CHAPTER 5
VOLATILITY & RISK MANAGEMENT

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5. VOLATILITY & RISK MANAGEMENT

5.1 Cash Market & Derivatives Market

Derivatives instruments were to be launched during the year 2000 with the hope that they would help in minimizing the future risk and control the stock price fluctuation. But now a day these instruments are to be treated as most speculative products. As these instruments are based on the value of cash market and their values are also derived from the underlying assets and both are significantly related to each other’s.

Derivatives market plays an important role in providing the additional information to the cash market about the future and worked as a leading factor in the cash market.

It also helps the cash market in discovery of price of the stock market. As the financial derivatives instruments are contracted for future and to calculate the future price there is a requirement of continuous watch about the information from around the world. It also requires a high degree of transparency.

On the one side this information helps in finding out the price of current market and on the other side the price of the current market will influence the future market, which helps in determining future price as well as the current price.

It helps create liquidity is the cash market by creating more confidence to the investors with risk transferring function. The derivatives market helps to transfer risk from those who have them, but may not like them to those who have an appetite for them.
Cash market provides a base to derivatives markets. As the value of derivatives is derived from the underlying assets, and the underlying assets are existing in the cash market, so there is a link in both.

Financial derivatives are exchange traded contracts which traded in a controlled environment. Due to that it transfers the speculation in a regulated market. A regulated and controlled security market helps in managing, monitoring, and surveillance of the trading activities of speculators, which helps investors to control over stock price fluctuations in the cash market.

5.2 Volatility and Efficiency of Cash Market with Financial Derivatives

The derivatives turnover on the NSE has surpassed the equity market turnover. The turnover of derivatives on the NSE increased from Rs. 23,654 million (US $ 207 million) in 2000-01 to Rs. 315,330,030 million in 2012-13. Derivatives trading assists in two vital socio-economic purposes: discovery of price and minimizing risk by shifting. Derivatives instruments help in minimizing risk with the hedging facility and also helped in discovery of price in the cash market as after the introduction of derivatives the impact of current news has increased and past news has declined on stock prices.

Various studies concluded that due to the price discovery function of the derivatives volatility of the stock market has also declined after the introduction of derivatives trading.

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27 NSE India Website.
As the enormous arena of finance endures to swiftly expand, it becomes vital to present the newest research and applications for researchers, specialists, and scholars in the field. The study of Volatility in the stock market has received great attention from the researcher and economic analyst. Volatility in the stock market not only put an impact on the growth of the stock market, but also affects the economic condition of individual investors, corporate and other market participators.

Indian stock market is a highly volatile market due to which domestic as well as foreign investors are afraid to make investments, which put an impact on the growth of the stock market as well as on the economy of the country. This is required to find out the role and impact of derivatives trading on the volatility of the stock market, which provide suggestions for the investors regarding the strategies that they can opt for trading in volatile stock market to minimize risk or fear of bearing losses. It also gives hope to the investors for earning profits in a fluctuating market.

The analysis of co-integration between the cash market and derivatives market is also requires, as the results can be helpful to the investors for making investment as well as for the regulators to formulate policies for the further development of the stock market.

**Volatility**

*Now, what actually is volatility? In simplest terms, the variability of return is called volatility.*

In financial terms, the rise or falls of the securities prices within a short period of time is known as volatility. It represents a level of price changes, which can be termed as a
deviation. Larger this deviation or variability, greater is the volatility. At a more primary level, volatility can indicate the strength or conviction behind a price move.

Volatility & Risk are two dissimilar terms which can be used interchangeably. But both have different meaning. Risk is the possibility of losing the purchasing power of money, whereas; Volatility is the level of the change in price over a given period of time. It refers to the amount of uncertainty rises or falls in the securities prices or risk about the decrease in a security's value. It can be said that volatility may be positive or negative, but the risk always has negative value.

A higher volatility means that a security's price can potentially be increased or decreased in a speedy way. The higher the fluctuation higher the fluctuations in stock prices over a short period of time in whichever direction. A lower volatility means that a security's value does not fluctuate quickly, but changes in value at a stable speed over a period of time. The higher the volatility, the more likely it is that the underlying asset will trade higher (or lower) than the exercise price of the expiry date.

It is difficult to analyze the term volatility as the term includes both upward and downward movements of the stock prices. But generally it is to be considered as downward movement, as people are more concerned about the losses. Volatility in the stock return is an essential part of the stock market, which represents the bull and bear trends in the security market. In the bullish market, the stock prices fly high and in the bearish market stock prices go down and these ups and downs determine the return and volatility of the stock market.

The volatility of security market also puts impact on the future pricing of securities. An increase in stock market volatility brings a large stock price modify of advances or
declines. It’s not financial market volatility itself, but only excessive volatility, that is, extreme and fundamentally not justified.

Asset price fluctuations may potentially impair financial market stability. Investment decision is a risky decision as it is related to uncertainty of return. It is necessary for an investor and portfolio manager to manage the risk and forecast the volatility of security price for getting maximum return and minimizing the financial risk.

There are various models through which, stock market volatility can forecast like historical or implied volatility models, inter-day or intra-day volatility models like Standard Deviation, Parkinson Model, Garman and Klass Model and ARCH/GARCH Models. Implied volatility models give more valuable results than other volatility models.

The stock market is a volatile market where stock prices are always fluctuating, due to the volatile market it is required to examine stock market volatility. Volatility can be calculated in percentage which helps in calculating the change in the stock prices for a particular period. Measurement of volatility helps investors to take future investment decision.

**Influence of Stock Market Volatility**

“Economists argue that stock market volatility can affect the economy in several ways:

1. it influences how much people spend and save:

2. it influences the prices of stocks: and
(3) *it influences the prices of financial options and thus affects how investors might hedge investment risk.*

Effect of volatility can be further explained in the following points:

**Good Impact**

- Provides liquidity to the market.
- May give good returns for investments.
- Generate revenues for the market.

**Bad Impact**

- Increasing the cost of replacement.
- Negative impact on international cash flow due to lack of confidence.
- Decreasing the value of currency.
- Higher volatility leads to the bear market.
- Create fear in the mind of investors.

### 5.3 Classification of Stock Market Volatility

**Historical Volatility and Implied Volatility**

Stock market volatility is often classified into historical volatility and implied volatility. *Historical Volatility* is also known as actual stock market volatility and the simplest method of calculating this volatility is the standard deviation. The historical

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volatility is to be calculated on the basis of past information and data that helps in predicting the future volatility.

Another type of volatility is *Implied Volatility*; this is also known as estimated volatility of a security's price. This is not very common, but good to measure estimated volatility, as it is based on current information rather than past and current is more valuable than past. Generally volatility is increasing when the market is bearish or stock prices are going down and the stock market volatility decreases when the market is bullish or stock prices are going up.

**Inter- day or Intra-day Volatility**

Volatility may also be measured by inter-day volatility and intra-day volatility.

The fluctuation in stock price return during the two trading days is known as *Inter-day Volatility*. Close to close and open to open stock prices helps in determining the inter day volatility on a daily basis.

*Intra-day Volatility* helps in measuring the volatility information for a particular day.

**5.4 Factors that Affect Volatility**

It is necessary to recognize and investigate the factors which are accountable for forming volatility in the stock market.

There are various *Economic Factors* like investment policies, taxes and interest rate policy, inflation rate, trading policy, financing policy, etc. are going to affect the stock price, which further leads to create volatility in the market.
Due to the international financial crisis in 2008 there was a major downfall in the history of the stock market and the stock market took a blood bath.

October 24, 2008, was the day for highest fall in the Indian market stock when the Sensex rushed by 1070.63 points (10.96 per cent) to close at 8,701.07. The National Stock Exchange Nifty ended at 2,557.25, down 13.11 per cent or 386 points. The BSE Midcap closed 8.38 per cent lower and BSE Small cap Index ended 7.66 per cent down.²⁹

Another factor is Political Factor, like instable politics, interference of the government; the fiscal policies of the government, international influence on Indian economy, and corruption etc. are also accountable for volatile stock prices.

During the year 2014, in a news channel it was declared that “India stocks rise as early vote count shows Modi win. Indian stocks rose as votes from India's general election indicated the leader of the opposition Baratiya Janata Party (BJP), Narendra Modi, would be the next prime minister. The Sensex index rose 6% to a record 25375.63, before falling back to stand up 1.29% at 24121.74. Both foreign and local investors are buying in the hope that BJP reforms will revive the Indian economy. Mr. Modi plans to revive economic growth in India by boosting investment.”³⁰

Another important factor is Industrial Factor, which involves industrial policies and rules and regulation, internal disputes also affect the stock prices, which enhance the volatility in the stock market positively or negatively.

This is common belief that an increase in stock market volatility leads to increase the risk of investment in securities investment. Due to probability of increasing risk

²⁹ NSE India Website.
investors would like to shift their funds in risk less investment. This change is not only impact on the native economy, but also impacts on the worldwide economy, which puts effect on the pockets of investors directly or indirectly.

The emerging economies like India are facing the same problem, due to which attrition of cash flow from the stock market, as investors don’t want to make an investment in a fluctuating market where return on an investment is not sure. Green market gives good hope and the red market takes every breath of the investor.

The stock market volatility is instigated by number of factors like variation in inflation rate, bank interest rate, financial influence, corporate earnings; dividends yield policies, technology, bonds prices and many other macroeconomic, social and political variables such as government stability, international trends, economic development, budget, universal business conditions, credit policy etc. Volatility in stock price is determined by changing in trading volume due to the upcoming of new information regarding new floats, or any economic, political, technological, industrial and corporate information that incorporate into market stock prices.

Among the other factors of volatility like economic, political, financial factors, the measure one more factor which is responsible for fluctuate the stock price is doing transaction or investment in stock market for a short period for getting quick return, Simultaneous buying and selling of securities in the lure of profits or speculative activities, rumors in the security market regarding rise or fall in stock prices, flow of information more quickly due to new technology and more quick reactions etc. creates volatile market.

Volatility in stock market creates fear in the mind of investors and it is difficult for regulators to control over such type of volatility. During the year 2001, derivatives
trading was launched by Indian Stock Market to control the volatility of spot market as the derivative contracts are related to future. By investing in derivative products one can hedge the losses of the spot market, which helps the investor to develop faith in the stock market and control over panic selling.

“Last decade was one of the most eventful decades in the International markets. On one side, just a few derivatives disaster stories were enough to bring the entire business of derivatives under the limelight, make everyone worry about unknown risks associated with derivatives, and elevate derivatives into a mysterious ‘something’; while, on the other side, there were people who started understanding the derivatives and used the derivatives for hedging and mitigating risks while adding liquidity to the markets.”

So, there is a question arise whether the introduction of derivatives instrument in security market helps in controlling stock market volatility or creating a more volatile market for the investors and market participants.

It is significant to evaluate the volatility as this is the crucial parameter to judge the efficiency of the security market. A high return and low volatility, market represents a good economy and financial condition of a country. On the other hand, high volatility and low return market are dangerous for the financial and economic condition of an economy.

There are various types of participants who are interested in doing trading in the stock market. Hedgers, speculators and arbitragers all are fascinated to the derivatives market for different purposes. All would like to minimize the risk or would like to get maximum return on the basis of their trading activities.

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There are contradictory opinions about the impact of derivatives trading on volatility of spot markets. Numerous studies have been conducted to discover the impact of derivatives on volatility. Studies have revealed diverse outcomes, some suggested derivatives increase volatility, some suggested derivatives decrease volatility and others suggested no impact of derivative trading on volatility of the stock market.

“Derivatives may be traded for a variety of reasons. A derivatives enables a trader to hedge some pre-existing risk by taking positions in derivatives markets that offset potential losses in the underlying or spot market. In India, most derivatives users describe themselves as hedgers (Fitch Ratings, 2004) and Indian laws generally require that derivatives be used for hedging purposes only. Another motive for derivatives trading is speculation (taking positions to profit from anticipated price movements).”

Volatility is the rate of change in the price of stocks by which stock market moves up and down, it may be positive or negative. Positive volatility occurs when an increase in stock price and negative volatility is just opposite to the positive volatility. Due to the volatile stock market it is very difficult for investors to predict the appropriate time for investment.

Hence there is a requirement for analyzing the volatility of the stock market and it’s a very important issue in the financial world. For the growth of the stock market and for doing trading in its volatility is required, but it should be up to some extent after that it would put a bad impact on the economy. As due to high volatility, risk of bearing losses may also increase, and due to that decrease in the flow of cash in capital market from investors.

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Volatility is also to be considered as risk used interchangeably most of the time. This creates confusion in the meaning of volatility. Most of the investors take high volatility as high risk. But both volatility and risk are separate terms.

Risk is the future uncertainty about expected results, which put negative impact on the profitability of the investors on the other side volatility, is the change in the price of securities during a period, which may be positive or negative, but generally volatility is considered for a bad cause.

The stock market is a place where stock prices are continuously moving either up or down, if prices are moving up, it’s to be treated good market condition and if moving down, considered as bad market condition. This moving up and down shows the volatility in the security market.

High gap between moving up and down shows highly volatile market, which creates a risk to the investors, as it is difficult to predict the market condition and create confusion in the mind of investors.

Measurement of volatility is an important tool to control over such type of difficulty. There is an instrument, with which investors can take opposite positions against the already holding position, that tool is ‘Financial Derivatives’.

*Merton Miller (1991) the winner of the 1990 Nobel Prize in economics - writes in his book Financial Innovation and Market Volatility* “By volatility public seems to mean days when large market movements, particularly down moves, occur. These precipitous market wide price drops cannot always be traced to a specific news event. Nor should the is lack of smoking gun be seen as in any way anomalous in market for assets like common stock whose value depends on subjective judgments about cash
flow and resale prices in highly uncertain future. The public takes a more deterministic view of stock prices; if the market crashes, there must be a specific reason.”

Now the question arises what is the impact of introduction of financial derivatives on the volatility of the stock market, whether increases the volatility or decreases the volatility of the underlying market.

There are lots of research already conducted on the topic of the impact of introduction of financial derivatives on the volatility of the stock market. It is essential to know the impact of introduction of future and option on spot market volatility as it helps policy maker and investors to take decisions regarding their investment.

**Stock Market and Indian Economy**

The stock market is an important part of the economy of a country. The stock market plays a pivotal role in the growth of the industry and commerce of the country, as it creates capital for the corporates that eventually affects the economy of the country to a great extent. That is the reason that the government, industry and even the central banks of the country keep a close watch on the happenings of the stock market. The stock market is important from both the industry's point of view as well as the investor's point of view. Stocks Market is not only important for the growth of industries but also important for individuals as they can increase their income by making investments in the stock market. To attract more investor’s smooth running of the stock market is very important, if there are so much fluctuation risk adverse investors, afraid to invest money and flow of capital starts to decline.

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Investors and Volatile Stock Market

One working paper of SEBI mentioned that “Introduction of Index futures is expected to reduce volatility in the cash market since speculators are expected to migrate to the futures market (Antoniou and Holmes, 1995). Many past studies in other countries measured impact of volatility on the cash market. In India as of now there is no scientific study that used some of the modern econometric techniques to measure volatility in the cash market after the introduction of Index futures.”34

Investment Decision: High volatility in the stock prices puts adversarial effects in an economy. In a volatile market investors are always confused regarding where to invest or not, as their hard earn money may be lost due to such fluctuations. It puts a negative impact on the flow of capital from domestic as well as foreign investors in the stock market.

Lost Confidence: A fluctuated market not only lost the flow of capital, but also lost the confidence of the investors and other participants from the stock market. As the stock market trading is based on the news and information, any bad news can create global slowdown and a fluctuated stock market is unable to make investors confident and discourage them to make investment and motivate them to run away from the market.

Depreciating Wealth: A smooth running stock market enhances the value of an investment, but a fluctuated market may depreciate the value of assets, which create fear in the mind of investors to lose their wealth.

34 SEBI, Price Discovery and Volatility on NSE Futures Market, M. T. Raju and Kiran Karande March 2003, working paper series no. 7, Pg. 10
Corporate and Volatile Stock Market

Lack of Capital: Risk of reducing the value of assets and return, decrease investment in the stock market. Trading in stock market creates capital to the corporates. But it may be affected due to the fluctuating stock prices.

High Cost of Capital: If corporates are unable to create capital money from the stock market, to meet out the capital requirement they have to approach to financial institutions, which will be costly for the corporates.

Economy and Volatile Stock Market

Inflation: Costlier source of capital increases, directly or indirectly increase the cost of products and decrease the purchasing power of money, which create inflation in the economy.

GDP: Gross domestic product also reduced due to the fluctuation in the stock market as lack of investment and lack of capital and due to which lack of production. The economy is not being able to meet out the demand of the country in the fluctuating stock market.

Vicious Circle of Poverty: High volatile market may be the cause for the vicious circle of poverty as it puts a negative impact on saving and investment, production, efficient utilization of resources, which creates poor become poorer and rich become richer.

Stock market volatility shows the degree of price fluctuation between the stock prices during a particular period. A certain degree of market volatility is inescapable, even necessary, as the stock price variation specifies changing values across economic activities and it enables better resource apportionment. But frequent and wide stock
market variations cause uncertainty about the value of an asset and affect the confidence of the investor. The risk averse and the risk neutral investors may withdraw from a market at sharp price movements. Extreme volatility disrupts the smooth functioning of the stock market.

A volatile market helps an investor to increase their pocket size but if the volatility is very high it makes the investor's heart beats fast. So, it is necessary to formulate some strategies or to take the help of professionals to manage our portfolio. As the volatile stock market has the opportunity to earn money. But a positive volatile market gives a smile to the investors, but negative volatility takes everything from investor. An investor should do the fundamental analysis of the market for investment and should diversify the fund instead of investing the whole money in one basket.

“Nowadays, one can buy derivatives that are written on volatility itself, in which case the definition and measurement of volatility will be clearly specified in the derivative contracts. In these new contracts, volatility now becomes the underlying “asset.” So volatility forecast and a second prediction on the volatility of volatility over the defined period is needed to price such derivative contracts.”35

There were many bull and bear phases on the Indian stock market and it has over on considerably short note. There are a lot of developments going on around the world in the stock market work and it is all having a correlation effect on each other. After a strong rally some sort of a pullback and consolidation are given. The bull phases earned decent returns and the bear phases incurred loss. In the bull phases volatilities were lower than bear phases. On the one hand, when good corporate results and economic reforms have boosted the investment sentiment, excessive speculation has

shaken the investors’ confidence on the other. However, the Indian capital market is on its way to maturity and as is typical of this phase, there are a lot of new ideas and concepts, a majority of which are still half baked. The progress made by the Indian capital markets in the post liberalization phase in terms of implementing international standard practices, widening and deepening of capital markets and the technological progress has been remarkable.

It should, however, be noted that this period was also marked by greatest turmoil that the markets have ever witnessed. With timely and appropriate policy initiatives, systemic failures were avoided. The importance of capital market in the development of the economy of a country cannot be over emphasized. Investors need to invest in the stocks which have the maximum expected returns with minimum risk. Expected dividends, financial stability of a company, individual’s investor’s age, wealth, income, education and occupation are some of the factors which influence the investor’s decision. Rumors and speculations also play a vital role in stock price movement; the study of volatility of the capital market can be very useful for decision making purpose.

5.5 Risk Management with Futures Contracts

Strategies are game tactics formed by an investor to deal with the risk and achieve objectives. These strategies are based on an investor perception of how the market will move. Different strategies are available for different views on market movements. Future contracts strategies can be classified into three groups as mentioned below:
**Hedging Strategies:** Hedge means taking an opposite position that an investor already has to reduce the risk of price fluctuation. Futures contract provides a facility to control over the risk in the spot market. There are two hedging strategies: one is long futures and the second is short futures.

A situation where an investor has to take a long position on futures contracts in order to hedge against futures price volatility is known as a long futures strategy. The other situation is when an investor has to take a short position on futures contracts in order to hedge against futures price volatility.

**Speculative Strategies:** Speculators desire to take a long or short position in the market to earn profits from fluctuating market. A long futures contract represents the buying position and will give profits when spot price increases. Shot position means selling position and will give profits only when prices decreases. A Long futures will gives a return, if an investor believes that particular stock prices is undervalued and expect its price will go up in near or mid-month. Stock futures can be used by a speculator who believes that a particular security is overvalued and likely to see a fall in price, for this short futures strategy may be used. Speculators are a risk taker and may create fluctuation in stock prices.

**Arbitrage Strategies:** Arbitragers are those who are dealing in two markets; buy stocks from one market at lower price and sell it in another market at a higher price. The difference between the buying price and the selling price will be the profits to the arbitragers. Dealing in spot stock market and futures stock market provides the opportunity to the arbitragers to earn profits with arbitrage strategies, like purchase stocks from spot market at lower price and short futures contracts at higher prices.
5.6 Risk Management with Options Contracts

Sometimes, it is profitable to take a bullish view on a stock by buying a call options on the stock, rather than buying the stock itself. Similarly, it is sometimes better to hedge a stock with a put option rather than to sell the stock. Options strategies can be employed to earn, gain from the bull as well as the bear market. It can be used to take a bullish or bearish view on an asset or to hedge an existing exposure. But, options are much more versatile instruments that can be used to take a more strategic view on the underlying or its volatility. There are various strategies can be formulated in an options contract by taking two or more options contracts to earn profits in volatile stock market. There are various strategies of options contracts like Straddle, Strangle, Butterfly, and Calendar Spreads could be used to minimize the risk of the price fluctuation in the stock market.

- **Straddle** is an option strategy in which investor long a call and long a put at the same strike typically close to the current price.

- **Strangle** is a strategy in which long a call and long a put at a lower strike. The two strikes are typically on either side of the current price.

- **Butterfly** is the taking of two short calls one long call at a higher strike and one long call at a lower strike. By put-call parity all calls can be replaced by put.

- **Calendar Spreads** consist of a near-month short call and a far-month long call option. More complex spread could have a complex options strategy in the near-month and a reverse strategy in the far-month.
5.7 Measures to Control Volatility (Risk Management)

The high amount of volatility is not good for the stock market and should be controlled for the growth of the stock market. But the question is that what should be the measures to be used to control over the volatility. There are various measures have been projected and used which helps in reducing in controlling volatility of the stock market returns. Security & Exchange Commission adopted some volatility controlling measures to protect the investors from volatile market, as mentioned below:

**Background on Single-Stock Circuit Breakers:** During the year 2010, the Commission permitted for single-stock circuit breaker on a pilot basis, in which trading stop for five minutes if a stock’s price moves up or down sharply in a five-minute window.

U.S. exchanges and the Financial Industry Regulatory Authority (FINRA) planned these actions in retort to unusually volatile trading on May 6, 2010, this exaggerated a huge number of individual securities but was not broad sufficient to activate the existing market-wide circuit breakers. These circuit breaker regulations were initially functional only stocks in the S&P 500 Index but were implemented on a pilot basis to all National Market System securities in June 2011.

**Circuit Breakers:** Panic selling is the major cause to increase the volatility of the stock market. Control over the panic selling during the huge declined stock market, coordination has to be conducted by the major stock exchanges and control over the red market with circuit breakers. During the year 2001, Indian stock exchange has introduced index-based market-wide circuit breakers in compulsory rolling settlement.
**Price Band:** The exchange also implemented price band on individual securities. There are three stages of a circuit breaker system of the index movement, i.e. 10%, 15% and 20%. Circuit breakers play an important role for both cash market and derivatives market when triggered. Table 5.1 represents the circuit breaker during the different market condition, which helps to control over volatility and risk of the stock market:

**TABLE 5.1: Market Condition & Circuit Breaker**

<table>
<thead>
<tr>
<th>Step</th>
<th>Market Condition &amp; Circuit Breaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The market-wide circuit breakers are triggered by movement of either the BSE Sensex or the NSE S&amp;P CNX Nifty, whichever is breached earlier.</td>
</tr>
<tr>
<td>2</td>
<td>In case of a 10% movement of either of these indices, there would be a one-hour market halt if the movement takes place before 1:00 p.m.</td>
</tr>
<tr>
<td>3</td>
<td>In case the movement takes place at or after 1:00 p.m., but before 2:30 p.m. there would be trading halt for ½ hour.</td>
</tr>
<tr>
<td>4</td>
<td>In case movement takes place at or after 2:30 p.m. there will be no trading halt at the 10% level and market shall continue trading.</td>
</tr>
<tr>
<td>5</td>
<td>In case of a 15% movement of either index, there shall be a two-hour halt if the movement takes place before 1 p.m.</td>
</tr>
<tr>
<td>6</td>
<td>If the 15% trigger is reached on or after 23 1:00p.m., but before 2:00 p.m., there shall be a one-hour halt. If the 15% trigger is reached on or after 2:00 p.m. the trading shall halt for the remainder of the day.</td>
</tr>
<tr>
<td>7</td>
<td>In case of a 20% movement of the index, trading shall be halted for the remainder of the day.</td>
</tr>
</tbody>
</table>
Pre Trading Session: Control over the opening price of the stock price, SEBI has been implemented Pre trading / Pre open session in July 2010 to discover opening price. Its main motive is to eliminate/ minimize opening volatility in prices of securities. The demand and supply of the securities will help in finding out the price of the first trade of the security of the day. Thus, it allows for overnight news in securities to be suitably reflected in the opening price. Table 5.2 shows that volatility can be controlled with some changes in pre-open session:

**TABLE 5.2: Control over Volatility with Pre-Open Session**

<table>
<thead>
<tr>
<th>Step</th>
<th>Pre-open Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The pre-open session is about the duration of 15 minutes, i.e. from 9:00 am to 9:15 am.</td>
</tr>
<tr>
<td>2</td>
<td>The pre-open session is comprised of Order Collection period and Order Matching period.</td>
</tr>
<tr>
<td>3</td>
<td>After completion of order matching there shall be a silent period to facilitate the transition from pre-open session in the normal market.</td>
</tr>
<tr>
<td>4</td>
<td>All Securities forming part of BSE Sensex and NSE Nifty are subject to the pre Trading Session.</td>
</tr>
</tbody>
</table>

New Limit Up-Limit Down Mechanism: The Commission permitted a “limit up-limit down” mechanism on 31st May, 2012 to reinstate the single-stock circuit breaker rules. The fresh limit up-limit down instrument is projected to avoid trading in individual securities from happening exterior of a particular price band. Table 5.3 shows the various important points related to new limit up-limit down system:
TABLE 5.3: New Limit Up-Limit Down Mechanism

<table>
<thead>
<tr>
<th>Step</th>
<th>New Limit Up-Limit Down Mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>This price band would be set at a percentage level above and below the average price of the stock over the immediately preceding five-minute trading period.</td>
</tr>
<tr>
<td>2</td>
<td>These price limit bands will be 5%, 10%, 20%, or the lesser of $0.15 or 75%, depending on the price of the stock.</td>
</tr>
<tr>
<td>3</td>
<td>Additionally, these price bands will double during the opening and closing periods of the trading day.</td>
</tr>
<tr>
<td>4</td>
<td>If the stock’s price does not naturally move back within the price bands within 15 seconds, there will be a five-minute trading pause.</td>
</tr>
</tbody>
</table>

**Increase in Trading Hours:** Indian market timings should be matched with those economies trading timings which are playing a significant role in reflected the price of Indian stock market. International news and information’s are fluctuate the price of the stock market.

TABLE 5.4: Control over Volatility with Increase in Trading Hours

<table>
<thead>
<tr>
<th>Step</th>
<th>Increase in Trading Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>At present, trading hours at stock exchanges are between 9.55 a.m. and 3.30 p.m.</td>
</tr>
</tbody>
</table>
To make parallel Indian markets with those of the international market & to facilitate the incorporation of any economic information that flow in from other global markets, the market trading hours proposed to increase from 9 a.m. to 5 p.m.

The increase of market hours may help in successfully assimilating information and this helps Indian markets to become efficient in terms of better price discovery, the reduction in volatility and impact cost.

Presently, the exchange-traded equity derivatives market is open from 9:55 am to 3:30 pm and the market timings are co-terminus with those of the underlying cash market.

Indian stock market presently is open for 5 days, i.e. Monday to Friday. Due to this the information is accumulated after the close of trading session on Friday is reflected in prices when markets reopen on Monday, this increases the volatility in the stock market. Thus, to curtail such impact, it is being considered to increase the trading days from 5 days to 6 days.

<table>
<thead>
<tr>
<th>The Market Supervision System:</th>
<th>Market supervision systems should be strong, which help in controlling the unfair trade practices in the stock market. Some of the surveillance systems and risk containment measures that have been put in place are briefly mentioned in Table 5.5:</th>
</tr>
</thead>
</table>

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<table>
<thead>
<tr>
<th>Step</th>
<th>Measures for Supervision or Surveillance System and Risk Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Risk control measures in the form of the detailed margining system and linking of intra-day trading limits and exposure limits to capital adequacy.</td>
</tr>
<tr>
<td>2</td>
<td>The stock exchange should have periodic reporting system.</td>
</tr>
<tr>
<td>3</td>
<td>Construction of sovereign surveillance cells in the stock exchanges</td>
</tr>
<tr>
<td>4</td>
<td>Market manipulation might be control with inspection of intermediaries; deferral of trading in scrip’s.</td>
</tr>
<tr>
<td>5</td>
<td>Formation of Inter Exchange Market Surveillance Group for prompt, cooperative and valuable decision making on surveillance issues and co-ordination between stock exchanges.</td>
</tr>
<tr>
<td>6</td>
<td>Employment of On-line automated surveillance system (Stock Watch System) at stock exchanges.</td>
</tr>
<tr>
<td>7</td>
<td>Intra-settlement and inter-settlement have to be implied by the brokers in addition to the overall limits specified by the SEBI.</td>
</tr>
</tbody>
</table>
5.8 Measurement of Stock Market Volatility

Measurement of volatility is an important issue in financial Econometrics. It is associated with the concept of risk and return, which are the key elements involved in all the financial decisions. There are various methods for measuring volatility. These methods can be divided into two parts, one is historical method and another is implied volatility methods. Historical volatility models (including Standard deviation and Exponential Weighted Moving Average), the implied volatility model, and autoregressive and heteroskedastic models, which includes an ARMA model and GARCH family of models. Consequently, using any measure of volatility has both advantages and disadvantages.

Historical Volatility Models

Historical volatility models are one of the simplest classes of volatility models. The name, HIS, is different in different literature, but most often it is used to stress that these models differ from the implied volatility models. There are various historical volatility models, some of them are mentioned in Table 5.6:

<table>
<thead>
<tr>
<th>Method</th>
<th>Historical Volatility Models</th>
</tr>
</thead>
<tbody>
<tr>
<td>Historical Average Model (HAM)</td>
<td>The mean, standard deviation calculated over some time interval and then used to forecast future values. Of course, this method produces poor results, but it can be used as a quick method. The error of this method can be used as a benchmark for other methods.</td>
</tr>
<tr>
<td>Method</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Simple Moving Average (SMA)</td>
<td>It is a more advance method than HAM. This method uses the most recent information to build a prediction. Under this method the forecasted volatility at time t+1 is computed using the following formula</td>
</tr>
<tr>
<td>Exponential Smoothing (ES)</td>
<td>This method is also based on historical values and gives more weight to the current volatility.</td>
</tr>
<tr>
<td>Exponential Weighted Moving Average (EWMA)</td>
<td>Under this method, the smoothing parameter β is estimated by minimizing the error on a training set. The JP Morgan Risk metrics model is a procedure that uses Exponentially Weighted moving Average.</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>This is the most common measure of volatility model. To calculate the standard deviation, it is required to find out the time frame in which volatility is to be measured like hourly returns, daily returns, monthly returns, etc. Standard deviation is a measure of dispersion from the mean. The more is the deviation, the more is volatility and vice versa.</td>
</tr>
</tbody>
</table>

**Implied Volatility**

Implied is used as a proxy. These are the volatilities implied by the market prices of the options. But there is no direct formula for computing the implied volatility (Hull, 2002).

However, a method of trial-and-error can be introduced which allows us to compute implied volatility with a good accuracy. It is important to find out the volatility of the
stock market as it helps in measuring the risk in the financial market. So, there is a requirement of creating time-varying stock return model to calculate volatility. The assumption of constant variance for the measures of uncertainty, for every time period is not true.

Economic time series have been found to exhibit periods of unusually large volatility followed by periods of relative tranquility (Engle, 1982). In such circumstances, the assumption of constant variance (homoskedasticity) is inappropriate (Nelson, 1991). There are some important terms, which helps in understating the volatility or changes in stock price are mentioned below:

- **Autoregressive:** The time series is found to depend on their own past value.
- **Conditional:** Depend on past information.
- **Heteroskedasticity:** Exhibit non-constant variance.
- **Time-Varying:** The stock market volatility changes with time.
- **Volatility Clustering:** Exhibits positive serial correlation, Large changes tend to be followed by large changes and small changes tend to be followed by small changes.

This implies that the changes in the stock prices are non-random. These characteristics of time series data can be adequately captured by ARCH/ GARCH models.

To fully comprehend the GARCH model introduced by Bollerslev (1986) there should be a clear understanding of the underlying assumptions and models from which GARCH is derived. In its simplest form, an autoregressive model is a model in which use the statistical properties of the past behavior of a variable \( y \) to predict its
behavior in the future. An overview of various implied volatility models is given in Table 5.6:

**TABLE 5.7: Implied Volatility Models**

<table>
<thead>
<tr>
<th>Method</th>
<th>Implied Volatility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autoregressive Moving Average (ARMA)</td>
<td>This model is a combination of the moving average model and Autoregressive model. This model states that the current value of some series depends linearly on its own previous values (AR) plus a combination of current and previous values of a white noise error term (MA). The ARMA model is an accepted model for forecasting financial markets as well as in many other applied areas.</td>
</tr>
<tr>
<td>Autoregressive Conditional Heteroskedasticity (ARCH)</td>
<td>This model was first introduced by Engle in 1982 (Engle, 1982). ARCH model and its extensions (GARCH, EGARCH, etc.) are among the most popular models for forecasting market returns and volatility. Originally, the ARCH model rather than using standard deviations used the variance. Time series data show certain characteristics like heteroskedasticity (non constant variance), volatility clustering, leptokurtosis and reversion towards the mean. Linear models are not able to capture these characteristics of the time series data. The assumption of variance is constant over time.</td>
</tr>
</tbody>
</table>
is not to be followed in the ARCH model. According to this model the squared error of today is a function of squared error of yesterday. The Conditional volatility models such as ARCH & GARCH incorporate time varying second order moments, where the series at any time period t is decomposed into its conditional mean and conditional variance. To test ARCH effect in error is required two situations: the first one is when we estimate a regression model with constant variance assumption; we may like to know whether our assumption is valid or the residuals have autoregressive conditional heteroscedasticity and required to be modeled as an ARCH process. The second condition is that for ARCH (1), explains the ARCH conditional volatility and no further ARCH effect is present I in residuals.

| Generalized Autoregressive Conditional Heteroskedasticity (GARCH) | The most popular among the models of conditional volatility is the GARCH (Generalized ARCH) models, proposed by Bollerslev (1986). Theoretically, this model is equivalent to the infinitive order ARCH model. There are various other family models of GARCH like EGARCH, TGARCH etc. extension of GARCH model. The GARCH (1, 1) model is more popular in practice. The unconditional (average) |
The volatility in the Indian stock market creates the interest of researchers and economist to focus and study on it. There are various arguments regarding the impact of derivatives trading on the volatility and efficiency of the Indian stock market.

Some researchers explained that derivatives trading increases stock market volatility due to high degree of leverage, low transaction costs and hence increases speculation & destabilizes the market. On the other hand, another school of thought claims that futures market plays an important role in price discovery, enhances market efficiency and reduces asymmetry information of the spot market and has a beneficial effect on the underlying cash market.

The studies which have been made to previously produce mixed results. The results varied depending on the time period studied and the country studied. Most of the studies made earlier considered a short time frame for the study. This study makes an attempt to provide generalizations about the impact of derivatives on stock market
volatility in India by studying the nature of volatility over a longer frame of time. The present study is focused to know the relationship between the cash market and derivatives market with the impact of derivatives on the volatility of the cash market in India. It also addresses the issue of whether the introduction of derivatives has been the only factor responsible for the change in volatility or there are other factors which affect the volatility of the stock market.