

	Short hedger	Long hedger
Position in spot market	Long	Short
Protection need against	Price fall	Price rise
Position in futures market	Short	Long

Example: A farmer anticipates a bumper crop amounting to 150 quintals, which he expects to harvest in the month of January. It is October and current price of crop is ` 10,000 per quintal. This price is acceptable to the farmer and give him a sufficient return. But he is apprehensive of fall in price by the time crop will be ready. He, therefore, sells 150 quintals on the commodity futures market at it current price of ` 9500 per quintal. In the month of January, price of crop have in fact risen. Current spot price is ` 11,000 per quintal. Now, farmer has two alternatives:

He can buy back 200 quintals of January crop on the futures market at a present futures price of ` 10,500. He can then deliver his actual crop of pepper in spot market at the ruling rate of ` 11,000 per quintal. As a result farmer will have following profit/loss:

January contract sale @ ` 9500 per quintal. January contract buys @ 10,500. So, there is a net loss of ` 1000 per quintal. Further he sells his output @ 11,000 in the spot market and by deducting the loss on futures market position of ` 1,000, net price obtained by former is ` 10,000 per quintal. He can deliver in the futures market @ ` 9500 per quintal. This situations; where sale of futures by those hedging against price fall is called short hedge and taken guarding against downward price movements.

Cross Hedging

All the hedged positions discussed earlier used futures contracts which are undertaken on the assets whose price is to be hedged and that expires exactly when the hedge is to be lifted. Sometimes, it is seen that the firms wish to hedge against in particular asset but no futures contract available. This situation is called as asset mismatch. Further, in many cases, same futures period (maturity) on a particular asset is not available, it is called a maturity mismatch. Referring to the different situations referred earlier, there is still possibility to hedge against price risk in related assets (commodities or securities) or by using futures contracts that expire on dates other than those on which the hedges are lifted. Such hedges are called cross hedges. In actual practice and in real business world, it will be rare for all factors to match so well. Thus, across hedge is

a hedge in which the characteristics of the spot and futures positions do not match perfectly.

Mismatch situations which make the hedge a cross hedge:

- The hedging horizon (maturity) may not match the futures expiration date.
- The quantity to be hedged may not match with the quantity of the futures contract.
- The physical features of the asset to be hedged may differ from the futures contract asset.

In general, one cannot expect a cross-hedge to be as effective in reducing risk as a direct hedge. However, cross hedges are commonly used to reduce the price risk. Now, the question is which futures contracts are good candidates for a cross hedge. For example, if we want to hedge a portfolio of silver coins then a silver futures contract will be more effective cross-hedge rather than a gold futures contract. Thus, if the price of the underlying asset and the price of correlated asset, one can analyze the nature of hedging. If perfectly correlated, it is perfect, in closely correlated, it is cross hedge, and in negatively correlated, there will be no hedging, rather more risk will be added by taking a position in the futures.

Cross Hedging Silver Coins with Silver Futures

Example: Suppose a firm has a collection of 100 kg of rare silver coin and the firm is concerned that value of those coins will drop over the next six months. There is no silver coin futures contract but we know the price of silver futures. Therefore, we consider cross hedging the value of our coin collection with a short position in silver futures expiring in the three months. The current silver futures price is ` 7600 per kg. Also the relationship between the price of silver coins and silver futures is:

Silver coin price = 100 + 1.20 (Silver futures) +e

Where error term, e take on values of only - 10, 0 and 10 and both silver coin price and silver futures price are in kg. From the above equation, it is clear that on average the silver coin price is 20 percent more volatile than silver futures price. Because each ` 1 movement in the silver futures price is associated with a ` 1.20 movement in silver coins price. So size of

futures position: Size of futures position = Hedge ratio x Size of cash position

= 1.2x l0kg= 12 kg

To see how this cross hedge might work, we calculate the hedged value of contract. We consider two values for spot silver price in three months, ` 7500 and ` 7650 and three levels (e) -10,0 and 10.

Case 1

Silver future price-7500

Basis error	Coin value	Futures profit	Hedged value
e = - 10	10 kg[100+1.2(7500)-10] =10(9090) = 90,900	=12(7600-7500 = + ` 1200	` 92,100
e = 0	10 kg[100+1.2(7500)+0] =10(9100) = 91,000	12(7600-7500) = + ` 1200	` 92,200
e = 10	10 kg[100+1.2(7500)+10] =91,100	=12(7600-7500) = + ` 1200	` 92,300

Silver future price-7650

No matter what the spot price of silver in next three months, the hedged value of contract (silver coin) equals ` 92,200 plus or minus 100. The unhedged value of contract can range from ` 91,500 to ` 92,900. Thus a cross hedging reduces the risk of position.

Example: Consider the problem faced by a film manufacturer that uses silver, a key ingredient in manufacturing photographic film. Film production is process industry, with more or less continuous production. COMEX silver futures trade for delivery in January, March, July, September and December. Suppose the film manufacture needs silver in February, April and June. So hedging horizon and futures expiration date do not match perfectly. Second,

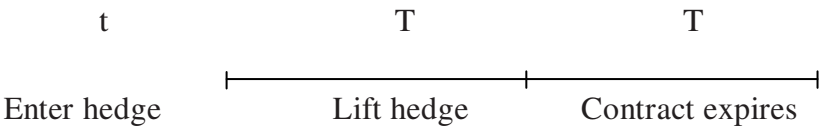
consider the difference in quality of silver required by the firm for production of film but at COMEX futures contract available are of 100% pure quality. There is also hedge may not be perfect. Further, if say the manufacturer needs 7000 ounces of silver, he has a problem to chose one or two contracts this portion because at Comex one standard contract is of 5000 ounce. These all are the cases of cross hedges.

The Cross Hedge Equation: After deciding the most closely correlated contract to the price, we wish to hedge, then the number of contracts are to be determined for minimizing risk. One way to estimate the statistical relationship between them, i.e., by a linear equation which is as under:

$$P_T = a + b\, F^*_T + e^*_T$$

where e^*_T is random error with zero mean, T is the expiration date of the futures contracts and T is the date the hedge will be closed out. If T# T, there is maturity mismatch. The following time line will show this situation:

Time line



The equation considers that hedges have bosh asset and maturity mismatch. We can interpret the constant term by assuming b = I, et = 0, and T= T.

Suppose a firm holds silver inventory in Mumbai. Also suppose that because of transportation cost, spot price of silver in Mumbai is always ` 50 per kg more than it is in Delhi. Delivery, location etc. are specified in the silver contract. In this case, the equation will be

$$P^M_T = a + P_T$$

Where superscript refers to Mumbai.

Example: Show the net difference between the inventory scenario in Mumbai and Delhi in the example shown in perfect hedge model by assuming ` 50 difference in silver prices between two cities.

Silver Inventory Revenue Hedging

Scenario Delhi/ Mumbai	New silver revenue	Futures profits	Net revenue
7700/7750	7,75,000	100 (7600 -7700) = -10,000	` 7,65,000
7400/7450	7,45,000	100 (7600-7400) = 20,000	` 7,65,000

The coefficient h in equation indicates that on an average spot will move b' rupees for every rupee move in futures price. A cross hedging strategy must adjust for the relationship between movements in the spot and futures prices.

Basis risk and hedging

The Concept of Basis Risk and Hedging

Understanding basis risk is fundamental to hedging. It is noted earlier that basis is the difference between the spot price (cash price) and futures price of an underlying asset. If the spot price is higher than the futures price, then the basis will be called as positive or over and vice-versa. This concept in equation form is as under:

$$\text{Basis}_{tT} = \text{Cash price}_t - \text{Futures price}_{tT}$$

If the futures prices and cash prices always change by the same amount then the basis will not change and it will be zero. It means there could be no change in the basis, if Futures price = Cash price, then

$$\text{Basis}_{tT} = \text{Futures price} - \text{Cash price} = 0$$

There is basis risk when the changes in futures prices and cash prices are not equal.

Further in this case, if the magnitude (in units) of the cash futures positions are identical then any loss (gain) in the value of the cash position will be totally offset by the gain (loss) in the value of the futures position. Prior to expiration, the basis may be positive or

negative. For example, low-interest rate currency or gold or silver assets, usually futures price is greater than the spot price, which means that basis is negative and vice-versa. When the change in spot price is more than the change in futures price, the basis will increase which is known as a strengthening of the basis. Similarly, if the change in spot price is less than the change in futures price, the basis will decrease; it is referred to as a weakening of the basis. Let us see the following:

It is observed from Table that change in spot price is 60 (7560-7500) whereas change in futures price is 10 (` 7590— ` 7580), and change in 50 (-30 + 80), is a situation of strengthening the basis.

Basis Position of Silver (Price ` per kg)

Scenario	Cash price	Futures price	Basis
April 8, 2002	7500	7580	—80
May 10, 2002	7560	7590	—30
Change	+60	+10	+50

To examine the basis risk, let us use the following notations: S_1 = Spot price at time t_1

S_2 = Spot price at time t_2

F_1 = Futures price at time t_2 F_2 = Futures price at time t_2 b_1 = Basis at time t_1 b_2 = Basis at time t_2

From the example given in Table, the basis will be b1 = S_1—F_1= 7500-7580= -80

$b_2 = S_2—F_2$= 7560-7590= -30

Let us consider a situation of a hedger who knows that the asset will be sold at time t_2 and takes a short futures position at time t_1. The price realized for the asset is S_2 and the profit on the futures position is $F_1 - F_2$. The effective price that is obtained for the asset with hedging is, therefore,

$$S_2+(F_1—F_2)=F_1 +b2$$

From our example, this will be ` 7550.

` 7560 + (` 7580 - ` 7590) = ` 7580 + (-30) 7560-10 =7580-30

Thus, the value of F_1 is known at time t_1, b_2 were also known at this time, a perfect hedge would result. The hedging risk is the uncertainty associated with the b_2. This is known as basis risk. Similarly, we can consider the next situation where a company knows it will buy the asset at time t_2 and initiate a long hedge at time t_i. The price paid for the asset's S_2 and the loss on the hedge is F_1 —F_2. The effective price which will be paid with hedging is, therefore,

$$S_2+(F_1—F_2)=F_1 +b_2$$

This is the same expression as we have seen earlier. The value of F_1 is known at time t_1 and the term b_2 represents basis risk.

Basis risk for the investment assets like securities arises mainly from uncertainty as to the level of the risk-free interest rate in the futures whereas in the case of consumption assets, in balances between supply and demand, difficulties in storing, convenience yield, etc. also provide the additional source of basis risk.

Basis risk = Spot price of asset to be hedged - Futures price of contract used

Suppose spot price of the share of XYZ Ltd. at the time of hedge initiated is ` 2.50 and futures price is ` 2.20 respectively. And at the tie of closing at hedge prices are ` 2.00 and 1.90 respectively. So basis will be:

$b_1 =S_1—F_1=2.50-2.20=0.30$ $b_2, =S_2—F_2=2.00-1.90=0.10$

Also consider a hedger who knows that the shares will be sold at time t_2 and takes a short futures position at time t_1. Effective price that is obtained for the assets with hedging is, therefore,

$$S_2 + (F_1 - F_2) = F_1 + b_2$$

=2.00+2.20-1.90=2.20+0.10
= 4.20-1.90 2.30
= 2.30 = 2.30

Value is ` 2.30 and where b_2 represents the basis risk.

Basis Risk Versus Price Risk

We have already seen that the basis b is the difference between the cash or spot price
s and the futures price F

$$B_{t,T} = S_t - F_{t,T}$$

A change in the basis, therefore, is: $\Delta b_{t.T} = \Delta S_t - \Delta F_{t.T}$

Example: Suppose futures price on March 1 in cent per yen is 0.7800 and spot and futures prices when contract is closed out are 0.7200 and 0.7250, respectively.

Basis risk = 0.7200 07250 = - 0.0050

If the changes in futures and spot prices were assumed to be equal then there would be no change in the basis.

If $\Delta S_t = \Delta F_{t.T}$
Then $\Delta b_{t.T} = \Delta S_t - \Delta F_{t.T} = 0$

When changes in futures and cash price are not equal, which is normal in practice, then there will be basis risk. Thus, basis risk is defined as the variance of the basis, i.., σ^2 (b)
$_{t.T}$ which will be equal to
It can be rewritten as:

$$\sigma^2(b_{t.T}) = \sigma^2 S_t - F_{t.T})$$

$$\sigma^2(b_{t.T}) = \sigma^2 (S_t) + \sigma^2 (F_{t.T}) - 2\rho\sigma (S_t)\sigma (F_{t.T})$$

where σ^2 is the variance, or is the standard deviation and ρ is the correlation coefficient between the futures and spot price series. From the above, it is revealed that the basis risk is zero when the variances of the futures and cash prices are identical and the correlation coefficient between cash and futures prices equals to one. Let us explain this by an example. If the variance of futures and cash prices are both to ` 25 and there is perfect correlation between the spot and futures prices, i.e., $\rho = 1$, then

$$\sigma^2(b_{t,T})=25+25-2 \text{ x } 1x5x5=50-50=0$$

Let us further assume that there is perfect correlation between spot and futures prices (i.e. p# 1), and if it equals only 0.50, basis risk will not be zero. In that case the basis risk will be

$$\sigma^2 (b_{,T}) = 25 + 25-2 \text{ x } (0.5)(5)(5) =50-25=25$$

Similarly, a difference between the variance of the futures and cash prices will result in some basis risk. However, in real world situation, the magnitude of the basis risk depends mainly on the degree of correlation between cash and futures prices, i.e., the higher the correlation, the less the basis risk.

As we see that perfect correlation between the cash and futures prices is very rare, the hedgers, then, always assume some basis risk. So to reduce their exposure to price risk (or to the variance of spot prices), they must accept in return an exposure to basis risk. In brief, it is evident that for a hedge to be attractive, the basis risk should be significantly less than the hedger's price risk.

Hedging Effectiveness

As noted earlier that the objective of the hedging is to reduce the exposure to price risk, and so the hedgers trade price risk for basis risk. Thus, one measure of anticipated hedging effectiveness (H.E.) is to compare the basis risk with the price risk. The smaller the anticipated basis risk in comparison to the anticipated price risk, the more effective is the hedge. This can be stated as follows:

$$H.E. = 1 - \frac{\sigma^2 (b_{t.T})}{\sigma^2 (S_t)}$$

i.e., 1 minus the ratio of the expected variance of the basis to the expected variance of cash prices. This means that the closer the H.E., the more effective the hedge. However, H.E. is only a way of judging how good a particular hedge is likely to be a priori. It should not be confused with the concept of an optimal hedge.

Devising a HedgingStrategy

In this section, we will discuss the concepts and principles involved in designing a specific hedging strategy. So, different issues concerning to it like how to select a futures contract for hedging, how to determine and calculate the optimal hedge ratio, how to design and manage a hedging strategy and so on will be discussed.

Deciding on the Futures Contract

The basic objective of an hedging strategy is to minimize risk or to maximize hedging effectiveness. In this respect, the first step towards designing a particular hedging strategy is to decide about the futures contract to be undertaken. For this purpose, two aspects are considered: first, what kind of futures to use, and second, which contract month of that futures to be used.

Which Futures Contract

While deciding about the futures contract to be undertaken, the hedger must consider that the correlation between the cash and futures prices must be very high. When hedging an asset on which no futures contract is traded, the choice is more difficult. Thus, first starting point to select a futures contract is to select such assets which are inter-related. In other words, evaluating the correlation coefficients of various price risk associated with, for example, with jet fuel, heating oil, gasoline, crude oil, etc. Likewise, with gold we can use gold coins, bullion, silver, silver coins, etc.

Which Contract Month

The second important consideration in designing a hedging strategy is to select the contract month. We see that futures contracts

are available in the market of different months. So the selection of month of a futures contract will depend upon the such period where the futures and spot prices are highly correlated. Obviously, the prices of the near month contract are the most highly con-elated with cash price. Thus, using the near month futures contract will reduce basis risk (or variance of the basis) the most. Since it is seen that the variance of the basis increases as the price correlation between cash and futures price decreases. Hence, hedging with the near month futures contract is preferable because it minimizes the basis variation.

It should be noted that the principle of choosing the futures contract should be applied in the context of specific hedging situations. Matching cash and futures obligations in different situations will be another way of dominating or minimizing basis risk. This strategy, of course, will be useful only if the duration of a hedger's cash obligations is fixed and known in advance, and there exist a matching futures contract where the hedger can not estimate his cash obligation with certainty, then in this situation he will not be able to pursue a matching strategy, but may want to hedge continuously. Thus, hedging in a continuous cash obligation, there can be two alternatives:

- Hedging with a nearby futures and rolling the hedge forward,
- Hedging with a more distant futures contract, and rolling it less frequently.

Both the alternatives have their own mechanism depending upon the hedging objective. For example, using a more distant contract usually increases basis risk because its price will be less correlated with spot market prices. But the brokerage cost and other transaction costs will be more due to frequent sales and purchases in the market. No specific rule can be made to decide between these alternatives. However, the hedgers in most cases, prefer to hedge with a futures contract that has a high price correlation either with the near month or the second month contract.

Hedging Objectives

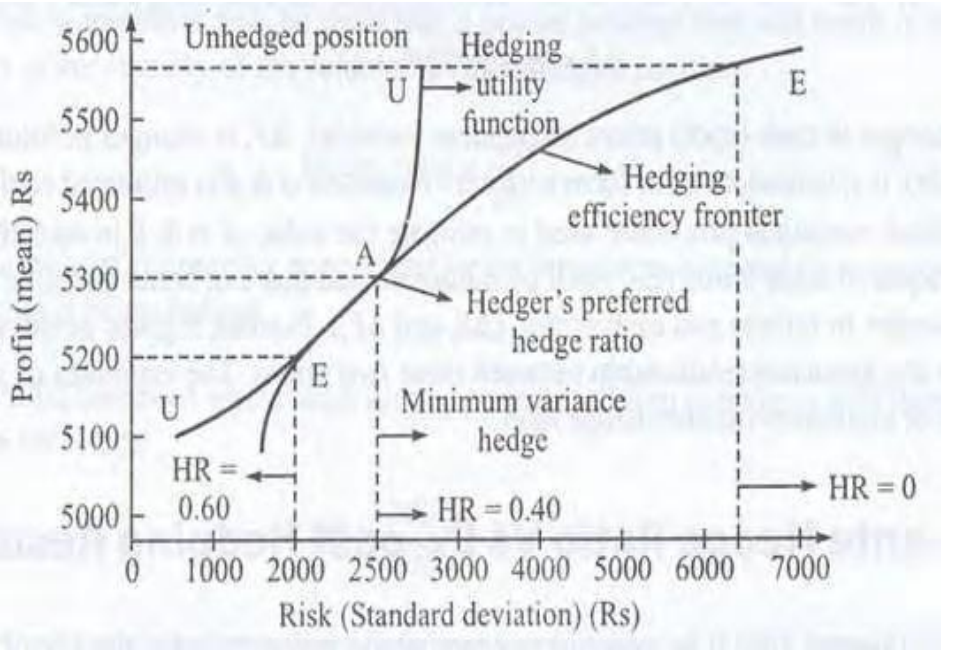
In the prior discussion of hedging strategies, we have assumed the only objective of hedging is to minimize the risk. However,

sometimes, the hedgers may be willing to assume more risk in order to earn more profit because eliminating all price risk will lead to eliminating the profit of the firm, which may not be good at all the time. Thus, the hedgers may use such hedging ratio other than the minimum-variance hedge ratio, or willingly may go for under hedging. Undoubtedly the decision relating to hedging ratio or how much to hedge will depend upon the hedger's risk preference. The lesser he hedges, the more risk he assumes. Not only this, the hedger may change his hedging strategy later on due to his strong belief about the futures price movements. So hedging objective is a relative concept and much depends upon the risk and return. In other words, it is the tradeoff between profits and risk reduction through hedging because it is observed that risk could be reduced but at the cost of lost profits.

Figure depicts trade off between risk and profit at the different level of hedge ratios. The hedger may choose the risk and return combination that he most prefers, or that he finds optimal. In this figure, line EE represents the hedging efficiency frontier: the most efficient combinations of risk and return that can be achieved by varying the hedge ratio. The line UU represents the highest level of utility which the hedger can achieve by hedging (being on the efficient frontier EE). The slope of UU represents how the hedger values change in risk relative to changes in profits. The value replaces on changes in risk versus changes in profit will determine his decision.

For example, at the point E, the hedge ratio is 0.60 where the expected profit is ` 5200 at ` 2000 standard deviation. Further, if he chooses the hedge ratio 0.40, by doing so he will increase risk to ` 2500 (by standard deviation). Point A where UU and EE touch (or tangent), indicates the hedger's optimal ratio ($\beta$= 0.40). This hedge strategy yields a profit of ` 5300 and a standard deviation of ` 2500, which yields a profit utility to the hedger.

In brief, the hedge can remain completely unhedged (β = 0), or can adopt the minimum- variance hedge (β = 0.60) yielding lower utility than that it would be at a hedge ratio of 0.40.



Management of the Hedge

After establishing an hedge, it is essential to manage it effectively. So regular monitoring and making adjustments are the key factors in managing of the hedge. There also needs to be a systematic evaluation of the effectiveness of the hedge relative to its anticipated (or excrete measure). Further, if the desired results are not being achieved from the hedging then the reasons should be identified and necessary steps be taken to improve hedge effectiveness in the futures. To manage effectively the hedging, following steps are taken:

Monitoring the Hedge

Continuous monitoring on the performance of an hedging is essential. For this purpose, the following information should be available regularly on an up-to-date basis:

Stock index futures

The Concept of Stock Index

Before discussing the concept of stock index futures, we should know about the term stock index. A stock index or stock market index is a portfolio consisting of a collection of different stocks. In others words, a stock index is just like a portfolio of different securities' proportions

traded on a particular stock exchange like NIFTY S&P CNX traded on National Stock Exchange of India, the S&P 500 Index is composed of 500 common stocks, etc. These indices provide summary measure of changes in the value of particular segments of the stock markets which is covered by the specific index. This means that a change in a particular index reflects the change in the average value of the stocks included in that index. The number of stocks included in a particular index may depend upon its objective, and thus, the size varies index to index. For example, the number of stocks included in SENSEX is 30 whereas 500 stocks are covered in Standard and Poor's 500. There are, however, some common features of these stock indices which are as under:

Common Features

1. A stock index contains a specific number of stocks, i.e., specification of certain sector number of stocks like 30, 50, 100, 200, 500 and so on.
2. Selection of a base period on which index is based. Starting value of base of index is set to large round like 100, 1000, etc.
3. The method or rule of selection of a stock for inclusion in the index to determine the value of the index.
4. There are several methods commonly used to combine the prices of individual stock like arithmetic average, weighted average, etc.
5. There are three types of index construction like price weighted index, return equally weighted index and market capitalization weighted index.
6. A stock index represents the change in the value of a set of stocks which constitute the index. Hence, it is a relative value expressed as weighted average of prices at a specific date.
7. The index should represent the market and be able to represent the returns obtained by a typical portfolio of that market.
8. A stock index acts as a barometer for market behaviour, a benchmark for portfolio performance. Further, it also reflects the changing expectations about the market.
9. The index components should be highly liquid, professionally maintained and accurately calculated. In the present section, we will not discuss the mechanism of construction of a stock index. However, it is beneficial to understand thoroughly the details of construction of an stock index particularly in which the investor is interested to trade.

Because when the differences and interrelationships among the indexes are understood, it will be easier to understand the differences among the futures contracts that are based on those indexes.

Stock Index Futures

A stock index futures contract, in simple terms, is a futures contract to buy or sell the face value of a stock index.

Diversity of indexes, Thursday, May 28, 1998*. Range for underlying indexes

	High	Low	Close	Net Chg.	From Dec. 31	% Chg.
Di Indus (DJX)	89.93	89.01	89.70	+0.33	+10.82	+13.4
Di Trans (DTX) DJ	395.89	331.19	333.70	+0.45	+8.05	+2.5
Util (DUX)	281.15	277.03	280.78	+3.36	7.71	+2.8
S&P 100 (OEX)	535.08	530.41	534.04	+2.04	+74.10	+16.1
S&P 500 -AM. (SPX)	1009.73	1089.06	1097.59	+5.36	+127.16	+13.1
CB-Tech (TXX)	256.92	253.34	254.86	-0.59	+39.07	+18.1
CB-Mexico (MEX)	105.55	104.22	104.53	-0.78	-22.45	-17.7
CB-Lps Mex (VEX)	10.56	10.42	10.45	-0.08	-2.25	-17.7
MS Multinti (NFT)	603.64	598.34	601.76	+1.14	+70.21	+13.2
GSTI Comp (GTC)	171.36	169.07	170.31	+0.05	+26.85	+18.7
Nasdaq 100 (NDX)	1218.16	1200.24	1214.83	+5.37	+224.03	+22.6
NYSE (NYA)	567.91	562.67	567.10	+3.17	+55.91	+10.9
Russell 2000 (RUT)	455.81	450.26	455.81	+5.55	+18.79	+4.3
Lps S&P 100 (OEX)	107.02	106.08	106.81	+0.41	+14.82	+16.1
Lps S&P 500 (SPX)	109.97	108.91	109.76	+0.54	+12.72	+13.1
S&P Midcap (MID)	358.63	354.91	358.52	+3.58	+25.15	+7.5

Major Mkt (XMl)	945.83	936.61	943.38	+4.10	+106.53	+12.7
HK Fltg (HKO)	173.78	173.78	173.78	-2.02	-40.78	-19.0
HK Fixed (HKD)	-	-	174.17	-2.02	-40.87	-19.0

1W Internet (LIX)	326.39	319.28	324.65	+1.64	+64.40	+24.8
AM-Mexico (MXY)	119.33	117.23	117.41	-1.38	-24.12	-17.0
Institut'I-A.M. (XII)	610.44	604.79	608.96	+1.89	-441.20	-42.0
Japan (JPN)	-	-	163.33	+1.31	+5.69	+3.6
MS Cyclical (CYC)	529.65	525.83	527.92	+0.30	+52.91	+11.1
MS Consumr (CMR)	495.33	489.82	494.52	+3.87	+48.88	+11.0
MS Hi Tech (MSH)	556.41	547.79	552.87	-0.26	+105.35	+23.5
Pharma (DRG)	632.15	626.09	628.92	-2.60	+95.18	+17.8
Biotech (BTK)	164.28	160.72	163.67	+2.38	+1.25	+0.8
Comp Tech (XCI)	523.40	516.06	518.55	-2.10	+79.56	+18.1
Gold/Silver (XAU)	76.73	74.90	76.29	+1.49	+2.10	+2.8
OTC (XOC)	881.56	869.79	879.12	+3.23	+141.17	+19.1
Utility (UTY)	308.88	304.45	308.86	+4.39	-1.17	-0.4
Value Line (VLE)	951.89	942.89	951.24	+8.21	+74.40	+8.5
Bank (BKX)	844.09	835.97	842.70	+4.80	+87.35	+11.6
Semicond (SOX) Top	271.09	265.43	267.75	+1.09	+4.12	+1.6
100 (TPX)	1046.94	1037.26	1044.39	+3.59	+134.77	+14.8
Oil Service (OSX)	104.67	100.79	104.67	+1.90	-9.70	-8.5
PSE Tech (PSE)	336.20	332.14	335.05	+1.98	+44.49	+15.3

* *Source:* The Wall Street Journal, May 29, 1998.

American Standard and Poor's 500 index, although recently there has been remarkable growth in the stock index futures trading all over the world. The changes of stock index futures prices are very similar to that of the underlying stock index. This has been observed by the various studies conducted in this respect. Comparing the returns on futures indexes and cash indexes, it has been found that there is very little difference between these two indexes. However, the volatility of the futures indexes is somewhat greater than the cash stock indexes.

The Standard and Poor's 500 (S & P500) index is based on a portfolio of 500 different stocks: 400 industrials, 40 utilities, 20 transportation and 40 financials. The weights of the stocks in portfolio at any given time reflect the stock's total market capitalization. (Stock price x No. of shares outstanding). The index accounts for about 80 percent of market capitalization of all the stock listed on New York Stock Exchange.

Specification of Stock Index Futures Contracts

All the stock index futures contracts are traded on the specified stock exchanges. For example, Standard and Poor's 500 Futures contract has the following specifications:

Standard and Poor's 500 futures contract specifications

Contract :	Standard and Poor's 500
index Exchange	:Chicago Mercantile Exchange
Quantity :	$500 times the S&P 500 index
Delivery months	:March, June, September,
December	

Delivery specifications :Cash settlement according to the value of the index at the opening on the Friday after the last day of trading
Minimum price movements :0.05 index points, or $25 per contract

In India, both the BSE and the NSE have introduced one month contracts on the sensex and NIFTY respectively. At any point of time, index futures of different maturities would trade simultaneously on the exchanges. Both BSE and NSE have introduced three contracts on BSE sensitive index for one, two and three months\maturities. Tick size on BSE has proposed of 0.1 index point for trading in sensex futures. Every index point for trading of sensex contract is priced at ` 50,0.1 point would be equivalent to ` 5.

Settlement Procedures or Delivery

Stock index futures are nearly always settled for cash delivery, in contrast to most futures contracts where physical delivery of an underlying asset is called for. Thus, in the stock index futures contract,

no physical delivery (shares or securities certificates) are delivered by the seller (short). This means that all the futures positions which are open at the close of the final trading day of the futures contract are settled by a cash transfer. This amount is determined by reference to the cash price at the close of trading in the cash market in the last trading day in the futures contract. Probably the stock index futures were the first to employ cash settlement as a substitute for physical delivery. The reason being that it is very difficult to deliver (for example the 500 proportions of various stocks in S&P Index 500) all the stocks which is more cumbersome and costly than the cash settlement. Further, if any investor is interested in actual delivery of a stock, he can easily purchase the same from the cash market. Hence, the settlement in futures index contracts is convenient and less costly. Further the effect of the cash settlement forces the futures prices of stock index futures to be identical to the cash stock index at the settlement.

The Stock Index Futures Prices

Stock index futures, like most other financial futures, are also traded in a full carry market. It means that cost-of-carry model provides (which we have been already discussed in detail in previous lessons) a virtually complete understanding of the stock index futures pricing. As per this, futures price must be equal to the spot price plus other cost of carrying charges, and if the conditions of this model are not fulfilled or violated then arbitrage opportunities will arise. A trader (or investor) would buy the stocks that underlie the futures contract and sell the futures and will carry the same until the futures expiration. When the stocks are priced very low relative to the futures, the cash-and-carry strategy is attractive. We have already seen previously that the basic cost-of-carry model for a perfect market with unrestricted short selling is as follows:

$$F_{t.T} = S_t \ (1 + C)$$

where F_{tT} futures price at t for delivery at futures time T, S is spot price at time t (today or current) and C is the percentage cost of carrying the asset from t (current) to T (futures). This model can be applied to the stock index futures contracts with some little modifications.

CHAPTER V

FINANCIAL DERIVATIVES MARKET IN INDIA

Introduction

The individuals and the corporate sector units are freely using derivatives, also popularly known as future market instruments, in most of the developed countries of the world to manage different risks by the individuals and the corporate sector units. Emerged in 1970s, the derivatives markets have seen exponential growth and trading volumes have nearly doubled in every three years, making it a multi- trillion dollar business market. The future markets in various segments have developed so much that now one cannot think of the existence of financial markets without the derivatives instruments. In other words, the derivatives markets whether belonging to commodities or financials have become, today, an integral part of the financial system of a country. The Indian financial markets indeed waited for too long for derivatives trading to emerge. The phase of waiting is over. The statutory hurdles have been cleared. Regulatory issues have been sorted out. Stock exchanges are gearing up for derivatives. Mutual funds, foreign institutional investors, financial institutions, banks, insurance companies, investment companies, pension funds and other investors who are deprived of hedging opportunities now find the derivatives market to bank on. They would find very soon all other important derivatives instruments in the Indian financial markets to manage their portfolios and associated risks.

Need for Derivatives

Today's sophisticated international markets have helped foster the rapid growth in derivative instruments. In the hands of knowledgeable investors, derivatives can derive profit from:

- Changes in interest rates and equity markets around the world
- Currency exchange rate shifts
- Changes in global supply and demand for commodities such as agricultural products, precious and industrial metals, and energy products such as oil and natural gas

Adding some of the wide variety of derivative instruments available to a traditional portfolio of investments can provide global diversification in financial instruments and currencies, help hedge against inflation and deflation, and generate returns that are not correlated with more traditional investments. The two most widely recognized benefits attributed to derivative instruments are **price discovery** and **risk management**.

1. Price Discovery

Futures market prices depend on a continuous flow of information from around the world and require a high degree of transparency. A broad range of factors (climatic conditions, political situations, debt default, refugee displacement, land reclamation and environmental health, for example) impact supply and demand of assets (commodities in particular) - and thus the current and future prices of the underlying asset on which the derivative contract is based. This kind of information and the way people absorb it constantly changes the price of a commodity. This process is known as price discovery.

- With some futures markets, the underlying assets can be geographically dispersed, having many spot (or current) prices in existence. The price of the contract with the shortest time to expiration often serves as a proxy for the underlying asset.
- Second, the price of all future contracts serve as prices that can be accepted by those who trade the contracts in lieu of facing the risk of uncertain future prices.
- Options also aid in price discovery, not in absolute price terms, but in the way the market participants view the volatility of the markets. This is because options are a different form of hedging in that they protect investors against losses while allowing them to participate in the asset's gains.

2. Risk Management

This could be the most important purpose of the derivatives market. Risk management is the process of identifying the desired level of risk, identifying the actual level of risk and altering the latter to equal the former. This process can fall into the categories of hedging and

speculation.

Hedging has traditionally been defined as a strategy for reducing the risk in holding a market position while speculation referred to taking a position in the way the markets will move. Today, hedging and speculation strategies, along with derivatives, are useful tools or techniques that enable companies to more effectively manage risk.

3. They Improve Market Efficiency for the Underlying Asset

For example, investors who want exposure to the S&P 500 can buy an S&P 500 stock Index fund or replicate the fund by buying S&P 500 futures and investing in risk-free bonds. Either of these methods will give them exposure to the index without the expense of purchasing all the underlying assets in the S&P 500. If the cost of implementing these two strategies is the same, investors will be neutral as to which they choose. If there is a discrepancy between the prices, investors will sell the richer asset and buy the cheaper one until prices reach equilibrium. In this context, derivatives create market efficiency.

4. Derivatives Also Help Reduce Market Transaction Costs

Because derivatives are a form of insurance or risk management, the cost of trading in them has to be low or investors will not find it economically sound to purchase such "insurance" for their positions

Evolution of Derivatives in India

In India, commodity futures date back to 1875. The government banned futures trading in many of the commodities in the sixties and seventies. Forward trading was banned in the 1960s by the Government despite the fact that India had a long tradition of forward markets. Derivatives were not referred to as options and futures but as ‘tezi- mandi’. In exercise of the power conferred on it under section 16 of the securities contracts (regulation), the government by its notification issued in 1969 prohibited all forward trading in securities. However, the forward contracts in the rupee dollar exchange rates (foreign exchange market) are allowed by the reserve bank and used on a fairly large scale. Futures trading are permitted in 41 commodities. There are 1 8 commodity exchanges in India. The forward markets commission, under the ministry of food and consumer

affairs, act as a regulator.

In the case of capital markets, the indigenous 125-year-old Badla system was very popular among the broking community. The advent of foreign institutional investors in the nineties and a large number of scams led to a ban on Badla. The foreign institutional investors (FIIs) were not comfortable with the system and they insisted on adequate risk management tools. Hence, the Securities Exchange Board of India (SEBI) decided to introduce financial derivatives in India. However, there were many legal hurdles, which had to be overcome before introducing financial derivatives. The preamble of Securities Contract (Regulations) Act was to prevent undesirable transactions in securities by regulating business of dealing therein, by prohibiting options, and by proving for certain other matters connected therewith. Section 20 of the act explicitly prohibits all options in securities. The first step, therefore, was to withdraw all these prohibitions and make necessary amendments in the act. The securities Law (Amendment) Ordinance, 1995, promulgated on January 25, 1995, withdrew the prohibition on options in securities. This has opened the possibility of starting options trading in India. The market for derivatives, however, did not take off, as there was no regulatory framework to govern trading of derivatives. Hence, SEBI set up a committee under the chairmanship of Dr. L C Gupta on November 18, 1996, to develop a regulatory framework for derivatives trading in India. The committee submitted its report on March 17, 1998.

The committee recommended that derivatives should be declared as 'securities' so that regulatory framework applicable to trading of securities could also govern the trading of derivatives. SEBI also set up a group in June 1998 under the chairmanship of Prof. J. R. Varma, to recommend measures for risk containment in derivatives market in India.

The report, which was submitted in October 1998, worked out the operational details of margining system, methodology for charging initial margins, broker net worth, deposit requirement and real-time monitoring requirements. The major recommendations of this committee were accepted by SEBI in March 1999.

On the recommendations of L C Gupta Committee, the Securities Contract Regulation Act (SCRA) was amended in Dec. 1999 to include

derivatives in the ambit of 'securities' and the regulatory framework was developed for governing derivatives trading. The act also made it clear that derivatives should be legal and valid if such contracts are traded on a recognized stock exchange, thus precluding OTC derivatives. The Government also rescinded in March 2000, the three-decade old notification, which prohibited forward trading in securities.

Derivatives trading formally commenced in June 2000 on the two major stock exchanges, BSE and NSE. Futures trading based on the Sensex commenced at the BSE on June 9, 2000, while futures trading based on S&P CNX Nifty commenced at the NSE on June 12, 2000.

SEBI setup a technical group to lay down the broad framework for risk management of index options. The trading in Index options commenced in June 4, 2001. The options on individual stocks were introduced in July 4, 2001 and that stocks were followed by futures on individual stocks in Nov. 9, 2001. Now, the National Stock Exchange is the leading stock exchange for both equity and derivatives trading in India. The Board of SEBI, on May 11, 1998, accepted the recommendations of the Dr. L.C. Gupta Committee and approved introduction of derivatives trading in India in the phased manner. The recommendation sequence is stock index futures, index options and options on stocks. The Board also approved the 'Suggestive Bye-Laws' recommended by the Committee for regulation and control of trading and settlement of derivatives contracts in India. Subsequently, the SEBI appointed J.R. Verma Committee to look into the operational aspects of derivatives markets. To remove the road-block of non-recognition of derivatives as securities under Securities Contract Regulation Act, the Securities Law (Amendment) Bill, 1999 was introduced to bring about the much needed changes. Accordingly, in December, 1999, the new framework has been approved and 'Derivatives' have been accorded the status of 'Securities'. However, due to certain completion of formalities, the launch of the Index Futures was delayed by more than two years. In June, 2000, the National Stock Exchange and the Bombay Stock Exchange started stock index based futures trading in India. Further, the growth of this market did not take off as anticipated. This is mainly attributed to the low awareness about the product and

mechanism among the market players and investors. The volumes, however, are gradually picking up due to active interest of the institutional investors.

Major Recommendations of Dr. L.C. Gupta Committee

Before discussing the emerging structure of derivatives markets in India, let us have a brief view of the important recommendations made by the Dr. L.C. Gupta Committee on the introduction of derivatives markets in India. These are as under:

The Committee is strongly of the view that there is urgent need of introducing of financial derivatives to facilitate market development and hedging in a most cost- efficient way against market risk by the participants such as mutual funds and other investment institutions.

There is need for equity derivatives, interest rate derivatives and currency derivatives.

Futures trading through derivatives should be introduced in phased manner starting with stock index futures, which will be followed by options on index and later options on stocks. It will enhance the efficiency and liquidity of cash markets in equities through arbitrage process.

There should be two-level regulation (regulatory framework for derivatives trading), i.e., exchange level and SEBI level. Further, there must be considerable emphasis on self-regulatory competence of derivative exchanges under the overall supervision and guidance of SEBI.

The derivative trading should be initiated on a separate segment of existing stock exchanges having an independent governing council. The number of the trading members will be limited to 40 percent of the total number. The Chairman of the governing council will not be permitted to trade on any of the stock exchanges.

The settlement of derivatives will be through an independent clearing Corporation/ Clearing house, which will become counter-party for all trades or alternatively guarantees the settlement of all trades. The

clearing corporation will have adequate risk containment measures and will collect margins through EFT.

The derivatives exchange will have on-line-trading and adequate surveillance systems. It will disseminate trade and price information on real time basis through two information vending networks. It should inspect 100 percent of members every year.

There will be complete segregation of client money at the level of trading/clearing member and even at the level of clearing corporation.

The trading and clearing member will have stringent eligibility conditions. At least two persons should have passed the certification programme approved by the SEBI.

The clearing members should deposit minimum ` 50 lakh with clearing corporation and should have a net worth of ` 3 crore.

Removal of the regulatory prohibition on the use of derivatives by mutual funds while making the trustees responsible to restrict the use of derivatives by mutual funds only to hedging and portfolio balancing and not for specification.

The operations of the cash market on which the derivatives market will be based, needed improvement in many respects.

Creation of a Derivation Cell, a Derivative Advisory Committee, and Economic Research Wing by SEBI.

Declaration of derivatives as 'securities' under Section 2 (h) of the SCRA and suitable amendments in the notification issued by the Central Government in June, 1969 under Section 16 of the SCRA.

The SEBI Board approved the suggested Bye-Laws recommended by the L.C. Gupta Committee for regulation and control of trading and settlement of derivatives contracts.

Explanation of Some Important Terms Used in the Committee's Recommendations Derivatives Concept

A derivative product, or simply 'derivative', is to be sharply distinguished from the underlying cash asset. Cash asset is the asset

which is bought or sold in the cash market on normal delivery terms. Thus, the term 'derivative' indicates that it has no independent value. It means that its value is entirely 'derived' from the value of the cash asset. The main point is that derivatives are forward or futures contracts, i.e., contracts for delivery and payment on a4pecified future date. They are essentially to facilitate hedging of price risk of the cash asset. In the market term, they are called as 'Risk Management Tools'.

Financial Derivatives – Types

Though the Committee was mainly concerned with equity based derivatives but it has tried to examine the need for derivatives in a broad perspective for creating a better understanding and showing inter-relaionship.

Broadly, there are three kinds of price risk exposed to a financial transaction, viz.

Exchange rate risk, a position arisen in a foreign currency transaction like import, export, foreign loans, foreign investment, rendering foreign services, etc.

Interest rate risk, as in the case of fixed-income securities, like treasury bond holdings whose market price could fall heavily if interest rates shot up

Equities', 'market risk', also called 'systematic risk'—a risk which cannot be diversified away cause the stock market as a whole may go up or down from time to time

The above said classification indicates towards the emergence of three types of financial derivatives namely currency futures, interest rate futures and equity futures. As both forward contracts and futures contracts can be used for hedging, but the Committee favours the introduction of futures wherever possible.

Forward contracts are presently being used in India to provide forward cover against exchange rate risk. Currency and interest rate futures lie in the sphere of Reserve Bank of India (RBI).

The Dr. L.C. Gupta Committee recognizes that the basic principles underlying the organization, control and regulation of markets of all kinds

of financial futures are the more or less same and that the trading infrastructure may be common or separate, partially or wholly. The Committee is of further opinion that there must be a formal mechanism for coordination between SEBI and RBI in respect of financial derivatives markets so that all kinds of overlapping of jurisdiction in respect of trading mechanism, be removed. Financial derivatives markets in India have been developed so far in three important instruments like equity, interest and currency. First one is regulated by the SEBI, whereas other two are controlled by the RBI. The markets of these instruments are in their preliminary stage.

Equity Derivatives

Dr. L.C. Gupta Committee considered in its study both types of equity like stock index derivatives and individual stocks derivatives. At the international level, stock index derivative is more popular than the individual stock. The Committee found in its survey that index futures are more preferable than individual stock from the respondents. The order of over-all preference in India as per the survey of the Committee, was as follows:

Stock index futures

Stock index options

Individual stock options

Individual stock futures.

Basic Reasons for the Preference of Stock Index Futures

Not only in India, in other countries too, is stock index futures most popular financial derivatives due to the following reasons:

Institutional investors and other large equity holders prefer the most this instrument in terms of portfolio hedging purpose.

Stock index futures are the most cost-efficient hedging device whereas hedging through individual stock futures is costlier as observed in other countries.

Stock index futures cannot be easily manipulated whereas individual stock price can be exploited more easily in India it is rather easier to play

this game as witnessed in the past scams.

This is in fact that due to a limited supply of an individual stock, supply can easily be cornered even in large companies in India like Reliance Industries, State Bank of India, etc. The Management of these companies has complained many times about their share prices being manipulated by some interested parties. On the other hand, the supply of stock index futures is unlimited, and hence, the possibility of cornering is ruled out. In fact, the manipulation of stock index futures can be possible only of the cash prices of each component securities in the index be influenced, which is rare and not so high.

It is observed from the experiences of other countries that stock index futures are more liquid, more popular and favorable than individual stock futures. The same is also witnessed by the L.C. Gupta Committee in its survey from the responses of the respondents.

Since, stock index futures consists of many securities, so being an average stock, is much less volatile than individual stock price. Further, it implies much lower capital adequacy and margin requirements in comparison of individual stock futures.

In case of stock index futures trading, there is always clearing house guarantee, so the chances of the clearing house going to be bankrupt is very rare, and hence, it is less risky.

Another important reason is that in case of individual stocks, the outstanding positions are settled normally against physical delivery of the shares. Hence, it is necessary that futures and cash prices remained firmly tied to each other. However, in case of stock index futures, the physical delivery is almost impractical, and they are settled in cash all over the world on the premise that index value, as independently derived from the cash market, is safely accepted as the settlement price.

Lastly, it is also seen that regulatory complexity is much less in the case of stock index futures in comparison to other kinds of equity derivatives. In brief, it is observed that the stock index futures are more safer, popular and attractive derivative instrument than the individuals stock. Even in the US market, the regulatory framework does not allow

use of futures on the individual stocks. Further only very few countries of world, say one or two, have futures trading on individual stock.

Strengthening of Cash Market

The Dr. L.C. Gupta Committee observed that for successful introduction of futures market in any country, there must be a strong cash market because derivatives extract their value from the cash asset. The constant feedback between these two markets through arbitrage will keep these markets in alignment with each other. The Committee noted certain weaknesses of the Indian equities markets which should be taken care for success of the futures trading in India. A few important weaknesses observed are as under:

Mixing of Cash and Forward Transactions

1) There is queer mixture of cash and future transactions in the Indian stock markets. For example, cash transactions (involving delivery), in most active scripts, deliveries are just around 5 per cent of the trading volume whereas in many others, it is just, 20-30 percent. In fact, the dominant cash transactions are the non-delivery which are the equivalent of futures/forward transactions.
2) It is further noted that the above said mixed system (cash-cum-carry forward) is not very sound for futures trading because (i) no transparency in the carry forward system, (ii) the influence of fundamental factors is not so strong due to dominance of short term speculation and (iii) creating a future market on such basis may have the effect of compounding the existing weaknesses.
3) The Committee is of the view that there must be separation between cash market and futures market. It will promote the markets economic efficiency. This has led to the adoption of the rolling settlement system because in this way, cash market will function as genuine cash markets but no carry forward. Even futures market does not permit carry forward from one settlement to another in the way practiced in India.
4) The trading in Indian stock market was shifted to rolling settlement recently where always emphasized for settlement by delivery. But in India, 'squaring up or closing' business (i.e. offsetting of buying and selling transactions within the settlement) is accounted for in bulk which is not appropriate for futures trading.

Differences in Trading Cycles among Stock Exchanges

Indian stock exchanges, now, most of them, have a weekly trading cycle but the cycles are not uniform. For example, NSE has from Wednesday to Tuesday and BSE has from Monday to Friday. Due to difference in trading cycles, the brokers who have membership in both the exchanges can easily go on circulating their trades from one exchange to the other without ever having to delivery. Such situation is a complete travesty of the cash market and an abuse to the stock market system.

It seems that in Indian stock markets, the different trading cycles have been kept with a vested interest in order to deliberately generate arbitrage opportunities, it is seen that due to this, the prices for the same securities on two (NSE and BSE) stock exchanges differ from 0.5 to 1.5 percent even it is larger on expiration days. The Committee feels that the different cycles serving the interest of only speculators and not of genuine investors. Even it is not good for market development and futures trading.

It is also noted, that the prices of various securities on both exchanges (NSE and BSE), sometimes are not the same. As a result, the value of the stock indices on both the exchanges will not be same, if computed separately from the NSE and BSE prices. This will create a problem in valuation of future market stock.

The Committee also noted that for a successful future trading, a coordinated but pro-competitive nationwide market system be achieved. So it is suggested that before implementing a uniform trading cycle system among all exchanges, till such time the rolling settlement system can be adopted. This system will provide ‘a sound and reliable basis for futures trading in India.

Weakness of Stock Exchange Administrative Machinery

The Dr. L.C. Gupta Committee members were of the strong opinion that for successful derivatives trading on the stock exchanges, there must be stringent monitoring norms and match higher standard of discipline, than in the present, be maintained. Though the SEBI has already made a good efforts but much more still is to be done

specifically in the controlling of trading members.

Inadequate Depository System

The Committee is of the view that all such securities which are composing in stock index and used for stock index futures, should necessarily be in depository mode. As observed earlier, settlement problems of the cash market may weaken the arbitrage process by making it risky and costly. Since, index based derivatives trading does not itself involve deliveries, it will increase the arbitrage trading between cash and index derivatives markets. The arbitrage process keeps the two markets in alignment. Thus, due to this reason, it is essential for successful futures trading that all the scripts of the particular stock index futures must be in the depository mode. Hence, depository scripts in India should be enhanced. The Committee has no doubt that the creation of futures markets by introducing the financial derivatives, including equity futures, currency futures and interest rate futures would be a major step towards the further growth and development of the Indian financial markets provided that the trading must be cost-efficient and risk hedging facilities.

Long Answer type Questions

Explain the term financial derivative. What are its different types of derivatives as given under SEBI guidelines? Explain them.

C1early bring out the need of derivatives market in India with suitable arguments in favor and disfavor.

Discuss the growth of financial derivatives in India, in the light of major recommendations of Dr. L.C. Gupta Committee on derivatives trading.

"Derivatives are considered as most important tools used by organization to hedge their risks." Comment on this statement with suggestions.

Explain the important recommendations of Dr. L.C. Gupta Committee regarding derivative trading in India with suitable examples.

Benefits of Derivatives in India

During December, 1995, the NSE applied to the SEBI for permission to undertake trading in stock index futures. Later SEBI

appointed the Dr. L.C. Gupta Committee, which conducted a survey amongst market participants and observed an overwhelming interest in stock index futures, followed by other derivatives products. The LCGC recommended derivatives trading in the stock exchanges in a phased manner. It is in this context SEBI permitted both NSE and BSE in the year 2000 to commence trading in stock index futures. The question, therefore, becomes relevant—what are the benefits of trading in Derivatives for the country and in particular for choosing stock index futures as the first preferred product?

Following are some benefits of derivatives

1. India's financial market system will strongly benefit from smoothly functioning index derivatives markets.
2. Internationally, the launch of derivatives has been associated with substantial improvements in market quality on the underlying equity market. Liquidity and market efficiency on India's equity market will improve once the derivatives commence trading.
3. Many risks in the financial markets can be eliminated by diversification. Index derivatives are special in so far as they can be used by the investors to protect themselves from the one risk in the equity market that cannot be diversified away, i.e., a fall in the market index. Once the investors use index derivatives, they will stiffer less when fluctuations in the market index take place.
4. Foreign investors coming into India would be more comfortable if the hedging vehicles routinely used by them worldwide are available to them.
5. The launch of derivatives is a logical next step in the development of human capital in India. Skills in the financial sector have grown tremendously in the last few years. Thanks to the structural changes in the market, the economy is now ripe for derivatives as the next area for addition of skills.

Categories of Derivatives Traded in India

- Commodities futures for coffee, oil seeds, and oil, gold, silver, pepper, cotton, jute and jute goods are traded in the commodities

futures. Forward Markets Commission regulates the trading of commodities futures.

- Index futures based on Sensex and NIFTY index are also traded under the supervision of Securities and Exchange Board of India (SEBI).
- The RBI has permitted banks, Financial Institutions (F1's) and Primary Dealers (PD's) to enter into forward rate agreement (FRAs)/interest rate swaps in order to facilitate hedging of interest rate risk and ensuring orderly development of the derivatives market.
- The National Stock Exchange (NSE) became the first exchange to launch trading in options on individual securities. Trading in options on individual securities commenced from July, 2001.
- Options contracts are American style and cash settled and are available in about 40 securities Stipulated by the Securities and Exchange Board of India.
- The NSE commenced trading in futures on individual securities on November 9, 2001. The futures contracts are available in about 31 securities stipulated by SEBI. The BSE also started trading in stock options and futures (both Index and Stocks) around at the same time as the NSE.
- The National Stock Exchange commenced trading in interest rate future on June 2003. Interest rate futures contracts are available on 91-day 1-bills, 10-year bonds and 10-year zero coupon bonds as specified by the SEBI.

Table Calendar of Introduction of Derivatives Products in Indian Financial Markets

Calendar of Introduction of Derivatives Products in Indian Financial Markets

OTC	Exchange traded
1980s—Currency forwards	June, 2000—Equity index futures
1997—Long term foreign currency-rupee	June, 2001—Equity index option

swaps	
July, 1999—Interest rate swaps and FRAs.	July, 2001—Stock option
July, 2003—FC-rupee options	June, 2003—Interest rate futures

Source: www.derivativesportal.com

Financial Derivatives in India: A Chronology

DerivativesTrading at NSE/BSE

The most notable of development in the history of secondary segment of the Indian stock market is the commencement of derivatives trading in June, 2000. The SEBI approved derivatives trading based on futures contracts at National Stock Exchange (NSE) and Bombay Stock Exchange (BSE) in accordance with the rules/bye-laws and regulations of the stock exchanges. To begin with, the SEBI permitted equity derivatives named stock index futures. The BSE introduced on 9 June, 2000 stock index futures based on the sensitive Index (also called SENSEX comprising 30 scripts) named BSX, and NSE started on June 12 2000 stock index future based on its index S&P CNX NIFTY (comprised 50 scripts) in the name of N FUTIDX NIFTY. Further details of these are given in Table.

Salient Features of Index Futures Contracts at BSE and NSE

Sl. No	Items	BSE	NSE
1	Date of introduction	June 9, 2000	June 12, 2000
2	Name of security	BSX	N FUTJDX NIFTY S&P
3	Underlying asset	BSE Sensitive (SENSEX)	CNX NIFTY
4	Contract size	Sensex value x 50	200 or multiples of 200
5	Tick size/Price step	0.1 point of Sensex	` 0.05

		(equivalent to ` 5)	
6	Minimum price fluctuations	` 5	Not applicable
7	Price bands	NA	NA
8	Expiration months	3-near months	3-near months
9	Trading cycle	A maximum of 3 months; the near month (I), the next month (2) and the a month (3)	As in previous column
10	Last trading/Expiry day	Last Thursday of the month or the preceding day	As in previous column
11	Settlement	In cash on *T+ 1* bas	As in previous column
12	Final settlement price	Index closing price on the last trading day (a)	Index closing price on the 1st trading day (s)
13	Daily settlement price	Closing of futures contract (a)(a)	Closing of future contract
14	Trading hours	9.30 am to 3.30 pm	-
15	Margin	Upfront margin on daily basis	As in previous column

- Computed on the basis of the weighted average of last 15 minutes trading.
- Computed on the basis of weighted average of the last 5 minutes, or if the no, of weighted average of last 5 trades.
- Weighted average price for the last half an hour's trade.

In India, stock index futures are available for one-month, two-month and three- month maturities. All the open positions in these contracts are settled daily. Further, the buyers and sellers are required to

deposit margin with the respective stock exchanges determined as per the SEBI guidelines. To facilitate the effective risk management in the derivatives segment, all the important measures like minimum net worth requirement for the broker, determination of margin based on value at risk model, position limit for various participants, mechanism for collection and enforcement of margin, etc. have been put in place. Subsequently, the derivative products range had been increased by including options and futures on the indices and on several highly traded stocks. In an estimate, the product wise turnover of derivatives on the Indian stock markets as on July 6, 2002 is stock futures (50%), index futures (2 1%), stock options (25%) and index option (4%). It means stock futures are most popular derivative traded at the stock market of India.

During the last decade, to make stock market functioning effective for futures trading, the SEBI has adopted several internationally tested and accepted mechanism for implementation at the Indian stock exchanges. For this, proper surveillance and risk containment like the circuit breaker, price bands, value at risk (VaR) based margin collections, etc. have been introduced. The SEBI set up a 'Technical Group' headed by Prof. J.R. Verma to prescribe risk containment measures for new derivative products. The group recommended the introduction of exchange traded options on Indices which is also conformity with the sequence of introduction of derivatives products recommended by Dr. L.C. Gupta Committee. The Technical Group has recommended the risk containment measure for exchange traded options on indices. The following are the important features of the risk containment framework for the trading and settlement of both index futures and index option contracts:

1. European style index options will be permitted initially. These will be settled in cash.
2. Index option contracts will have a minimum contract size of ` 2 lakh, at the time of its introduction.
3. The risk containment measures described hereunder are only for premium style European option.

4. Index option contract will have a maximum maturity of 12 months and a minimum of three strikes, i.e., in the money, near the money and out of the money.
5. A portfolio based margining approach, which would take an integrated view of the risk involved in the portfolio of individual client will be adopted. It is for the first time that such an approach is introduced in the Indian stock market. It is inconsistent with the practices followed in the countries. This approach will not only cover the risk but also help in reducing the transaction costs in derivatives.
6. The initial margin requirements will be based on worst case loss of a portfolio of an individual client to cover a 99% value at risk (Var) over a one day horizon. The initial margin requirement will be netted at level of individual client and it will be on gross basis at the level of Trading/Clearing member. Further, the initial margin requirement for the proprietary position of Trading/Clearing member will also be on net basis.
7. The short option minimum margin equal to 30% of the Notional value of all short index option will be charged if sum of the worst scenario loss and the calendar spread margin is lower than the short option minimums margin.
8. Net option value will be calculated on the current market value of the option times the number of options (positive for long options and negative for short options) in the portfolio. The net option value will be added to the Liquid Net Worth of the clearing member.
9. For option positions, the premium will be paid in by the buyer in cash and paid out to the seller in cash on T+ 1 day until the buyer pays in the premium due shall he deducted from the available Liquid Net Worth on a real time basis.

   In case of index futures contracts, the mark-to-market gains losses for index futures position will continue to be settled.

Contrary to international experience, the growth of derivatives market did not take off as anticipated. The value of trading has been

low. This is mainly attributed to the low awareness about the products and mechanism of trading among the market players and investors. SEBI's technical group on new derivative products has recently examined this issue and recommended the following measures for the development of derivatives market:

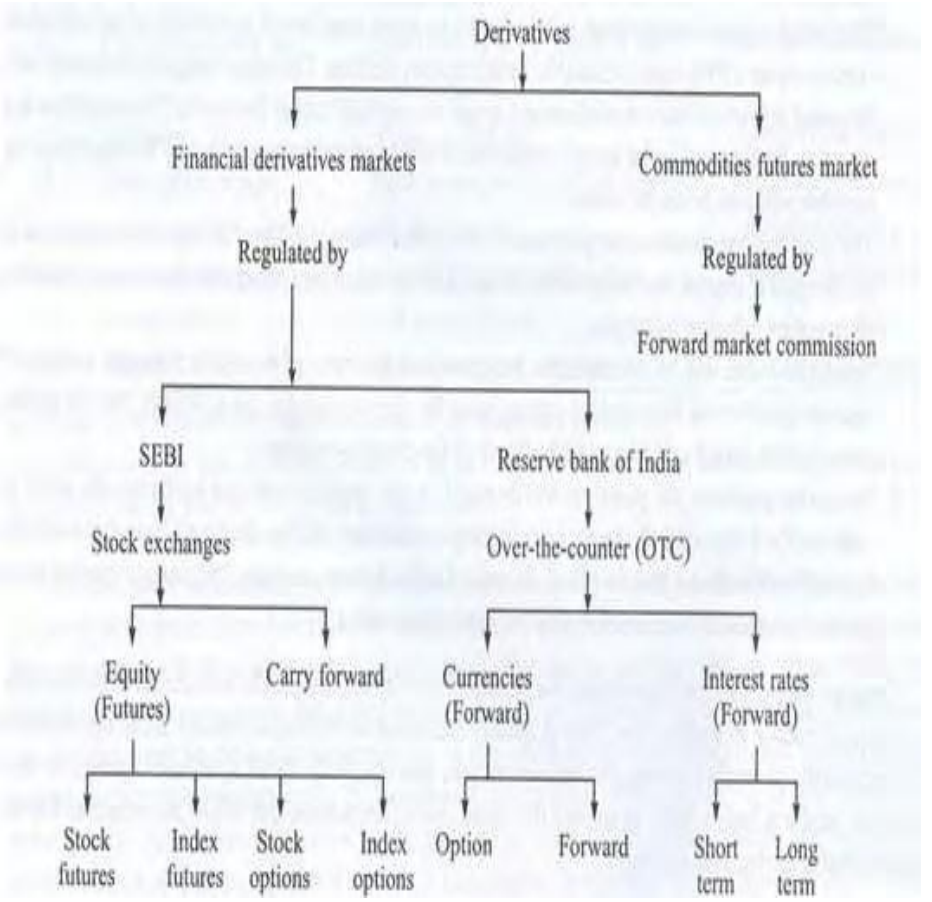
1. The system of sub-brokers be used for increasing the volume of trading in this market.
2. Financial institutions and mutual funds be permitted to sell short in the cash market for facilitating the free arbitrage between cash and derivatives market. However, such short sale may be restricted to the extent of corresponding exposure in the derivative market.
3. Arbitrage between cash and derivatives markets will assist in better price discovery in both the markets.

Countries like USA, UK and Singapore have reaped considerably economic benefit from foreign participation in their futures markets. Foreign participation in futures markets hedge the potential to act as a substantial 'invisible earner' of foreign exchange. Earlier the SEBI and the RBI both were hesitant to allow the foreign institutional investors (FITs) for trading in the futures markets.

However, recently the RBI has allowed FITs to trade in derivatives market subject to the condition that the overall open position of the FIT shall not exceed 100 percent of the market value of the concerned FII's total investment. As per the recent notification of the Central Government, SEBI and RBI will jointly examine the issues concerning trading in financial derivatives by FIs and FII (s).

Eligibility of Stocks

The SEBI board has initially approved the introduction of single stock futures contract on 31 stocks on which option contracts have been introduced on BSE and NSE. A list of these has been given in Table. The Advisory Committee on Derivatives of the SEBI shall review the eligibility criteria for introduction of futures and options on any other stock from time to time. A brief structure in general relating to financial derivatives operating in India has been shown in Fig.



Structure of derivatives markets in India.

Emerging Structure of Derivatives Markets in India

Derivatives markets in India can be broadly categorized into two markets namely; financial derivatives markets and commodities futures markets. Financial derivatives markets deal with the financial futures instruments like stock futures, index futures, stock options, index options, interest rate futures, currency forwards and futures, financial swaps, etc. whereas commodity futures markets deal with commodity instruments like agricultural products; food grains, cotton and oil; metals like gold, silver, copper and steel and other assets like live stocks, vegetables and so on.

Products of the National Stock Exchange (NSE)

Products	**Index / futures**	**Index options**	**Futures on individual securities**	**Option on individual securities**
Underlying instruments	S&P CNX NIFTY	S&P CNX NIFTY	87 Securities stipulated by SEBI	87 securities stipulated by SEBI
Type	-	European style	-	American style
Trading cycle	Maximum of 3-month trading cycle. At any point in time, there will be 3 contract available: Near month Mid month Far month duration	Maximum of 3-month trading cycle. At any point in time, there will be 3 contract available: Near month Mid month Far month duration	Maximum of 3-month trading cycle. At any point in time, there will be 3 contract available: Near month Mid month Far month duration	Maximum of 3-month trading cycle. At any point in time, there will be 3 contract available: Near month Mid month Far month duration
Expiry day	Last Thursday of expiry month	Last Thursday of expiry month	Last Thursday of expiry month	Last Thursday of expiry month
Contract size	Permitted lot size is 200 and multiple thereof	Permitted lot size is 200 and multiple thereof	As stipulated by NSE (Not less than ` 2 lacs)	As stipulated by NSE (Not less than ` 2 lacs)
Price steps	` 0.05	` 0.05	-	-
Basic price first day of trading	Previous day closing NIFTY value	Theoretical value of the option contracts arrived at based on Black scholes model	Previous days closing value of the underlying security	Theoretical value of the option contracts arrived at based on Black scholes model
Base price subsequent	Daily settlement price	Daily close price	Daily settlement	Daily close price
Price bands	Operating ranges are kept at +10%	Operating ranges are kept at 99% of the base price	Operating ranges are kept at +20%	Operating ranges are kept at 99% of the base price

Quantity freeze	20,000 units or greater	20,000 units or greater	Lower of the 1% of the market position limit stipulate for option positions or ` 5 crores	Lower of the 1% of the market position limit stipulate for option positions or ` 5 crores

Financial derivatives markets in India are regulated and controlled by the Securities and Exchange Board of India (SEBI). The SEBI is authorized under the SEBI Act to frame rules and regulations for financial futures trading on the stock exchanges with the objective to protect the interest of the investors in the market. Further carry forward trading (Badla trading) is also regulated by the SEBI which is traded on the stock exchanges. Some of the other financial derivatives like currency options and futures and interest rate futures are controlled by the Reserve Bank of India (RBI). These are dealt on Over-the-Counter (OTC) markets. Financial futures on interest rate include both short-term interest rate and long-term interest rate forwards. Currencies include options and forwards. Since the RBI is the apex body to regulate currencies and interest rates in India, hence, financial derivatives relating to foreign currencies and interest rates are generally come under the RBI regulation. Major stock exchanges in India, under the regulation of the SEBI, trade in two kinds of futures products, namely equity and carry forwards. Equity futures include stock futures, index futures, stock options and index options. Currently these are traded on National Stock Exchange and Bombay Stock Exchange. Examples of such companies on which options and futures are available, e.g. ACC, SBI, CIPLA, HPCL, TELCO, GRASIM, Dr. Reddy, Lab, HLL, HDFC, Hero Honda, etc. Commodity futures markets are regulated in India by Forward Market Commission (FMC). The Commission is entrusted with to regulate commodities futures trading in India. Products like hessian, potatoes, pepper, cotton, etc. are traded on Coimbatore Commodity Exchange and Calcutta Commodity Exchange. Recently the Central Government has allowed futures trading on 54 new commodities of different categories to be eligible for trading on exchanges.