Chapter 1
Introduction

Capital market plays a crucial role in attracting new sources of capital and allocating them across productive sectors of the economies. This process facilitates the economy to grow at a sharper pace. The growth of capital market is a proper signal of people’s confidence in the economic prosperity of the country. If a country is called developed, it implies that it owns an organized developed capital market. The proper allocation of financial resources to the productive industries is the main function of various institutions of capital markets. If we compare economies, we find that people of less developed economies are more inclined to save in unproductive and fruitless channels such as real estate and precious metals. On the other hand, when a capital market is developing and it leads to better economic condition of that country, the investors are more willing to undertake their investment in the capital market. In other words, the savings rate of households in developed economies may be affected by the growth of capital markets. However, the investors even in developed economies may be unwilling to invest in capital markets due to high volatility. The term emerging market has been widely used, particularly, over the recent decade in financial economic literature. A vast body of the studies has reported high volatilities in the emerging capital markets like China, India, Russia, and Brazil. These studies showed that the emerging markets are more volatile relative to the developed markets. Therefore, it can be assumed that the volatility of equities in the emerging markets have different characteristics compared to those of the developed markets. There are some important sources of volatility namely asset concentration, stock market integration (particularly as result of globalization, microeconomic and macroeconomic effects) and political risks. Only asset concentration risk can be minimized using portfolio diversification. However, the rest of the risks cannot be managed through diversification. The non-diversifiable risks are also known as systematic risks. Some noteworthy examples of systematic risk are interest rate and exchange rate risks. One of the main objectives of the capital market is to stabilize the values of securities and reduce the unwanted fluctuations in the stock prices. The value stabilization and price volatility minimization are facilitated by financial instruments namely derivatives.
1.1 Financial Derivatives

Derivatives are financial instruments whose values are derived from the values of underlying assets, i.e. security or index. For example, a stock option is a derivative because its value changes in relation to the price movement of the underlying stock. In fact, derivatives are contracts between two parties under which payments and transactions have to be made. The first derivatives exchange was founded in Chicago, United States in 1848, namely the Chicago Board of Trade (CBOT) which has been the oldest organized futures market all over the globe. In 2007, the CME Group was established with the merger of CBOT and the Chicago Mercantile Exchange. The most common derivatives instruments are options, futures, forwards and swaps. Other than the main types of derivatives, some others like credit derivatives, energy derivatives, weather derivatives, interest rate derivatives and currency derivatives have come into existence. Standardized derivative contracts can be traded on an organized stock exchange. These derivatives are also called exchange-traded derivatives. They can also be customized as per the needs of the user by making an agreement with the other party. Such derivatives are called over-the-counter (OTC) derivatives.

Derivatives can be used for either speculation or risk management (hedging) purposes. Trading in futures market allows risk-averse producers and inventory holders to hedge their productions and inventories by locking in sales prices through taking a short position in futures contracts (Stein, 1987). Besides the risk management process, the price discovery role of derivatives is another key function of this market. Theoretically, if spot and futures markets are efficient based on responding to new information and are also perfectly correlated, there would not be any mispricing and arbitrage opportunities. However, it would not be the case in the real world, as a large number of empirical studies evidenced that futures markets lead spot markets in the price discovery process. A discrepancy between demand and supply of the derivatives market may lead to disequilibrium between theoretical derivatives price and their market price. The equilibrium can be adjusted by arbitragers who take opposite positions in derivatives and underlying markets. However, derivatives have been seminally designed for mitigating the risk in the underlying asset. Derivatives facilitate the investors to transfer the risk of the prices from one party to another. Besides hedging and price discovery functions of derivatives markets,

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offering higher capital leverage than the underlying markets is another advantage of these markets. Due to quick shock transmission of derivatives, their prices are expected to change more rapidly than the underlying spot markets. The greater the liquidity, the faster the transmission of information to the futures market prices. Theoretically and empirically, this issue has been widely argued in the existing literature. Brooks et al. (2001, p. 34) states that:

But why might such lead-lag relationships exist? For a practical perspective it is generally agreed that two phenomena of market sentiment and arbitrage trading are the major determinants linking stock index futures and the stock market. Conventional wisdom amongst professional traders suggests that movements in the futures price should reflect expected future movements in the underlying cash price. The futures price should quickly reflect all available information regarding events that may affect the underlying and respond quickly to new information. The index should respond in a similar fashion, but for the index to react to the new information completely the underlying stocks must all be revalued, i.e. every constituent stock must re-evaluate the new information and adjust accordingly.

Since the introduction of futures trading in CBOT in 1865, one of the main concerns that has motivated the participants of capital markets to carry out empirical investigations is the impact of futures trading on underlying spot markets. The main reason behind this issue is that speculators, hedgers, researchers and all other capital market participants believe that speculative activities in futures markets might either stabilize or destabilize the underlying spot markets. Conventionally, it is argued that the advent of futures trading might add more informed traders to the spot market and make the spot market more liquid and stabilized. Another theoretical viewpoint suggests that futures’ trading is a source of destabilization for the cash prices. It believes that presence of uninformed traders (irrational speculators) in both spot and futures markets is due to the start of futures trading. These speculators drive the prices up and down in the hope of short-run profit. They hold this point of view to the expiration day effects caused by large institutional arbitrageurs. However, we do not know how irrational these speculators trade, the economist theoretically argued that a considerable amount of irrational speculation may lead to destabilization in the cash markets². Lower transaction costs in derivatives markets attract uninformed speculators suggesting higher level of speculation and liquidity in derivatives market compared to the underlying markets. These activities, in turn, lead to tighter bid-ask spread. Cox (1976, p. 1217) saying that:

Speculators take a long or short position in the futures market when they expect the futures price to rise or fall. Relatively low costs of transacting in futures markets make it worthwhile for these speculators to close out their positions with an offsetting sale or purchase of futures contracts rather than accepting delivery of and selling, or acquiring and delivering, the physical commodity. With futures trading, speculators can bear price risks whenever they expect profits without establishing trade connections for merchandising the commodity. This is not to say that there are no speculators trading a commodity in the absence of futures trading. Whenever stocks of a commodity are held in an uncertain world, someone speculates by bearing the price risk of stockholding. Futures’ trading attracts additional speculators who would not trade the commodity without a futures market.

A principal concern of policy makers, financial institutions and investors is that speculative activities involved in futures markets may lead to destabilization in underlying stock markets. In the case of destabilization, the cost of capital increases, therefore, policy makers may include restrictions on futures trading. However, further regulations may have negative effects on the operation of financial markets and the economy as a whole (Kamara et al., 1992 and Antoniou and Holmes, 1995). Concerns about the impact of speculative activities on market price volatility have been even argued long time before the futures trading onset. Traditionally, most of them did not believe in this idea that speculations might increase the market price volatility (Mill, 1871 and Kaldor, 1960). Arguments about these concerns have increased intensively after the introduction of futures trading particularly due to the attraction of futures markets to the potential speculators. However, theoretical and empirical literature is replete with a large number arguments and investigations, this concern still remains inconclusive and it leads to inappropriate managerial implications.

1.2 History and Development of Financial Derivatives in India

Derivatives market in India has been in existence in one form or the other for a long time. In commodities, the Bombay Cotton Trade Association started futures trading way back in 1875. In 1952, the Government of India banned cash settlement and options trading. Derivatives trading shifted to informal forwards markets. In recent years, the government policy has shifted in favor of an increased role of market-based pricing and less suspicious derivatives trading. The first step towards introduction of financial derivatives trading in India was the promulgation of the Securities Laws (Amendment) Ordinance, 1995. It provided for withdrawal of prohibition on options in securities. The last decade, beginning the year 2000, saw the ban on futures trading
being lifted in many commodities. Around the same period, national electronic commodity exchanges were also set up.

Derivatives trading commenced in India in June 2000 after the Securities and Exchange Board of India (SEBI) granted the final approval in May 2001 on the recommendation of the L.C. Gupta Committee. SEBI permitted the derivatives segments of two stock exchanges, National Stock Exchange (NSE) and Bombay Stock Exchange (BSE), and their clearing house/corporation to commence trading and settlement in approved derivatives contracts. Initially, SEBI approved trading in index futures contracts based on various stock market indices such as CNX Nifty and Sensex. Subsequently, index-based trading was permitted in options as well as individual securities.

NSE provides a trading platform for all types of securities --i.e. equity, debt, and derivatives. Following its recognition as a stock exchange under the Securities Contracts (Regulation) Act, 1956 in April 1993, it commenced operations in the Wholesale Debt Market (WDM) segment in June 1994, in the Capital Market (CM) segment in November 1994, and in the Equity Derivatives segment in June 2000. The Exchange started providing trading in retail debt of government securities in January 2003, and trading in currency futures in August 2008. NSE started providing trading in currency option in October 2010. Derivatives on global indices such as S&P 500, Dow Jones Industrial Average and FTSE 100 have been introduced for trading on the NSE. The future contracts for trading on Dow Jones Industrial Average (DJIA) and futures and options contracts on S&P 500 were introduced on August 29, 2011. The futures and options contracts on FTSE 100 were introduced on May 3, 2012.

The Bombay Stock Exchange (BSE) created history on June 9, 2000 when it launched trading in Sensex based futures contract for the first time. It was then followed by trading in index options on June 1, 2001; in stock options and single stock futures (31 stocks) on July 9, 2001 and November 9, 2002, respectively. It permitted trading in the stocks of four leading companies namely; Satyam, State Bank of India, Reliance Industries and TISCO (renamed now Tata Steel). Chhota (mini) SENSEX7 was launched on January 1, 2008. With a small or mini market lot of 5, it allows for comparatively lower capital outlay, lower trading costs, more precise hedging and flexible trading. Currency futures were introduced on October 1, 2008 to enable participants to hedge their currency risks through trading in the U.S. dollar-rupee future platforms. NSE started trading in index futures, based on popular CNX Nifty Index, on June 12,
2000 as its first derivatives product. Trading in index options was introduced on June 4, 2001. On November 9, 2001, Futures on individual securities started. As stated by the Securities & Exchange Board of India (SEBI), futures contracts are available on 233 securities. Trading in options on individual securities commenced on July 2, 2001. The options contracts, available on 233 securities, are of American style and cash settled. Trading in interest rate futures was started on 24 June 2003 but it was closed subsequently due to pricing problem. The NSE achieved another landmark in product introduction by launching mini index futures & options with a minimum contract size of Rs. 1 lakh. NSE created history by launching currency futures contract on US dollar-rupee on August 29, 2008 in Indian Derivatives market (Gakhar and Meetu, 2013).

India is one of the most successful developing countries in terms of a vibrant market for exchange traded derivatives. This reiterates the strengths of the modern development of India’s securities markets which are based on nationwide market access, safe and secure electronic trading, and a predominantly retail market. There is an increasing sense that the equity derivatives market is playing a major role in shaping price discovery. Factors like increased volatility in financial asset prices, growing integration of national financial markets with international markets, development of more sophisticated risk management tools, wider choices of risk management strategies to economic agents and innovations in financial engineering have been driving the growth of financial derivatives worldwide and also fueled the growth of derivatives in India. Despite the encouraging growth and developments, industry analysts feel that the derivatives market has not yet realized its full potential in terms of growth and trading. Analysts point out that the equity derivative markets on the BSE and NSE have been limited to only four products --index futures, index options and individual stock futures and options-- which, in turn, are limited to certain select stocks only. Although NSE and BSE recently added more products in their derivatives segment (weekly options, currency futures, mini index, etc), their number is still far less than the depth and variety of products prevailing across many developed capital markets. As Indian derivatives markets become more sophisticated, greater investor awareness will become essential. NSE has programs to inform and educate brokers,
dealers, traders and market personnel. In addition, institutions will need to devote more resources to develop the business processes and technology necessary for derivatives trading.3

The equity derivatives market turnover on the Indian exchanges increased from Rs 32,158,208 crore in FY4 2012 to Rs 38,704,572 crore in FY 2013. NSE has created a niche for itself in terms of derivatives trading in various instruments. The currency derivatives trading in India started in August 2008 at NSE with currency futures on the underlying USD-INR exchange rate followed by futures trading in currency pairs such as GBP-INR, EURO-INR and JPY-INR. Later in October 2010, currency options’ trading was allowed on USD-INR. The currency derivatives turnover in India decreased from Rs 9,896,413 crore in FY 2012 to Rs 8,710,504 crore in FY 2013.5

1.3 Research Design

The rapid growth of derivatives in the emerging markets and their critical responsibility in the volatility of the stock markets led to frequent empirical investigations on the impact of derivatives on spot market volatility during the recent decades. In spite of large amounts of research on finding whether derivatives trading stabilize or destabilize the cash market, it still remains as a controversial issue among the researchers, investors and policymakers. Time of investigation, different structure and macro economic conditions of underlying markets have been detected as the influencing factors in determining stabilization or destabilization effects of futures trading on cash markets. However, the derivatives being originally used to hedge risks and offset the possible losses; most of the economist particularly after recent financial crash in 2008 argued that the world’s economy is destroyed due to the horrific derivatives bubble more than any other cause. As the large bets and speculations are made in the derivatives market, it has become a casino. Because the derivatives market is almost an unregulated where particularly in the recent years it has been bubbled to an unbelievable proportion. Not surprisingly, tremendous speculative activities have taken place in such situation. In the theoretical literature, a large number of arguments suggest that the start of trade in derivatives increases the speculative

4 FY is abbreviation of Financial Year.
activity that, in turn, destabilizes the cash markets. On the other hand, some people argued that an increase in well informed speculative trade has two opposite effects on the measured volatility. It decreases the volatility due to order flow imbalances, caused by uninformed traders, because informed traders provide liquidity in such events and it increases the volatility due to new fundamental information since the information is impounded into prices more quickly (Harris, 1989). Conventional wisdom suggests that futures trading will add more informed traders to the cash market, making the cash market more liquid and, therefore, less volatile. The viewpoint of stabilization effects of futures trading may stem from a belief that argues the introduction of futures trading results in the presence of uninformed (or irrational) speculators in both futures and cash markets. These speculators drive prices up or down hoping for short-run “bandwagon”6 profits (Irwin and Brorsen, 1985). The stabilization view also implies that the start of futures trading leads to more information flow and more complete market which, in turn, can dampen the volatility of the cash market (Debasish, 2011). These arguments catch the attention of the academics and professionals to find the impact futures trading on underlying cash market volatility. A large volume of studies has been carried out in the developed economies to investigate the stabilization/destabilization effects of derivatives trading on spot markets. Due to riskier economic systems of emerging markets, the results achieved from developed markets cannot be extended to the emerging markets. Therefore, this issue still remains inconclusive in the emerging markets scenarios.

The volatility may be an undesirable factor from an investor’s point of view; however, it is not a negative element in the financial market as it reflects the information transmission. An important question which is of a considerable interest to the researchers and policy makers is whether derivatives markets affect price discovery in the cash markets. Theoretically speaking, in an efficient financial market, the new information should be transmitted into cash and futures markets at the same time. However, it is not the case in the real world where institutional factors often create an empirical lead-lag relationship between alternative securities price changes. The market with the greater liquidity, lower transaction costs and lesser restrictions may play a predominant role in the price discovery process. In fact, futures markets may incorporate information more quickly than cash markets because of their inherent leverage, low transaction

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6 Jumping on the bandwagon suggests following the crowd for the excitement of the event rather than any firm conviction in its direction. In this context it means to profit from a craze.
costs, and limited restrictions in short selling (Tse, 1999). Accordingly, the prices of the futures and spot markets have a systematic relationship in the short-run and/or in the long-run. The price discovery process implies that prices of two markets (spot and futures) are tied up in the presence of long-run equilibrium. If disequilibrium takes place over the time, one or both prices would adjust to correct disparity (Zhong et al., 2004). The individual investors and researchers often use non-stationary financial time-series data. This data may lead to a spurious regression model. Therefore, the analysis of the price discovery role of spot and futures markets consists of two main steps. First, to test whether both series are non-stationary in the same order and they also need to be examined for their cointegration relationship. The second step depends on the first one. If there is no significant cointegration relationship or even each of the series are non-stationary of different order, we should stop the investigation because they are significantly independent time-series and there would not be right information in each of the series to predict the prices of the other series (Quan, 1992). As stated earlier, the price discovery function broadly depends on three main factors namely leverage benefits, transaction costs and liquidity. Therefore, the market that provides superiority in such benefits may play a dominant role in the price discovery process. In the theoretical and empirical literature, most of the studies opined that the futures markets lead the cash markets due to the mentioned factors (Chan, 1992; Chatrath et al., 1999; and Yang et al., 2001).

Like other finance aspects, the investigation on finding a predominant role of price discovery process has mostly concentrated on developed markets. Conducting similar investigations in the emerging economies is a crucial task for the researchers, professionals and regulators.

1.4 The Statement of the Research Problem and Need for Study

The financial stability is a term which the majority of investigations in stock markets are revolving around. The issue of impact of derivatives introduction on the cash market volatility has invited substantial attention of the researchers and policy makers, particularly following the stock market crash in 1987. A large number studies were conducted to find stabilization/destabilization effects of futures trading on spot market (Aggarwal, 1988; Edwards, 1988a, b; Koutmos and Tucker, 1996; Bessembinder and Seguin, 1992; Antoniou and Holmes, 1995; Kan, 1997; Lee and Tong, 1998; Antoniou et al., 1998; Mallikarjunappa and Afsal, 2008;
Dawson and Staikouras, 2009; and Alexakis, 2011). Some people evidenced a decrease in the volatility of cash market following the onset of futures trading (Edwards, 1988a; Dawson and Staikouras, 2009; and Alexakis, 2011). Some others supported the evidence of higher spot market volatility after the introduction of futures trading (Aggarwal, 1988; and Bessembinder and Seguin, 1992). However, some people like Antoniou et al. (1998) and Mallikarjunappa and Afsal (2008) showed that the start of futures trading had neither stabilization nor destabilization effect on the spot market volatility. These results appear different as they were investigated using different econometric models in different time and markets settings with particular structural characteristics. The effect of derivatives trading on spot markets has been widely investigated in advanced market scenarios like US, UK, Japan and Canada. However, there has not been a great deal of research conducted on Indian derivatives market as a transition economy. Therefore, the empirical investigations carried out on Indian market will contribute to the literature and will also provide helpful managerial implications. Although, over the recent decade, Indian market received the global attention of a large number of researchers, the debate about Indian derivatives market effects on spot market still remains a controversial one.

India’s experience with the equity derivatives market has been extremely positive. The turnover of derivatives on the NSE increased from Rs. 24 billion in 2000–2001 to Rs. 292,482 billion in 2010–2011, and reached Rs. 313,497 billion in 2011–2012. In 2012-2013, the figure reached Rs. 315,330 billion. The average daily turnover in this segment of the markets on the NSE was Rs. 1,266 billion in 2012–2013 compared to Rs. 1,259 billion in 2011–2012. India is one of the most successful developing countries in terms of a vibrant market for exchange-traded derivatives. In terms of the number of single stock futures contracts traded in 2012, the NSE held the fourth position. It was second in terms of the number of stock index options contracts traded and fifth in terms of the number of stock index futures contracts traded in 2012. This reiterates the strengths of the modern developments in Indian securities market. There is an increasing sense that the equity derivatives market plays a predominant role in the price discovery process.

Since a common debate that argued large sum money speculating in derivatives markets - about 600 trillion dollars that is 10 times of the GDP of the world-- is the root cause of the previous financial crisis on 2008. Therefore, there is an empirical question to answer whether less regulated derivatives markets are identified as the prime suspect of this economic turmoil. Over the recent years, the regulatory authorities of different countries attempted to put restricted
regulations in derivatives trading and introduce new derivatives tools to manage the risk and control unwanted fluctuations. The Security Exchange Board of India (SEBI) as regulatory authority of India’s securities market permitted the introduction of new derivatives tools and enacted new restricting regulations in the post financial crisis. During December 2007, SEBI permitted mini derivative (F&O) contract on index (Sensex and Nifty). Further, in January 2008, longer tenure index options contracts and Volatility Index (VIX) and in April 2008, bond index was introduced. In addition to the above, during August 2008, SEBI permitted exchange traded currency derivatives.7 As mentioned earlier, derivatives on global indices such as S&P 500, Dow Jones Industrial Average and FTSE 100 have been introduced for trading on the NSE. The future contracts for trading on Dow Jones Industrial Average (DJIA) and futures and options contracts on S&P 500 were introduced on August 29, 2011. The futures and options contracts on FTSE 100 were introduced in NSE on May 3, 2012.8 Applying new technology has been the backbone of the NSE market. NSE chose to harness technology to create a new market design. The exchange believes that technology provides the necessary impetus for an organization to retain its competitive edge and to ensure timeliness and satisfaction in customer service. The NSE is the first exchange in the world to use satellite communication technology for trading. In total, the financial derivatives have been changing the world of finance through the creation of innovative ways to comprehend, measure, and manage risks and Indian derivatives market held among the top markets.

Further, as a part of gradual liberalization process, comprehensive guidelines for derivatives trading in India were released by the RBI in 2007-08. The guidelines aimed to lay down the general principles for derivatives trading, management of risk and sound corporate governance requirements, which also include a conduct code for market makers. The derivatives and spot markets are highly integrated in Indian market by arbitrage establishing in the long-run. Therefore, it is very important to study the long-run cointegration relationship, price discovery leadership, volatility spillover, and information dissemination between spot and futures markets. However, a large number of studies have been conducted in Indian context; there is still a lack of consensus (Mukherjee and Mishra, 2006; Karmakar, 2009; Mallikarjunappa and Afshal, 2010; and

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Kumar and Chaturvedula, 2013). Mukherjee and Mishra (2006) found that the spot market comparatively plays a stronger leading role in the price discovery and information dissemination process. On the other hand, Karmakar (2009) evidenced that Nifty futures has a leadership in the price discovery procedure. However, Mallikarjunappa and Afsal (2010) and Kumar and Chaturvedula (2013) showed neutral and mixed price discovery roles. As we find the mixed results in the literature of the price discovery and volatility spillover between Indian spot and futures markets, they still remain as debating issues. In addition, a lack of uniformity in selected models is seen in the literature. Therefore, much empirical attempts are needed in these aspects to achieve a consensus which, in turn, can provide the policy makers a helpful underpinning in the regulatory reforms.

Following the recent reforms in Indian derivatives market, this study can provide a fruitful foundation to address the issue of stabilization/destabilization effects of futures trading activity and their price discovery leadership role in the post reformation era.

1.5 Objectives of the Study

Commonly, an investor would like to craft a perfect investment by realizing the expected return and minimizing the risk of portfolio. An investor or a business maker could face three types of risk in the investment process --i.e. market risk, business risk and financial risk. Identifying the causes of volatility can help the investor to curb and to take advantage of these inevitable market swings. Therefore, taking the right hedging strategy is essentially needed to reduce the market risk or volatility. The advent and growth of the derivatives market over the last three decades can be traced back to the willingness of risk-averse investors to hedge themselves against unwanted fluctuations of the stock prices. The start of futures and options trading in the emerging markets has increased dramatically during the recent decade. The derivatives products initially designed to reduce the impact of price fluctuations on the cash flows of the investors; however, they are likely to attract larger uninformed speculators due to lower transaction costs and leverage benefits which, in turn, lead to higher volatility in the spot prices. In the wake of derivatives introduction in 2000, the new opportunity of trading has been established for investors in Indian market. The recent developments of Indian derivatives market encourage academics, regulators and professionals to investigate the impact of derivatives trading on underlying spot market.
Although, the spot and futures markets are generally cointegrated over the long-run, it cannot be concluded that these markets are responding to new information contemporaneously. Therefore, the price discovery process takes place. It implies that one market plays a leading role and the other market follows it. The leading market is the one which attracts the information faster than the other market. In the other words, the dominant market provides a platform to transmit the new information to the prices. Generally, the price discovery process hinges to three main factors namely transaction costs, leverage benefits and liquidity. Accordingly, the traders would have been attracted to the futures markets due to lower trading costs, higher liquidity and benefits of leverage. Therefore, by transferring the informed speculators from spot to the futures market, the later one is expected to be more liquid and less volatile. These issues provide us an empirical question to address whether the futures market plays a leading role in the price discovery process. In this study, the following objectives are set out to investigate the impact of futures trading on the underlying spot prices in India market.

1. To analyze whether stock futures trading significantly affects the spot market volatility.
2. To analyze whether spot market volatility behaves differently after the introduction of futures.
3. To examine whether spot market volatility is affected asymmetrically by positive and negative news.
4. To examine whether the volatility of spot and futures markets are more influenced by old news or recent innovation.
5. To determine the price discovery leadership role between the futures and the spot prices of underlying individual stocks.
6. To examine whether futures market is more efficient in the price discovery process.
7. To measure the direction of volatility spillover between the spot and futures markets.
8. To determine the cointegration relationship between the stock futures and underlying individual stocks and to find whether there is a long-run equilibrium and short-run deviations from equilibrium between them.

1.6 Hypotheses

Based on above mentioned objectives, the following hypotheses are taken for testing.

1. The introduction of derivatives trading has no effect on underlying spot market volatility.
2. There is no change in the structure of spot market volatility during the post-futures sub-period compared to the period before futures’ introduction.
3. There is no leverage effect in the volatility of spot market.
4. There is no intraday lead-lag relationship between the stock futures prices and the underlying individual spot market.
5. There is no evidence of futures market efficiency in the price discovery process.
6. There is no cointegration relationship between the stock futures market and the underlying individual spot market.
7. There is no volatility spillover between the stock futures market and the underlying individual spot market.

The alternative hypotheses of above outlined null hypotheses are defined as follows:
1. The futures’ trading has significant impact on the spot market volatility.
2. The structure of volatility of the spot market has significantly changed after the introduction of futures.
3. There is leverage effect in the volatility of spot market.
4. There is significant intraday lead-lag relationship between the stock futures prices and the underlying individual spot market.
5. The futures market is more efficient in the price discovery process.
6. The significant cointegration relationship between the stock futures market and the underlying individual spot market is existed.
7. The volatility spillovers from one market to the other market.

1.7 Scope and Limitations of the Research

This study attempts to investigate the impact of stock futures trading on the underlying spot market. This investigation undertakes in two different aspects. The impact of stock futures trading on the underlying spot market volatility is deeply analyzed. The price discovery leadership role is carried out with respect to the lead-lag relationship between the stock futures intraday price series and the underlying spot prices. However, majority of the studies have been carried out using index data, we use individual stocks to analyze our study. As on the facts, the total turnover of derivatives market in NSE is more than the total cash market turnover in Indian markets (NSE plus BSE). Therefore, NSE derivatives market can be a reliable representative for
Indian derivatives market. This study attempts to evaluate these analyses using the most active individual stocks listed in NSE of India. These analyses are restricted to those individual stocks which are trading in the futures market for a considerable period (say at least three years). They are also limited to those stocks that are traded over a substantial period in pre-futures trading sub-period. Some stocks have been recently listed in derivatives market and there is no substantial data to analyze.

To analyze the impact of futures trading on the volatility of underlying spot market, we select 187 stocks listed on NSE meeting the above-mentioned criteria. Daily closing prices of these stocks for the period January 02, 1996 to September 30, 2013 are used. However, the beginning of the period for each symbol may vary depending on the stocks’ listed dates in NSE. The daily closing prices of BSE 200 index and S&P 500 index are used for the same period of time.

To investigate the lead-lag relationship and price discovery leadership role between spot and futures markets, the high frequency one minute intraday data are used which are provided by CDs from NSE. Among high frequency data intervals, one minute intraday data has been empirically detected as the best pattern to examine the lead-lag relationship between two markets. The most frequently traded symbols (42 individual stocks) are used for this analysis. The selected stocks with high frequency data are those that have at least one trading price in each one minute interval. Non-synchronous data is an inherent problem of high frequency data which is managed by matching futures market data with the underlying spot price at the same one minute interval.

1.8 Chapter Scheme

This study is arranged in seven chapters explained as below.

**Chapter 1- Introduction.** This chapter presents a history of derivatives market developments, its participants and their roles, integration between derivatives market and underlying spot markets and a brief background of derivatives market in India. A design of the derivatives market research, statement of the problem, need for study, objectives of this study, hypotheses, scope of this study and chapter scheme are represented in this chapter.

**Chapter 2- Financial Derivatives.** This chapter discusses a deep background of financial derivatives. The developments of derivatives products, their economic functions and concepts
and derivatives pricing models are explained in short. The derivatives market segments (exchange-traded vs. OTC derivatives markets) are briefly discussed.

**Chapter 3-** The Equity Derivatives in Indian Market. This chapter explains the evolution of derivatives market in India, the position of Indian F&O market among the global context, equity derivatives trading mechanism, contract specifications of instruments in F&O market, transaction charges, clearing and settlements, risk management mechanism and types of margins. There is also a brief discussion about regulatory framework of Indian market.

**Chapter 4-** Survey of Literature on the Effect of Derivatives Trading on Underlying Spot Market. This chapter is divided into two sub-sections. Part A discusses the theoretical and empirical studies conducted on the impact of derivatives trading on underlying spot market over the time. Part B reviews the relevant literature on lead-lag relationship and volatility spillover between derivatives and corresponding spot market.

**Chapter 5-** Analysis of Impact of Futures Trading on Underlying Spot Market Volatility. This chapter analyzes the investigation conducted to estimate the impact of futures trading on underlying spot market volatility in Indian market. The econometric methodology and data specifications are explained in details. The behavior of volatility of spot market during pre-futures and post-futures sub-periods is discussed using GARCH family models --i.e. simple GARCH, EGARCH and GJR-GARCH. The persistence level, unconditional volatility and the sensitivity of individual spot market to market wide (represented by BSE 200 index) and global (proxied by S&P 500 index) factors are discussed. The structural change in the spot market volatility following the launch of futures trading is provided by the estimates of Chow breakpoint test. The forecasting performance of alternative GARCH models are discussed using the most familiar measures of forecasting evaluation, namely, Root Mean Squared Error (RMSE), Mean Absolute Error (MAE), Mean Absolute Percentage Error (MAPE) and Theil Inequality Coefficient (TIC).

**Chapter 6-** An Analysis of Intraday Causal Relationship and Volatility spillover between Spot and Futures Markets. This chapter discusses the analysis of intraday causal relationship and volatility spillover between Indian spot and futures markets. The theoretical base of price discovery process, econometric methodology, Johansen (1988) cointegration test, Granger causality test, vector error correction model (VECM) and bi-variate BEKK-GARCH model are explained.
Chapter 7- Summary and Conclusions. This chapter includes summary of major findings, discussions, conclusions, recommendations and suggestions for further research.