Chapter III

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3.1 Introduction

In 1875 the first stock exchange was set up in Bombay and it is stated to be the oldest in Asia. In 1894 the Ahmedabad Stock Exchange was started to facilitate dealings in the shares of textile mills. The Calcutta stock exchange was started in 1908 to provide a market for shares of plantations and jute mills. Later the Madras stock exchange was started in 1920. At present there are 20 Stock Exchanges in the country. The Stock Exchanges are being administered by the Ministry of Finance. Government also Constituted Securities and Exchange Board of India (SEBI) in April 1988 for orderly development and regulation of securities industry and Stock Exchanges.

The National Stock Exchange (NSE) has the sustained leadership positions across asset classes in the Indian and global exchange sectors that demonstrates the robustness and liquidity of our exchange. It was incorporated in 1992. It was recognized as a stock exchange by SEBI in April 1993 and commenced its operations in 1994 with the launch of the wholesale debt market, followed by the cash market segment. The NSE promotes the derivative instruments in Indian stock market. The derivative market functions as the basic trading mechanism of the price discovery and hedging technique. Hence an attempt has been made by the researcher to explain the NSE’s cash market operation, market players, derivative instruments, futures terminology, hedging concept, hedging technique and so on.
3.2 Cash Market in the NSE

The NSE commenced its operations in 1994 as a first step in reforming the securities market through improved technology and introduction of best practices in management. It was started with the concept of an independent governing body without any broker representation, thus ensuring that the operators' interests are not allowed to dominate the governance of the exchange. Before the execution of NSE, trading on the stock exchanges in India used to take place through open choice without the use of information technology for immediate matching or recording of trades.

3.2.1 System Based Trading in the NSE

Manual trading on stocks may consume more time and energy and is inefficient. The practice of physical trading imposed limits on trading volumes as well as the speed with which new information was incorporated into prices. To prevent this, the NSE introduced Screen Based Trading System (SBTS) in which a member can sell and buy shares through the computer and also they can know the prices of shares in particular company’s website. The transaction is executed as soon as the quote punched by a trading member finds a matching sale or buys quote from counter-party. SBTS electronically matches the buyer and seller in an order-driven system or finds the customer the best price available in a quote-driven system, and hence one can save time, effort, cost and risk of error as well as the chances of fraud. SBTS enables distant participants to trade with each other improving the liquidity of the markets. With the relatively high speed of networks, trades are executed and a large number of participants can trade simultaneously without bias which allows faster incorporation of price-sensitive information into prevailing prices. This increases the informational efficiency of markets. With SBTS, it becomes possible for market participants to see
the full market, which helps to make the market more transparent, leading to increased investor confidence. The NSE started nation-wide SBTS which provides a completely transparent trading mechanism. Regional exchanges lost a lot of business opportunities due to the formation of NSE because it consists of stringent rules and regulations and they are asked to adopt new technologies forcing them to introduce SBTS. Today, India can boast that almost 100 percent\(^1\) trading takes place through electronic order matching.

Prior to the setting up of NSE, trading on stock exchanges in India took place without the use of information technology for immediate matching or recording of trades. The immoral operators used this information asymmetry to manipulate the market. The information asymmetry helped the brokers to commit a manipulative practice known as "gala"\(^2\). Gala is a practice of extracting the highest price of the day for "buy" transaction irrespective of the actual price at which the purchase was actually done and give the lowest price of the day for "sell" transactions irrespective of the price at which sale was made. The clients did not have any method of verifying the actual price. The electronic and fully online trading introduced by the NSE has makes such manipulation difficult. It also helps to improve the concept of liquidity and made the entire operation highly transparent and efficient.

3.3 Cash Market Clearing and Settlement

The NSE has set up a clearing corporation to provide legal counterparty guarantee to each trade thereby eliminating counterparty risk. The National Securities Clearing Corporation Ltd. (NSCCL) commenced its operations in April 1996\(^3\). Counterparty risk is guaranteed through fine-tuned risk management systems and an innovative method of on-line position monitoring and automatic disablement. The
principle of innovation is implemented by NSE capital market segment. Under this principle, the NSCCL is the counterparty for every transaction and therefore default risk is minimized. To support the assured settlement, a settlement guarantee fund has been created. A large settlement guarantee fund provides a cushion for any residual risk. As a consequence, despite the fact that the daily traded volumes on the NSE run into thousands of crores of rupees, credit risk no longer poses any problem in the marketplace.

While NSE provides a platform for trading to its investors and also for institutional investors, the NSCCL determines the funds or securities obligation of the trading members and ensures that the trading members meet their obligations. The core processes involved in clearing and settlement are:

i. **Trade Recording**

   The key details about the trades are recorded to provide the basis for settlement. These details are automatically recorded in the electronic trading system of the exchanges.

ii. **Trade Confirmation**

   The parties to a trade agree upon the terms of trade like security, quantity, price, and settlement date, but not the counterparty, which is the NSCCL. The electronic system automatically generates confirmation by direct participants.

iii. **Determination of Obligation**

   The next step is a determination of what counter-parties owe, and what counter-parties are due to receive on the settlement date. The NSCCL interrupt itself as a central counterparty between the counterparties to trades and the net positions so that a member has security wise net obligation to receive or deliver a security and has to either pay or receive funds.
iv. Pay-in of Funds and Securities

The members bring in their funds or securities to the NSCCL. They make available required securities in designated accounts with the depositories by the prescribed pay-in time. The depositories move the securities available in the accounts of members to the account of the NSCCL. Likewise, members with funds obligations make available required funds in the designated accounts with clearing banks within the prescribed pay-in time. The NSCCL sends electronic instructions to the clearing banks to debit the member's accounts to the extent of payment obligations. The banks process these instructions, debit accounts of members and credit accounts of the NSCCL.

v. Pay-out of Funds and Securities

After processing for shortages of funds or securities and arranging for movement of funds from surplus banks to deficit banks through RBI clearing, the NSCCL sends electronic instructions to the depositories or clearing banks to release pay-out of securities or funds. The depositories and clearing banks debit accounts of the NSCCL and credit accounts of members. The settlement is complete upon release of payout of funds and securities to members.

vi. Risk Management

A sound risk management system is an integral part of efficient settlement system. The NSCCL ensures that the trading members' obligations are proportionate to their net worth. It has put in place a comprehensive risk management system, which is constantly monitored and upgraded to prevent market failures. It monitors the track record and performance of members and their net worth; and also it undertakes on-line monitoring of members' positions and analyses the exposures available in the market, collects margins from its members and automatically disables members if the limits are
breached. The risk management methods adopted by NSE have brought the Indian financial market in line with the international markets.

3.4 Settlement of the Activities by the Agencies

The NSCCL with the help of clearing members, custodians, clearing banks and depositories settles the trades executed on exchanges. The roles of each of these entities are explained below:

a) NSCCL

The NSCCL is responsible for post-trade activities of a stock exchange. Clearing and settlement of trades and risk management are its central functions. It clears all trades, determines obligations of members, arranges for pay-in of funds or securities, receives funds or securities, processes for shortages of funds or securities, arranges for pay-out of funds or securities to members. guarantees settlement collects and maintains margins, collateral, base capital and other funds. It is the counterparty to all settlement obligations of the members.

b) Clearing Members

They are responsible for settling their obligations as determined by the NSCCL. They have to make available funds or securities in the designated accounts with clearing bank or depositories, as the case may be, to meet their obligations on the settlement day.

c) Custodians

Custodian is a clearing member but not a trading member. They settle trades assigned to him by trading members. They are required to confirm whether they are going to settle a particular trade or not. If it is confirmed, the NSCCL assigns that obligation to that custodian and the custodian is required to settle it on the settlement day.
d) Clearing Banks

Every clearing member is required to open a dedicated clearing account with one of the clearing banks. Based on his obligation as determined through clearing, the clearing member makes funds available in the clearing account for the pay-in and receives funds in case of a payout.

e) Depositories

Depositories help in the settlement of the dematerialized securities. Each custodian or clearing member is required to maintain a clearing pool account with the depositories. They are required to make funds available for required securities in the designated account on settlement day. The depository runs an electronic file to transfer the securities from accounts of the custodians or clearing member to that of NSCCL. As per the schedule of allocation of securities determined by the NSCCL, the depositories transfer the securities on the pay-out day from the account of the NSCCL to those of members or custodians.

f) Professional Clearing Member

The NSCCL admits special category of members namely professional clearing members. Professional Clearing Member (PCM) may clear and settle trades executed for their clients. In such an event, the functions and responsibilities of the PCM would be similar to Custodians. PCMs may also undertake clearing and settlement responsibility for trading members. In such a case, the PCM would settle the trades carried out by the trading members connected to them. A PCM has no trading rights but has only clearing rights, that is they clear the trades of their associate trading members and institutional clients.
g) Settlement Cycles

The NSCCL clears and settles trades as per well-defined settlement cycles. Since the beginning of the financial year 2003, all securities are being traded and settled under T+2 rolling settlement. The NSCCL notifies the consummated trade details to clearing members or custodians on the trading day. The custodians affirm back the trades to NSCCL by T+1 day. Based on the affiliation, NSCCL nets the positions of counterparties to determine their obligations. A clearing member has to pay-in or pay-out funds or securities. A member has a security-wise net obligation to receive or deliver a security. The obligations are netted for a member across all securities to determine the fund obligations and investors have to either pay or receive funds. Members' pay-in and pay-out obligations are determined the latest by T+1 day and are forwarded to them on the same day so that they can settle their obligations on T+2 day. The securities or funds are paid-in or paid-out on T+2 day and the settlement is completed in three days from the end of the trading day.

3.5 Derivatives

The term derivative indicates that it has no independent value. Its value is entirely derived from the value of the underlying asset. The underlying asset can be securities, commodities, bullion, currency and so on. It means forward, futures, option or any other hybrid contract of predetermined fixed duration, linked for the purpose of contract fulfilment to the value of a specified financial asset or to an index of securities.

3.5.1 Significance of the Derivatives

1) 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 and so on. Derivatives assist the holders to shift or modify suitably the risk characteristics of their portfolios. These are specifically useful in the highly volatile financial market conditions like erratic trading, highly flexible interest rates and volatile exchange rates.

2) 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 enables to discover from suitable correct or true equilibrium prices in the markets. As a result, they assist inappropriate and superior allocation of resources in the society.

3) In derivatives trading, there is no need for immediate full payment of the amount. since most of them are based on margin trading. As a result, there is a gradual increase in a number of traders, speculators, arbitrageurs in such markets. So, derivatives trading enhance liquidity and reduce transaction costs in the markets for underlying assets.

4) 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 to increase their yields and achieve other investment goals.

5) It has been observed from the derivatives trading in the market that the derivatives have smoothened out price fluctuations, squeezed the price spread, integrated price structure at different points of time and removed gluts and shortages in the markets.

6) The derivatives trading encourages the competitive trading in the markets, different risk-taking preference of the market operators like speculators, hedgers, traders, arbitrageurs and so on resulting in an 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.

7) It is observed that derivatives trading develops the market towards ‘complete markets’. The complete market concept refers to that situation where no particular investors is better than others, or pattern on returns of all additional securities are covered by the already existing securities in it, or there is no further scope of additional security.

3.5.2 Reasons for the Rapid Growth of the Derivative Markets

a) The major economies in the world switched from fixed exchange rate regimes to floating rate mechanisms. Consequently, the management of foreign exchange exposure became very vital. Naturally, there was tremendous growth in the market for forex derivatives.

b) After the 1973 middle east war, petroleum prices became highly volatile and unpredictable. This had far-reaching effects on virtually all commodity markets since the transportation cost of commodities is directly linked to crude oil prices. Hence, markets for commodity derivatives grew rapidly.

c) Major central banks gradually began to abandon their policies of keeping interest rate stable. Interest rates were used increasingly as tools for regulating the money supply. This led to an explosion in the market for interest rate derivatives.

d) Many countries began to gradually liberalize capital account transactions. As capital started to move freely across borders and markets became more integrated, the risk began to multiply. The need of risk management and consequently for derivatives thus increased.

e) In October 1986, the London Stock Exchange (LSE) eliminated the fixed brokerage commissions. This event is known as ‘Big Bang’. From the same year, the
LSE started admitting foreign brokerage firms as full members of the exchange. The changes were all designed to make London an attractive market for international transactions. London is a major international market because of its ideal location. It serves as a middle link between markets in the US and markets in Singapore and Tokyo, thereby facilitates 24-hour trading.

f) One of the major developments responsible for the rapid growth of the derivative markets has been the rapid advances made in the field of information technology. From streamlining back-end operation to facilitating program trading or Index Arbitrage, computers have played a critical role in the explosion of derivative trading.

3.5 Derivative Market Instruments

i. Forward

A forward contract is a customised agreement between two parties, it is an OTC (Over – the – Counter) derivative instrument. The contract has been negotiated by the buyer and seller at any point in time. A forward contract is customised. A party that wishes to back out from the contract has to seek out the original counterparty in order to cancel the agreement. Forward contracts are the most often used in foreign exchange markets in the Indian context.

ii. Futures

Futures contracts are standardised contracts which are traded on organised exchanges. By standardised, it means that the terms of the contract are specified by the exchange on which it is traded. The investor who has entered into futures contract can undo their obligation by taking a counter-position on the floor to the exchange. This implicates that if the investor has originally gone long in the futures market, the
investors should go short, and vice versa. When a counter-position is taken, the party with whom we trade need not be the same as the one we originally traded with. The key point to understand is that, unless the agreement is cancelled or a counter-position was taken, both parties to a futures contract have an obligation to fulfil their part of the contract.

iii. 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.

iv. Warrants

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

v. Swaps

It is a customized contract in the form of Over the Counter (OTC) derivative. Thus, swaps are non-standardized contracts that are traded through OTC. A swap is an agreement between two counterparties to exchange something (one “leg” of swap) for something else (the other “leg”). Theses “things” will generally be cash flows arising from different financial instruments, obligations or rights. Thus, a swap is an agreement between counterparties to exchange cash flows at pre-specified future times according to pre-specified conditions.
a) Types of Swaps

A swap is a derivative contract to exchange cash flows in the future. Its value is derived from the specific underlying such as interest rate, foreign exchange, equity, commodity and so on. These are as follows:

1. Interest Rate Swap

   An interest rate swap is an exchange of two sets of interest flows based on different interest rate in same currency, with no exchange of underlying notional principal. Interest rate swaps often exchange a fixed payment for a floating payment that is linked to an interest rate. These are very popular highly liquid instruments and used hedge interest rate risks.

2. Currency Swap

   A currency swap is an OTC derivative. It is closely related to interest rate swap. It involves the exchange of cash flows between counterparties which takes place in two different currencies. In the currency swap the parties swap both interest and principal.

3. Equity Swaps

   Equity swaps are similar to interest rate swap contracts. There are two counterparties. They agree to exchange a set of future cash flows at set dates in future.

4. Commodity Swaps

   A commodity swap is an agreement between two counter parties to exchange cash flows depending upon the price of a given commodity. It is an agreement whereby a floating price is exchanged for a fixed price. One party will pay a fixed price for the given commodity, while the counter party will pay
floating price for the same commodity on the settlement date. Commodity swaps are used to lock-in the price of a commodity.

3.5.4 Participants in the Derivatives Market

The following are the participants in the derivative market.

a) Hedgers

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 a ‘hedger’. A hedger uses futures markets to minimize risk caused by the price movements of securities, commodities, exchange rates, interest rates, indices and so on. As such, a hedger will take a position in the futures market that is opposite a risk to which the trader is exposed. By the hedger taking a reverse position to a perceived risk is called ‘hedging strategy in futures markets’. The essence of a hedging strategy is the acceptance of a futures position that, on average, generates profits when the market value of the obligation is higher than the expected value. The hedging strategy can be undertaken in all the markets like futures, forwards, options, swap and so on. But their mode of operation will be different. Forward contracts are considered to offset risk by fixing the price that the hedger will pay or receive for the underlying asset. As an options strategy, it provides insurance and protects the investor against adverse price movements. Similarly, in the futures market, the investors may be benefited from favourable price movements.

b) Speculators

A speculator deliberately wishes to take a position in the market. Speculator wants to consciously take the risk, hoping to profit from subsequent price changes.
Such a person is either betting that the price will rise, or else the speculator is hoping that it will fall. Futures and options can be used by speculators too.

c) Arbitrageurs

The arbitrageurs are the third group of participants in the derivative markets. Arbitrage entails the locking of a costless and riskless profit by concurrently entering into two or more markets transaction. The key phrase here is ‘costless and riskless’. The logic is that if the trader arbitrageurs get into a risky strategy entailing a cost, they should get a risk-adjusted expected rate of return. This is the approach taken by models like the Capital Asset Pricing Model (CAPM). If the trader strategy is riskless but requires an initial investment, then they should get the riskless rate of return. However, if the trader does not have to invest anything, and face no risk, then logically they should get no returns. The presence of a positive return in such a circumstance is referred to as an arbitrage opportunity and the people who seek to exploit such opportunities are referred to as arbitrageurs. Arbitrageurs could keep the prices in position and help to maintain equilibrium in the market.

3.6 Global Futures Exchanges

Two of the largest futures exchanges in the world are in Chicago namely the Chicago Board of Trade (CBOT) and the Chicago Mercantile Exchange (CME). The CBOT offers contracts on many different assets like corn, soybeans, wheat, silver, T-bonds, T-notes and the Dow Jones index. The CME provided a market for pork bellies, live cattle and for the S&P 500 index. The International Monetary Market (IMM) is a division of the CME and conducts Futures trading in foreign currencies. The IMM also trades contracts on gold, T-bills, and Euro-dollars. A Euro-dollar is a dollar deposited in a bank outside the US. The Euro-dollar interest rate is the inter-bank interest rate on
Eurodollars and is also known as the London Inter-Bank Offer Rate (LIBOR). The interest rate underlying the Euro-dollar contract is the 90 day LIBOR. India has three futures exchanges. Multi commodity exchange (MCX) is exclusive for commodity and the BSE and NSE are handling the financial futures.

Some of the other major futures exchanges in the world are the London International Financial Futures Exchange (LIFFE) and the Singapore International Monetary Exchange (SIMEX). Futures exchanges are also rapidly growing in the developing countries. Such emerging markets are the Shanghai Metal Exchange (SHME) in China and the Kuala Lumpur Commodity Exchange (KLCE) in Malaysia.

3.7 Derivatives Market in India

The first step towards the introduction of derivatives trading in India was the promulgation of the Securities Laws (Amendment) Ordinance, 1995, which withdrew the prohibition on options in securities. The market for derivatives, however, did not take off, as there was no regulatory framework to govern trading of derivatives. The SEBI set up a 24-member committee under the Chairmanship of Dr. L. C. Gupta on November 18, 1996, to develop an appropriate regulatory framework for derivatives trading in India. The committee submitted its report on March 17, 1998, prescribing necessary pre-conditions for introducing derivatives trading in India. The committee recommended that derivatives should be declared as ‘securities’ so that regulatory framework applicable to trading of ‘securities’ could also govern trading of securities. The SEBI also set up a group in June 1998 under the chairmanship of Prof. J. R. Varma, to recommend measures for risk containment in the derivatives market in India. The report, which was submitted in October 1998, worked out the operational details of the
margining system, a methodology for charging initial margins, broker net worth, deposit requirement and real-time monitoring requirements.

The SCRA was amended in December 1999 to include derivatives within the ambit of ‘securities’ and the regulatory framework was developed for governing derivatives trading\(^9\). The Act also made it clear that derivatives shall be legal and valid only if such contracts are traded on a recognized stock exchange. The government also rescinded in March 2000, the three-decade-old notification, which prohibited forward trading in securities.

Derivatives trading commenced in India on June 2000 after the SEBI granted the final approval to this, after that it came into force on May 2000. The SEBI permitted the derivatives segments of two stock exchanges such as NSE and BSE, and to their clearinghouse or corporation to commence trading and settlement in approved derivatives contracts. To begin with, SEBI approved trading in index futures contracts based on S&P CNX Nifty and BSE-30 (Sensex) index. This was followed by approval for trading in options which commenced in June 2001 and the trading in options on individual securities commenced in July 2001\(^{10}\). Futures contracts on individual stocks were launched in November 2001. Futures and Options contracts on individual securities were available on more than 200 securities. Trading and settlement in derivative contracts were done in accordance with the rules, bye-laws, and regulations of the respective exchanges and their clearing house or corporation duly approved by the SEBI and notified in the official gazette.

3.7.1 Recent Development of the Derivatives Market in India

Financial sector reforms were an integral part of the liberalization of the Indian economy which began in 1991. In the initial years, the focus was on the developments
of a modern, efficient and more transparent cash market. The most important developments in this regard were as follows:

1. A new Electronic exchange – The NSE was set up and commenced trading in equities in November 1994. The NSE introduced screen-based trading and linked up investors across the country by using Very Small Aperture Terminal (VSAT) technology.

2. NSE asked permission from SEBI for trade index futures in 14 December, 1995.

3. In 25 May 2000, SEBI gave permission to NSE and BSE to do index futures trading.


5. The NSE introduced the stock option trading in July 2001.

6. The NSE introduced the currency futures trading in 29 August 2008.

7. Interest rate derivatives trading commenced on NSE in 31 August 2009.

8. The NSE started the European style stocks options and currency options in 28, 29 October, 2010.


3.8 Types of Underlying Assets in Futures Contracts

Derivative markets can broadly be classified as commodity derivative markets and financial derivatives markets. As the name suggests, commodity derivatives market trade contracts for which the underlying asset is a commodity. It can be an agricultural commodity and non-agricultural commodity. Financial derivatives market trade contracts that have a financial asset or variable as the underlying. The very popular financial derivatives are equity, interest rates and exchange rates as the underlying. The most commonly used derivatives contracts are forwards, futures and options.
In international markets, futures contracts are available on a number of assets such as food grains, oilseeds, metals, petroleum, foreign currencies, Euro-dollars, stock indices and interest rates. Until a few decades ago, most of the contracts were based on agricultural commodities. But subsequently, trading in contracts based on financial instruments such as bonds, stock indices and foreign currencies, has surpassed the demand for commodity-based contracts.

In the US, the food grains and oilseeds on which contracts are available, include corn, oats, soybeans and wheat. Cocoa, coffee, cotton, sugar, orange juice and rice are some of the food and fibre products on which contracts are traded. Contracts are also traded on metals like copper, gold and silver, and on petroleum products such as crude oil, heating oil and gasoline. In India, however, futures contracts are available for coffee, oilseeds, oils (Castor and palm oil), pepper, cotton, jute and so on.

Contracts on a number of foreign currencies are traded in the US. They include Australian and Canadian dollars, pound sterling, Deutsche marks, Japanese yen and Swiss Francs. The popular stock indices on which contracts are traded include the Dow Jones Industrial Average, the Nikkei and the Standard and Poor’s (S & P) 500. Interest rate futures contracts are available on Treasury bills, notes and bonds, all of which are government securities. They differ from each other in terms of their original time to maturity. If the time to maturity is less than or equal to one year, the instrument is called a T-bill; if it is between one to ten years, it is called a T-note; and if it is over ten years, it is called a T-bond.

3.8.1 Equity Futures

In 1996, the SEBI set up a committee headed by Dr L. C. Gupta, to develop an appropriate regulatory framework to facilitate derivative trading. This committee
submitted its report in 1998\textsuperscript{12}. Subsequently, SEBI gave approval to the BSE and the NSE to commence trading in derivative contracts, which included only index futures, to begin with. The NSE began trading futures contracts on the S&P CNX Nifty Index on June 12, 2000, onwards. At any point in time, three contracts are available, namely, for the current month, the next month and the following month.

European options on the Sensex began trading from June 1, 2001. The NSE commenced trading in Nifty Index options on June 4, 2001. Currently, contracts with one, two and three months to expiration are available. Options on individual stocks began trading on the NSE from July 2, 2001\textsuperscript{11}. The BSE introduced similar contracts on July 9 of the same year. The options are American in nature and are available with one, two or three months to expiration. The SEBI has specified that stock options will be settled in cash for an initial period of six months from the date of launch. That if the Call holder is to exercise the option, rather than paying the exercise price and receiving physical delivery of a share, call holder will receive the difference between the stock price at the time of exercise, and the exercise price. Similarly, a put holder will receive the difference between the exercise price and the stock price, if put holder chooses to exercise. Index options, just like index futures, are cash settled.

Stock index futures were introduced in India in the year 2000. Currently, contracts are being traded on the S&P CNX Nifty Index on the National Stock Exchange and on the Sensex on the BSE.

\textbf{3.8.2 Foreign Exchange Futures}

During the period 1975-1992, the exchange rate of the rupee was officially set by the Reserve Bank of India (RBI) in terms of a basket of currencies of India's major trading partners and there were significant restrictions on not only capital but current
account transactions as well. Since the early 90’s, India is on the path of a gradual progress towards capital account convertibility. The emphasis shifted away from debt creating to non-debt creating inflows, with a focus on more stable long-term inflows in the form of foreign direct investment and portfolio investment. The exchange rate regime has evolved from a single-currency fixed-exchange-rate system to fixing the value of the rupee against a basket of currencies and further to a market-determined floating exchange rate regime.

The Indian foreign exchange derivatives market was in debt with its origin to the important step that the RBI took in 1978 to allow banks to undertake intra-day trading in foreign exchange; as a consequence, the stipulation of maintaining a square or near square position was to be complied with only at the close of each business day. This was followed by use of products like cross-currency options, interest rate and currency swaps, caps or collars and forward rate agreements in the international foreign exchange market; development of a rupee-foreign currency swap market; and the introduction of additional hedging instruments such as foreign currency-rupee options.

3.8.3 Commodity Futures

All the commodities are not suitable for futures trading. Only the suitable commodities are traded in the Indian commodity exchanges. MCX deals with the metals and bullion products in the derivative segment. The National Commodity Derivative Exchange (NCDEX) deals with the futures contracts in agricultural commodities such as pepper, turmeric, Gur (jaggery), hessian (jute fabric), jute sacking, castor seed, potato, coffee, cotton and so on. Those commodities are also traded in regional commodity exchanges situated in different parts of the country in the futures
segment. Trading in Options segment was introduced in the MCX for gold contract in January 2018.

3.9 ROLE OF FUTURES AND OPTIONS MARKET

a) Risk Management

Derivative markets help to reallocate risk among investors. A person who wants to reduce risk can transfer some of that risk to a person who wants to take more risk. They can obviously reduce risk by hedging when they do so, the opposite position in the market may be taken by a speculator who wishes to take more risk. Since people can alter their risk exposure by using futures and options; derivative markets help in the raising of capital. As an investor, they can always invest in an asset, and then change its risk to a level that is more acceptable to them, by using derivatives.

b) Price Discovery

Price discovery refers to the market’s ability to determine true equilibrium prices. Future prices are believed to contain information about future spot prices and help in disseminating such information. The futures market provides a low-cost trading mechanism. Thus information pertaining to supply and demand easily percolates into such markets. Accurate prices are essential for ensuring the correct allocation of resources in a free market economy. Options market provide information about the volatility or risk of the underlying asset.

c) Operational Advantages

As opposed to spot markets, derivative markets involve lower transaction costs. Secondly, they offer greater liquidity. Liquidity refers to the ability
of market participants to transact quickly at prices that are close to the true or fair value of the asset. Large spot transactions can often lead to significant price changes. However, futures markets tend to be more liquid than spot markets, because the market participants can take a large position in the derivative market which is relatively easier to take and has less price impact, as opposed to a transaction of the same magnitude in the spot market. Finally, it is easier to take a short position in derivative markets when it is sold in spot markets.

**d) Market efficiency**

The availability of derivatives makes markets more efficient. It is easy and cheap to trade in derivatives. It is possible to exploit arbitrage opportunities quickly and to keep prices in position. Hence, these markets help to ensure that prices reflect true values.

**e) Ease of Speculation**

Derivative markets provide speculators with a cheaper alternative to engage in spot transactions. The amount of capital requires taking a comparable position is less in this case. This is important because facilitation of speculation is critical for ensuring free and fair markets. Contrary to what lay people may believe, speculation is not synonymous with gambling. Gambling refers to the habit of taking the risk for the sheer pleasure of it. Speculators, however, take calculated risks. A speculator will accept a level of risk only if they are convinced that the associated expected return commensurates with the risk that he is taking.

**3.10 Standardization of Futures Contracts**

i). Futures terminology

a) **Spot price**: The price at which an asset trades in the spot market.
b) **Futures price**: The price at which the futures contract trades in the futures market.

c) **Contract Cycle**: The period over which a contract trades. The NSE index futures contract is traded for one month, two-month and three-month expiration. The expiry of the contract is last Thursday of every month. Thus a January expiration contract expires on the last Thursday of January and a February expiration contract ceases trading on the last Thursday of February. On Friday following the last Thursday, a new contract having a three-month expiry is introduced for trading.

d) **Expiry date**: It is the date specified in the futures contract. This is the last day on which the contract will be traded, at the end of which it will cease to exist.

e) **Contract size**: The amount of asset that has to be delivered under one contract. It is also called lot size.

f) **Basis**: In the context of financial futures, the basis can be defined as the futures price minus the spot price. There will be a different basis for each delivery month for each contract. In a normal market, the basis will be positive. This reflects that futures prices normally exceed spot prices.

g) **The cost of carrying**: The relationship between futures prices and spot prices can be summarized in terms of what is known as the cost of carrying. This measures the storage cost plus the interest that is paid to finance the asset less the income earned on the asset.

h) **Initial margin**: The amount that must be deposited in the margin account at a time a futures contract first entered into is known as initial margin.
i) **Marking-to-market**: In the futures market, at the end of each trading day, the margin account is adjusted to reflect the investor’s gain or loss depending on the futures closing price. This is called marking-to-market.

j) **Maintenance margin**: This is somewhat lower than the initial margin. This is set to ensure that the balance in the margin account never becomes negative. If the balance in the margin account falls below the maintenance margin, the investor receives a margin call and is expected to top up the margin account to the initial margin level before trading commences on the next day.

ii). **Delivery Arrangements**

The contract must state the location where delivery is to be made. Sometimes, alternative locations may also be specified.

iii). **Futures pricing**

Pricing of futures contract depends on the characteristic of the underlying asset. There is no single way to price futures contracts because different assets have different demand and supply patterns, different characteristics and cash flow patterns. This makes it difficult to design a single methodology for calculation of pricing of futures contracts. Market participants use different models for pricing futures. There are two popular models available for futures pricing such as cash and carry model and expectancy model.

iv). **Cash and carry model for futures pricing**

Cash and carry model is also known as non–arbitrage model. This model assumes that in an efficient market, arbitrage opportunities cannot exist. In other words, the moment there is an opportunity to make money in the market due to mispricing in the asset price and its replicas, arbitrageurs will start trading to profit from these
mispricing and thereby eliminating these opportunities. Thus trading continues until the
prices are aligned across the products or markets for replicating assets.

The futures position in a stock can be created in the following manners:

a) Enter into a futures contract, or

b) Create a synthetic futures position by buying in the cash market and carrying
the asset to future date.

The price of acquiring the asset as on future date in both the cases should be the
same that is the cost of a synthetic futures contract (spot price + cost of carrying the
asset from today to the future date) should be equivalent to the price of the present
futures contract.

The cost of carrying a synthetic futures position is a fair price of the futures contract.
Fair price of a futures contract is nothing but the addition of spot price of underlying
asset and cost of carrying the asset from today until delivery. The cost of carrying a
financial asset from today to the future date would entail different costs like transaction
cost, custodial charges, financing cost and so on; whereas for commodities, it would
also include costs like warehousing cost, insurance cost and so on.

v) Pricing of stock futures

The theoretical price of a futures contract is the sum of the current spot price
and cost of carrying. However, the actual price of futures contract very much depends
upon the demand and supply of the underlying stock. The futures prices are greater than
the spot prices of the underlying stocks.

Futures Price = Spot Price + Cost of Carrying (3.1)\textsuperscript{12}
Cost of carrying is the interest cost of a similar position in cash market and carried to maturity of the futures contract less any dividend expected till the expiry of the contract.

**vi). Pricing efficiency**

Pricing efficiency refers to a market where prices at all times fully reflect all available information that is relevant to the valuation of securities. That is, relevant information about the security is quickly integrated into the price of securities. Eugene Fama classified the pricing efficiency of the market into three forms such as weak, semi-strong and strong\(^\text{13}\).

a) **Weak efficiency** means the price of the security reflects the past price and trading history of the security.

b) **Semi-strong efficiency** means the price of the security that fully reflects all public information it includes but is not limited to historical price and trading patterns.

c) **Strong efficiency** exists in a market where the price of a security reflects all information, whether or not it is publicly available.

**3.11 Market Index**

Traditionally, indices have been used as benchmarks to monitor markets and judge performance. Modern indices were first proposed in the 19th century by the mathematicians namely Etienne Laspeyres and Hermann Paasche. The grandfather of all equity indices is the Dow Jones Industrial Average which was first published in 1896; since then indices have come a long way - not only in their sophistication - but also in the variety\(^\text{15}\).
There are three main types of indices namely price index, quantity index and value index. The price index is most widely used. It measures changes in the levels of prices of products in the financial, commodities or any other markets from one period to another. The indices in financial markets measure changes in prices of securities like equities, debentures, government securities, and so on. The most popular index in the financial market is the stock (equity) index which uses a set of stocks that are representative of the whole market, or a specified sector, to measure the change in the overall behaviour of the markets or sector over a period of time.

3.11.1 Significance of Stock Index

i). The stock index is the lead indicator of the performance of the overall economy or a sector of the economy:

ii). It is a barometer for market behaviour: It is used to monitor and measure market movements, whether in real time, daily, or over decades, help to understand economic conditions and prospects.

iii). It is the benchmark for portfolio performance: A managed fund can communicate its objectives and target universe by stating which index or indices serve as the standard against which its performance should be judged.

iv). It is underlying for derivatives like index futures and option. It also underpins products such as exchange-traded funds, index funds and so on. These index-related products form a several-trillion-dollar business and are used widely in investment, hedging and risk management.

v). It supports research, such as benchmarks for evaluating trading rules, technical analysis and so on.
3.11.2 Reasons for stock price volatility

Price of a stock moves for two reasons namely company specific development (product launch, closure of a factory, arrest of chief executive) and development affecting the general environment (nuclear bombs, election result, budget announcement), which affects the stock market as a whole\(^\text{16}\). The stock index captures the second part, that is, the impact of environmental change on the stock market as a whole. This is achieved by averaging which cancels out changes in prices of individual stocks.

3.11.3 Stock Market Indices

Stock Indices represent the performance of the stock market. An Index is providing the information about the price movements of financial products, commodities or any other markets. A stock market index is created by selecting a group of stocks that are representative of the whole market or a specified sector or segment of the market. Stock indices are barometers to measure the general economic performance of a particular country or sector. It updates every second throughout on every trading activity so as to reflect the exact picture of the economy. It is also a permanent record of the history of markets. A stock index is created by selecting a group of high performing stocks. An index is calculated with reference to a base period and a base index value.

3.12 Broad Market Indices in NSE

The broad-market indices are constructed on the basis of the trade frequency and liquidity of stocks which is listed in NSE. They serve as a benchmark for measuring the performance of the stocks. The major broad market indices are discussed as follows:
3.12.1 Nifty 50 Index

The Nifty 50 is a diversified 50 stock index accounting for 12 sectors of the economy. It is used for a variety of purposes such as benchmarking fund portfolios, index based derivatives and index funds. Nifty 50 is owned and managed by India Index Services and Products Ltd. (IISL). IISL is India's specialized company focused on the index as a core product. The Nifty 50 Index represents about 62.9\(^\text{17}\) per cent of the free float market capitalization of the stocks listed on NSE as on March 31, 2017. The total traded value of Nifty 50 index constituents for the last six months ending March 2017 is approximately 43.8\(^\text{18}\) per cent of the traded value of all stocks on the NSE. Nifty 50 is ideal for derivatives trading.

Table 3.1

<table>
<thead>
<tr>
<th>S. No</th>
<th>Year</th>
<th>Turnover (Rs. Cr)</th>
<th>Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2007-08</td>
<td>1546935.32</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2008-09</td>
<td>1619936.43</td>
<td>4.71908</td>
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<tr>
<td>3</td>
<td>2009-10</td>
<td>2144609.91</td>
<td>32.38852</td>
</tr>
<tr>
<td>4</td>
<td>2010-11</td>
<td>1688895.08</td>
<td>-21.2493</td>
</tr>
<tr>
<td>5</td>
<td>2011-12</td>
<td>1511340.26</td>
<td>-10.5131</td>
</tr>
<tr>
<td>6</td>
<td>2012-13</td>
<td>1401763.45</td>
<td>-7.25031</td>
</tr>
<tr>
<td>7</td>
<td>2013-14</td>
<td>1579587.25</td>
<td>12.68572</td>
</tr>
<tr>
<td>8</td>
<td>2014-15</td>
<td>1952171.15</td>
<td>23.58742</td>
</tr>
<tr>
<td>9</td>
<td>2015-16</td>
<td>1947304.9</td>
<td>-0.24927</td>
</tr>
<tr>
<td>10</td>
<td>2016-17</td>
<td>2211238.72</td>
<td>13.5538</td>
</tr>
</tbody>
</table>

Source: Computed secondary data
Table 3.1 explicates the growth of the Nifty 50 index. It has attained the maximum growth in the year 2009-10 followed by 2014-15. There was negative growth rate in four years out of 10 year of the study.

3.12.2 Nifty Next 50 index

The Nifty Next 50 Index represents 50 companies from Nifty 100 after excluding the Nifty 50 companies. The Nifty Next 50 Index represents about 11.9 per cent\(^9\) of the free float market capitalization of the stocks listed on NSE as on March 31, 2017. Table 3.2 portrays the turnover of Nifty Next 50 Index.

**Table 3.2**

**Turnover of Nifty Next 50 Index**

<table>
<thead>
<tr>
<th>S. No</th>
<th>Year</th>
<th>Turnover (Rs. Cr)</th>
<th>Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2007-08</td>
<td>489274.56</td>
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<td>2</td>
<td>2008-09</td>
<td>444816.82</td>
<td>-9.08646</td>
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<tr>
<td>3</td>
<td>2009-10</td>
<td>626466.27</td>
<td>40.83691</td>
</tr>
<tr>
<td>4</td>
<td>2010-11</td>
<td>498985.89</td>
<td>-20.3491</td>
</tr>
<tr>
<td>5</td>
<td>2011-12</td>
<td>1511340.26</td>
<td>202.8824</td>
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<tr>
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<td>2012-13</td>
<td>1401763.45</td>
<td>-7.25031</td>
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<tr>
<td>7</td>
<td>2013-14</td>
<td>528161.53</td>
<td>-62.3216</td>
</tr>
<tr>
<td>8</td>
<td>2014-15</td>
<td>728050.65</td>
<td>37.84621</td>
</tr>
<tr>
<td>9</td>
<td>2015-16</td>
<td>673570.35</td>
<td>-7.48304</td>
</tr>
<tr>
<td>10</td>
<td>2016-17</td>
<td>747620.53</td>
<td>10.99368</td>
</tr>
</tbody>
</table>

Source: Computed secondary data
Table 3.2 brings out the progress of Nifty Next 50 Index. The maximum turnover of Nifty Next 50 Index was 202.88 per cent in the year of 2011-12 followed by 2009-10, 2014-15 and 2016-17. It was identified that there was a negative trend in four years.

3.12.3 Nifty 100 Index

Nifty 100 is a diversified 100 stock index representing major sectors of the economy. Nifty 100 represents top 100 companies based on full market capitalization from Nifty 500. This index intends to measure the performance of large market capitalization companies. The Nifty 100 tracks the behaviour of a combined portfolio of two indices such as Nifty 50 and Nifty Next 50. Nifty 100 is owned and managed by IISL. IISL is India’s specialized company focused on the index as a core product. The NIFTY 100 Index represents about 74.8 per cent of the free float market capitalization of the stocks listed on NSE as on March 31, 2017. Table 3.3 shows the turnover of Nifty 100 Index.

Table 3.3

<table>
<thead>
<tr>
<th>S. No</th>
<th>Year</th>
<th>Turnover (Rs. Cr)</th>
<th>Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2007-08</td>
<td>2023823.67</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2008-09</td>
<td>2059724.36</td>
<td>1.773904</td>
</tr>
<tr>
<td>3</td>
<td>2009-10</td>
<td>4083548.03</td>
<td>98.25701</td>
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<tr>
<td>4</td>
<td>2010-11</td>
<td>2187881.02</td>
<td>-46.4221</td>
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<tr>
<td>5</td>
<td>2011-12</td>
<td>1906288.04</td>
<td>-12.8706</td>
</tr>
<tr>
<td>6</td>
<td>2012-13</td>
<td>1836300.12</td>
<td>-3.67142</td>
</tr>
</tbody>
</table>
Table 3.3 reveals the growth of the Nifty 100 Index. The Nifty 100 Index performed below one per cent during the period of 2010-11, 2011-12, 2012-13 and 2015-16 and it has increased up to 98.25701 per cent in 2009-10.

3.12.4 Nifty 500 Index

It represents the top 500 companies based on full market capitalization from the eligible universe. The Nifty 500 Index represents about 95.2 per cent of the free float market capitalization of the stocks listed on NSE as on March 31, 2017\textsuperscript{21}. The Nifty 500 companies are disaggregated into industry indices.

Table 3.4

<table>
<thead>
<tr>
<th>S. No</th>
<th>Year</th>
<th>Turnover (Rs. Cr)</th>
<th>Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2007-08</td>
<td>2767381.35</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2008-09</td>
<td>2469200.39</td>
<td>-10.7748</td>
</tr>
<tr>
<td>3</td>
<td>2009-10</td>
<td>3714035.09</td>
<td>50.41449</td>
</tr>
<tr>
<td>4</td>
<td>2010-11</td>
<td>3047615</td>
<td>-17.9433</td>
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<td>5</td>
<td>2011-12</td>
<td>2551740.14</td>
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<td>6</td>
<td>2012-13</td>
<td>2522298.42</td>
<td>-1.15379</td>
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<td>7</td>
<td>2013-14</td>
<td>2656614.98</td>
<td>5.325165</td>
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<tr>
<td>8</td>
<td>2014-15</td>
<td>3967204.74</td>
<td>49.33307</td>
</tr>
</tbody>
</table>

Source: Computed secondary data
Table 3.4 shows the turnover of Nifty 500 Index. Nifty 500 Index trade performance has decreased below one per cent from the year 2010 to 2013 continuously. It has performed the highest turnover 50.41 per cent and 49.33 per cent in the year of 2009-10 and 2014-15 respectively. It was found that there was negative trend during five years in the study.

3.12.5 Nifty Midcap 50 Index

The primary objective of the Nifty Midcap 50 Index is to capture the movement of the midcap segment of the market. Nifty Midcap 50 includes top 50 companies based on full market capitalization from Nifty Midcap 150 index and on which derivative contracts are available on NSE. In case 50 midcap stocks do not have derivatives contract available on them then it could have less than 50 stocks in the index. The Nifty Midcap 50 Index represents about 5.8 per cent of the free float market capitalization of the stocks listed on NSE as on March 31, 2017. Table 3.5 describes the turnover of the Nifty Midcap 50 Index.

<table>
<thead>
<tr>
<th>S. No</th>
<th>Year</th>
<th>Turnover (Rs. Cr)</th>
<th>Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2007-08</td>
<td>371171.08</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2008-09</td>
<td>183626.63</td>
<td>-50.5278</td>
</tr>
<tr>
<td>3</td>
<td>2009-10</td>
<td>429637.29</td>
<td>133.9733</td>
</tr>
<tr>
<td>4</td>
<td>2010-11</td>
<td>323021.27</td>
<td>-24.8154</td>
</tr>
<tr>
<td>5</td>
<td>2011-12</td>
<td>259673.59</td>
<td>-19.611</td>
</tr>
</tbody>
</table>
Table 3.5 reveals that turnover of Nifty midcap 50 index. The amount of Nifty Midcap 50 index trade in the year of 2014-15 was Rs. 701545.22 crores and it was the highest portion of trade which had the growth rate of 78.96 over the previous year. The growth rate of Nifty Midcap 50 index ranged between -50.52 per cent and 133.97 per cent during the study period. The lowest of -50.528 per cent was recorded in 2008-09 and the highest of 133.97 per cent was recorded in 2009-10.

3.12.6 Nifty Free Float Midcap 100 Index

The objective of the Nifty Free Float Midcap 100 Index is to capture the movement and be a benchmark of the midcap segment of the market. The Nifty Free Float Midcap 100 Index represents about 11.8 per cent of the free float market capitalization of the stocks listed on NSE as on March 31, 2017. Table 3.6 explain the turnover of Nifty Free Float Midcap 100 Index.

<table>
<thead>
<tr>
<th>S. No</th>
<th>Year</th>
<th>Turnover (Rs. Cr)</th>
<th>Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2007-08</td>
<td>391251.57</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2008-09</td>
<td>225167.84</td>
<td>-42.4493</td>
</tr>
<tr>
<td>3</td>
<td>2009-10</td>
<td>508129.93</td>
<td>125.6672</td>
</tr>
<tr>
<td>4</td>
<td>2010-11</td>
<td>535382.52</td>
<td>5.363311</td>
</tr>
</tbody>
</table>
Table 3.6 shows the growth rate of turnover of Nifty Free Float Midcap 100 Index. There was the maximum growth rate of 125.6672 per cent during 2009-10. There was negative growth rate in three years out of 10 years. It was found that there were fluctuations in trend.

### 3.13 Price Discovery

Price discovery refers to the market’s ability to determine true equilibrium prices. Future prices are believed to contain information about future spot prices and help in disseminating such information. The futures market provides a low-cost trading mechanism. Thus information pertaining to supply and demand easily penetrates into such markets. The mechanics of price discovery are important to both investors and regulators. Since the trading process may introduce noise that results in inaccurate prices, it has the implications for traders interested in avoiding pricing errors and policymakers concerned with market stability. Poor price discovery may lead to high price volatility, including bubbles or sudden market crashes, when prices are predominantly influenced by Short-Hill disturbances. A recent concern for market participants is whether the explosion of alternative trading venues may have adverse effect on the price formation process through market fragmentation. Price discovery is
the process of finding an asset's permanent value. The unobservable permanent price reflects the fundamental value of the stock. It is distinct from the observable price, which can be disintegrated into its fundamental value and its temporary effects. Price discovery is the process of buyers and sellers arriving at a transaction price for a given quality and quantity of a product at a given time and place. Price discovery contains numerous interrelated concepts such as:

   a) Market structure (number, size, location, and competitiveness of buyers and sellers);
   b) Market behaviour (buyer procurement and pricing methods);
   c) Market information and price reporting (amount, timeliness, and reliability of information); and
   d) Futures markets and risk management alternatives.

Futures trade assumes significance in a volatile ready market and price risk management because of the price discovery. The price discovery is the process of determining the price of a commodity or stock, based on supply and demand factors. The expectations theory hypothesizes that the current futures price is a consensus forecast of the value of the spot price in the future.

### 3.13.1 Price Discovery process

It examines price discovery processes in the equities and forex markets, in order to shed light on the differences between price discovery processes according to product’s different characteristics. The following are the processes involved in price discovery.
a) **Intraday and intra-week patterns**

In this process, the market information is generated 24 hours a day, 7 days a week. However, no financial market is opened for such long hours\(^{24}\). So all market players face a price risk in not being able to trade at the prices which reflect the generated information when the market is closed. In addition, there may be some clustering of important public information at certain times of the day or week, which also affects trading activity in the market. There are some distinct intraday and intra-week patterns of price discovery, reflecting market participants’ behaviour in managing these issues.

b) **Price discovery process after the arrival of public information**

There must be some type of public information which systematically affects the price discovery process in government securities market. The processes are the analyses, the effect of statistical announcements, notification of open market operations by central banks and releases of policy rate changes on the price discovery process. The price discovery process after the arrival of public information has been observed from the trading volume, price volatility and bid-ask spread.

c) **Interlinkage between the cash and futures markets**

If similar products are traded in more than one market, this leads to the market which incorporates new information first. The price discovery is used to examine the speed of price changes in cash and futures market. This is based on the assumption that price discovery speed is a proxy for market liquidity, that is, the market is more liquid when price discovery speed is high because the degree of information content is high. The speed of price discovery depends upon the accessibility of the two markets.
3.13.2 Importance of Price Discovery

When a market experiences stress and its negative impacts persist over a period of time, the market's liquidity declines and market conditions become unstable. Under such stress, the price discovery functions as an important mechanism in markets which is weakened, leads to higher price volatility and lower market liquidity. At the most general modeling perspective, each of the observable prices of an asset in multiple markets can be decomposed into two components such as, one reflecting the common efficient (full-information) price shared by all these markets\textsuperscript{20}, and one reflecting the transitory frictions that arise from the trading mechanism, such as the bid-ask bounce, liquidity effects, and rounding errors. Evolving as a random walk, the common efficient price captures the fundamental value of the financial asset and its innovation impounds the expectation revisions of investors (thus new information) about the asset payoff of observed prices that respond to the common efficient price innovation which characterizes the dynamics of price discovery. Therefore, identifying the common efficient price innovations is a necessary step before any meaningful measure of price discovery can be constructed.

High-quality and ultra-high frequency asset price data across markets and countries, allow us to study price movements in (near) continuous time; synchronized survey data on market participants' expectations, allow us to infer "surprises" or "innovations" when the news is announced; and advances in statistical modelling of volatility, facilitates efficient inference. By doing so, they can probe into the workings of the marketplace in new and powerful ways, focusing on episodes where the source of price movements is well identified, leading to a high signal-to-noise ratio.
3.13.3 Price Discovery in the Different Markets

i). Price Discovery in Tick Time

A central question in market microstructure is how information about the value of an asset is incorporated in its market price. In fragmented markets, information about the value of an asset arrives at the market from multiple sources. The process of how information from different sources is incorporated into the value of an asset has become known as price discovery. Interesting questions for such a market are which dealer contributes most, how quick the discovery process works, and how it depends on market circumstances like liquidity, volatility and trading intensity.

An important measure of the contribution to price discovery is the information share\(^{25}\). Information share is defined as the part of the variance of the random walk component of returns that can be attributed to a particular market or dealer. Unfortunately, this variance decomposition is not unique when price changes are contemporaneously correlated.

ii). Price Discovery in Multiple-Dealer Markets

"Price discovery" is a dynamic process in which a diverse group of traders and market makers gather, evaluate, and interpret disparate pieces of information; coordinate trading demands; and generate market-clearing prices. The classical concept of price discovery involves a “Walrasian auctioneer” who detects quantities supplied and demanded at different prices and determines the price that clears the market.

iii). Price Discovery in Thin Traded Markets

Price discovery is an important function performed by futures markets. Effective futures markets should generate prices that express consciously formed
opinions on cash prices in the future and should transmit that information throughout the marketing system in a timely manner\textsuperscript{26}. Traditionally, a thin market has been understood to be a market in which the number of transactions over a given period of time is insufficient to ensure efficient price discovery. There are three major concerns related to thin markets such as first, those prices may not accurately reflect supply and demand conditions in the market, that thinness will contribute to higher price volatility and that thinness (due to the magnified impact of individual transactions) increases the incentive for market manipulation.

iv). Price Discovery in Informationally Linked Markets

When a security is traded in more than one market, investors have several avenues to trade and exploit information. An investor who wants to trade the Nifty 50 stock index can do so in the spot market in NSE and during the same opening hours, in the futures market in India. Where frictionless and continuous information sharing across markets exist, trading should be considered as taking place in a single market with simultaneous price changes in the stocks, stock indices, and derivative instruments. If the markets are not frictionless, some markets would appear to be more attractive than others because of concerns relating to transaction costs, regulation, and liquidity, leading to differences in price discovery across the exchanges.

v). Price Discovery in Commodity Markets

Instability of commodity prices has always been a major concern of the producers as well as the consumers in an agriculture-dominated country like India. Apart from increasing the stability of the market through direct government intervention, various actors in the farm sector can better manage their activities in an environment of unstable prices through derivative markets. These markets serve a risk-
shifting function and can be used to lock-in prices instead of relying on uncertain price developments. This problem can be sorted out by making a survey of the price risk management system prevailing in the agricultural commodity markets and to empirically investigate how efficient is the price discovery function of futures for ensuring better hedge against price uncertainty in some selected commodities.

3.14 Hedging concepts

Hedging is one of the tools to protect present risk against future loss. In the framework of futures trading, hedging technique is used in the futures transactions to minimize the price risk in the spot market. A hedge is a position that is taken as a temporary substitute for a later position in another asset until the position is liquidated.

3.14.1 Hedging Objectives

(a) To reduce the risk.
(b) To find the acceptable combination of risk and return.
(c) To send signal to the potential user.
(d) To provide the benefit to the individual, firm and hedger.
(e) To reduce the cost of the business operators.
(f) To improve the firm’s liability.
(g) To offset the market risk.
(h) To diversify the risk.
(i) To have the long term liquidity.

3.15 Multi-Purpose Concept of Hedging

The trader often hedged their futures transaction for covering all the price risks. However, this concept was challenged by Holbrook 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:
a) **Carrying charge hedging**

The carrying charge hedging is used to monitor the price spread between the spot and futures prices, and if the spread covers even carrying costs then the investors buy the stocks. It means that the traders may go for hedging if the spread is adequate to cover carrying costs whereas those hedges are used to protect against loss of stock held.

b) **Operational hedging**

The hedgers use the futures market for their operations and use the similar substitute for each or forward transaction. They think that the futures markets are more liquid and have the lower difference between ‘bid’ and ‘ask’ prices.

c) **Discretionary hedging**

The traders do not always hedge themselves but only do so on selected occasions when they predict adverse price movement in futures. The objective is to cover the risk of adverse price fluctuation rather than to avoid price risk. So they use hedging technique selectively at the time of adverse price movements.

3.16 **Types of Hedging**

The hedging is classified into three categories on the basis of their nature such as short hedge, long hedge and cross hedge.

3.16.1 **Short hedge**

A short hedge is a hedge that involves selling the position in the futures contract. Short hedge means ‘being short’ having a net sold position or a commitment to deliver. Thus, the main objective is to protect the value of the cash position against a decline in cash prices. A short hedge is suitable when the hedger already has the position and
expects to sell it at some time in the futures. Once the short futures position is established, it is expected that a decrease in the value of the cash position will be fully or partially compensated by a gain on the short futures position.

Consider a person who holds a long position in the spot market and a short position in the futures market. If this hedge is held till the expiration of the futures contract, then the profit from the spot market will be $S_T - S$ and the profit from the futures market will be $F - F_T$.

The profit from the spot market is self-explanatory. They denote the profit from the futures market as $F - F_T$. The reason is as follows:

If $F_T < F$, then the short will make a profit and $F - F_T$ will be greater than zero, thereby indicating a profit.

However, if $F_T > F$, the person with a short futures position will make a loss and $F - F_T$ will be negative, thereby indicating a loss.

So $\pi = (S_T - S) + (F - F_T) = (S_T - F_T) - (S - F) = b_T - b$ (3.1)

But we know that $S_T = F_T$ and therefore $b_T = 0$. So the profit from the short hedge = -b.

$S_T + (F - F_T) = F + (S_T - F_T) = F + b_T = F$ (3.2)

F is known at time 0 when the hedge is initiated. Thus, there is no uncertainty about the effective price that will be received if the hedge is held till the date of expiration of the futures contract.
3.16.2 Long Hedge

The long hedge involves where a long position is taken in a futures contract. The basic objective is to protect itself against a price increase in the underlying asset prior to purchasing in the futures market. A long hedge is appropriate when a firm has to purchase a certain asset in futures and wants to lock in a price. It is also called ‘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.

Consider a person with a short position in the spot market and a long position in the futures market. If such a hedge is held till expiration, the profit from the spot market will be \( S - S_T \) and that from the futures market will be \( F - F_T \). So

\[
\pi = (S - S_t) + (F_T - F) = (S - F) - (S_T - F_T) = b - b_T \quad (3.3)
\]

But \( b_T = 0 \), since \( S_T = F_T \). Therefore, the profit from the long hedge is equal to \( b \), if the hedge is held till expiration and the effective price paid by the long hedger is

\[
- S_T + (F_T = F) = - (F + b_T) = - F \quad (3.4)
\]

\( F + b_T \) indicates the effective price paid is an outflow. Since \( b_T \) is zero, the effective price is \( F \). Thus once again, there is no uncertainty regarding the price if the long hedge is held to expiration,

Let us consider the case wherein the hedge is lifted at time \( t \). The profit is given by

\[
\pi = (S - S_t) + (F_t - F) = (S - F) - (S_T - F_T) = b - b_T \quad (3.5)
\]

The effective price paid is
\[-S_t + (F_T - F) = -(F + b_t) (3.6)\]

If the basis remains unchanged, \(b\) will equal to \(b_t\), the profit will be equal to zero, and the effective price paid will be \(F + (S - F) = S^{27}\). As in the case of the short hedge, we would have locked in the initial spot price.

### 3.16.2.1 Changes in the Basis

If the futures price is greater than the spot price, then the basis will be negative. This represents a **Contango market**. When the basis becomes more negative, then the basis is **Widened**. If the basis becomes less negative, then the basis is **Narrowed**.

In the backwardation market, the futures price will be less than the spot price, and the basis will be positive. If the basis becomes more positive, then the basis is *widened*, whereas if it becomes less positive, then it is *narrowed*.

Thus the terms ‘widening’ and ‘narrowing’ refer to changes in the absolute value of the basis. A short hedger is said to be Long the Basis, whereas a long hedger is said to be Short the Basis.

For a short hedger, the profit from the hedge is \(b_t - b\). In a contango market, if the basis narrows, \(b_t\) will be less negative than \(b\). Thus a narrowing basis would lead to a profit. Similarly, a widening of the basis would lead to a loss. In the case of a long hedger, the profit is \(b - b_T\). In a contango market, if the basis narrows, then it will lead to a loss, whereas a widening basis would lead to a profit.

In a backwardation market, if the basis narrows, then \(b_t\) will be less positive than \(b\). This will lead to a loss for the short hedger and a profit for the long hedger. On the other hand, a widening basis will lead to a profit for the short hedger and a loss for the long hedger.
3.16.3 Cross Hedging

All the hedged positions 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 a particular asset but no futures contract available. This situation is called an asset mismatch. Further, in many cases, when the same futures period (maturity) on a particular asset is not available, it is called a maturity mismatch. There is possibility to hedge against price risk in related commodities or securities by using futures contracts that expire on dates other than those on which the hedges are lifted. Such hedges are called cross hedges. In trading practice and in the real business world, it will be rare for all factors to match so well. Thus, the cross hedge is a hedge in which characteristics of the spot and futures positions do not match perfectly.

Mismatch situations which make the hedge across hedge are as follows:

a) The hedging maturity may not match the futures expiration date.

b) The quantity to be hedged may not match with the quantity of the futures contract.

c) The physical features of the asset to be hedged may differ from the futures contract asset.

The hedger 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.
3.16.3.1 Basis for a Cross Hedging

The asset whose price risk is being hedged is the same as the asset on which the futures contracts being used for writing. In the case of a cross hedge, the two assets will be different.

Let \( S_t \) be the spot price of the asset that we wish to hedge and \( S_t \) the spot price of the asset underlying the futures contract that we are using. The effective price that is paid or received is

\[
S_t + (F - F_t) = F + (S_t* - F_t) + (S_t - S_t*) \quad (3.7)
\]

Thus, in such a case, the basis will consist of two components. The first component; \( S_t - F_t \) is the basis that would exist if the asset being hedged is the same as the asset underlying the futures contract. The second term, \( S_t - S_t* \), is the basis that arises due to the fact that the two assets are not the same.

3.16.3.2 Quantifying Basis Risk

The basis is defined as

\[
b_t = S_t - F_t \quad (3.8)
\]

The risk in modern finance is defined as the variance of the random variable. Therefore, basis risk may be measured by

\[
\sigma^2(b_t) = \sigma^2 (S_t - F_t) = \sigma^2 (S_t) + \sigma^2 (F_t) - 2 \rho \sigma (S_t) \sigma (F_t) \quad (3.9)
\]

If the spot price and the futures price have identical variances and are perfectly positively correlated, then \( \sigma^2(b_t) \) will be zero and there will be no basis risk.
The critical factor is $\rho$. The higher the correlation, the lower will be the basis risk. Hedging substitutes price risk with basis risk. Hence, an investor will find it attractive to hedge, only if the basis risk is substantially lower than the price risk.

3.21 Management of the Hedging

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

3.21.1 Monitoring the hedge

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

i). Cash position

The hedger must get the information of the current size of the cash position being hedged. The changes are to be noted in its magnitude since the inception of the hedge, the gains or losses on this position to date and the reasons of such deviation.

ii). Futures positions

Likewise, cash position, the information regarding the size of futures position, profits and losses incurred to date of this position, to be collected for further consideration.
iii). Basis movements

All such information regarding the changes in this basis should be collected to see whether they are consistent with prior expectations or there are any major deviations at the particular time intervals.

3.21.2 Adjustments to the hedge

After monitoring the hedging performance through the information network, sometimes, there is need to make some adjustments during the life of a hedge. A few important such adjustments, in general, have been discussed as under.

i). Changes in risk exposure

During the monitoring period, if the size of the cash position being hedged is changed, then the size of the hedging futures position should be changed accordingly. Further, changes in risk exposure will also lead to change in cash position.

ii). New hedging goals

Managing the hedging position effectively much depends upon the information network of the hedger. As the new information becomes available, there may need to change the goal of the hedger. Based upon such changes, the hedging strategies should be adjusted accordingly.

iii). Basis management

With the changes in the basis, the new opportunities may arise for the hedgers. In order to take the advantages of such developments in the basic movements, futures position may be adjusted from one contract month to another so forth contract month.
3.22 Rolling the hedge

Sometimes, such events and development occur in the market that it becomes necessary for the hedgers to change their hedging strategies. Then in that situation, futures positions may be lifted periodically from one month to another month. In other words, the futures position may be initiated or to switch them like from less liquid period to more liquid period.

3.23 Devising a Hedging Strategy

There are different concepts and principles involved in designing a specific hedging strategy, such as to select a futures contract for hedging, to determine and calculate the optimal hedge ratio, to design and manage a hedging strategy and so on.

a) Deciding on the futures contract

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

b) Selection of futures contract

While deciding on 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, the starting point in a futures contract is to select such assets which are inter-related.
c) Selection of contract month

The important consideration in designing a hedging strategy is to select the contract month. The futures contracts are available in the market of different months. So the selection of month of a futures contract will depend upon such period where the futures and spot prices are highly correlated. Obviously, the prices of the near month contract are the most highly correlated with a cash price. Thus, using the near-month futures contract will reduce basis risk 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 next month futures contract is preferable because it minimizes the basis variation.

Both the alternatives have their own mechanism depending upon the hedging objective, such as 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.

3.24 Hedge Ratio Concept

Another important decision in devising a hedging strategy is to determine the optimal futures position to follow, popularly known as optimal hedge ratio. In order to minimize the risk, the hedger must take a futures position, that is the number of the futures contracts times the quantity represented by each contract, which will result in the maximum reduction in the variability of the value of the total (hedged) position.29
The hedge ratio (HR) is the ratio of the size of the position taken in futures contracts to the size of the exposure.

\[
HR = \frac{\text{Future position}}{\text{Cash market Position}} = \frac{QF}{QS}
\]

Where HR is Hedging ratio, QF is quantity (or units) of the asset represented by the futures position and QS is quantity (or units) of the spot (cash) asset that is being hedged.

3.24.1 Estimating the Hedge Ratio

To determine the number of futures contracts to hedge with, it is essential that a prior estimate of hedge ratio be obtained. Various methods are used to estimate the ratio depending upon the nature of futures contracts. It is important to note that no one can know with certainty what the relationship will be in the futures between the cash and futures prices of the underlying asset being hedged. One can just rely on the past behaviour and relationship of these prices and normally it is expected that the same would happen in futures too.

3.25 Hedge evaluation

The final step in effective hedge management is to evaluate how prior hedging strategies have worked and to determine whether they can be improved or not. In order to evaluate a hedging strategy, we can use an ex-post measure of effectiveness which is as under:

\[
HE = 1 - \frac{\text{Variance (Gains or losses in hedged position)}}{\text{Variance (Gains or losses in unhedged cash position)}}
\]
If the value of the above is closer or nearer to one, the more successful is the hedge. According to this measure, a comparison is done between the ex-ante hedging effectiveness and the ex-post hedge effectiveness. If there is significant difference or deviation between these two, then the situation will be analyzed in depth to find out the reasons behind such departure. All such costs like brokerage fees, translation costs, management costs, and so on should also be examined from time to time. After considering these, the hedging should be compared with alternative risk management.

### 3.25.1 Measuring Hedging Effectiveness

The objective of a hedger is to try and reduce, if not totally to eliminate the exposure to price risk. But in the process, the hedge has to take on basis risk. A hedge can be said to be effective only if the resulting basis risk is significantly less than the price risk to which the hedger would have been exposed. Therefore, the hedging effectiveness is computed by using the following formula.

\[
HE = 1 - \frac{\sigma^2 (b)}{\sigma^2 (S)}
\]

If the basis risk equals the price risk, as measured by \(\sigma^2 (S)\), then there will be no risk reduction and the hedging effectiveness will be zero. On the other hand, if the basis risk is zero, then we would have a perfect hedge and the hedging effectiveness will be one.

### 3.26 Conclusion

The financial growth of the nation depends upon the performance of the equity market. Indian capital market is a fully automated trading system. It gives transparency of the trading activities to the investors. The futures market function depends upon the basic principle of the price discovery mechanism. This mechanism provides the price discrepancy between the spot and futures market. Hedging is used to control the price
risk of the securities. Hence the researcher has discussed the concept of the cash market, futures market operations and hedging mechanism.
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