Chapter – 6

SUMMARY AND CONCLUSIONS
Financial Derivatives have been playing a crucial role in mitigating the risks of the stock markets and have become a boon to the risk averse investors all over the world with lower transaction cost and flexibility in operation they have become equally attractive to the high risk bearing speculators also. Derivative instruments are different from insurance, in that they cover general risk where as the latter covers specific risks.

Derivative trading in Financial Instruments commenced in India in June 2000 after SEBI granted the final approval to the recommendation of L.C. Gupta Committee in May 2000. Initially, SEBI permitted the derivative segments in two major exchanges, NSE and BSE and their clearing house/corporation to commence trading and settlement in approved derivative contracts. The derivative trading on NSE commenced with S&P CNX NIFTY Index Futures on 12th June 2000. The trading in Index Options commenced on 4th June 2001 and trading in Options on Individual Securities commenced on 2nd July 2001. Single Stock Futures were launched on 9th November 2001. At present 17 indices and 143 stocks belonging to 13 industrial sectors have been permitted for Futures and Options trading apart from Currency Derivatives and Interest Rate Derivatives.

Review of various studies on Financial Derivatives have revealed that there are a very few research studies focussing on the impact of financial derivatives on stock market volatility. Most of these studies are in the form of articles published in various Journals and the reports submitted by committees. The present study is different from these studies particularly from the point of view of period of the analysis and scope. While majority of previous studies analysed data relating to five to six years except few studies like the study of Gurucharan Singh which covered a period up to 14 years. Further, most of these
studies restricted to only one category of derivative instruments. This study is different from the earlier studies as it covers a period of 19 years subdivided into short and long intervals and covers the two categories of derivative instruments i.e. Futures and Options.

The broad objective of the study is to analyse the impact of financial derivatives on stock market volatility during the pre and post introduction of derivatives in NSE. The specific objectives are:

- To analyse the concept and nature of Financial Derivatives, origin of financial derivatives, economic functions of derivatives in Indian economy
- To analyse the growth of financial derivatives in India
- To analyse the impact of Index Futures and Stock Futures on the stock market volatility
- To analyse the impact of Index Options and stock Options on the stock market volatility.
- To analyse the impact of non-price variables on the underlying cash market.

The following are the Hypotheses of the Study:

- **H_{01}**: Index Futures and Stock Futures have no impact on stock market volatility
- **H_{02}**: Index Options and Stock Options have no impact on stock market volatility
- **H_{03}**: Non-price variables like Open Interest and Trading Volume have no impact on underlying Cash Market
Sample Design:

For the purpose of the present study, four derivative instruments traded in Futures and Options segment of NSE – Index Futures, Index Options, Stock Futures and Stock Options have been selected. To assess the impact of stock futures and stock options on stock market volatility, 10 industrial sectors out of 13 industrial sectors in which derivative trading is permitted have been chosen. These industrial sectors comprise of Banking, FMCG, Infrastructure, Pharmaceuticals, Telecommunication, Finance, Information Technology, Petrochemicals, Manufacturing and Engineering. Two companies from each of these industrial groups (10 companies in Futures segment and 10 companies in Options segment) have been selected for detailed analysis. While selecting these companies care has been taken to see that permission for derivative trading in these companies exist almost from the date of launching/nearer to the date of launching of derivatives in India and they are among the top five in terms of turnover in the derivative trading in the respective industrial sectors. The market capitalisation weightage of the selected companies (20) under study in Futures and Options put together is about 61 per cent. The study covers a period of nineteen years i.e. from 1995 to 2013 and is based mainly on secondary data, which have been collected from various websites of NSE, BSE, SEBI and selected companies. The study period is divided into three sub-periods i.e. Period-I (1994-95 to 2000-01) before introduction of financial derivatives, Period-II after introduction i.e. mid period of the study (2001-02 to 2007-08) and Period-III (2008-09 to 2012-13) relating to recent data. The study is divided into six chapters including the introductory first chapter, which provides the theoretical aspects relating to financial derivatives, review of
literature and methodology. The second chapter provides an overview of the growth of financial derivatives in India and abroad and also covers the regulatory framework for financial derivatives in India. The third chapter presents the impact of Index Futures and Stock Futures on stock market volatility. The fourth chapter analyses the impact of Index Options and Stock Options on stock market volatility. The fifth chapter analyses the impact of non-price variables like open interest and traded volume on underlying cash market and the sixth chapter presents the summary of findings and conclusions.

CHAPTER-II

This chapter presents the growth and development of financial derivatives in India in terms of turnover and number of contracts traded in derivatives segment of two premier stock exchanges in India. NSE and BSE, growth of cash and derivatives segments in NSE, growth of turnover and number of contracts traded in different types of financial derivative instruments, growth of different financial derivative instruments in top five exchanges in the world and the regulatory framework for derivatives in India. The following are the important observations.

1. It is observed that though the BSE and the NSE started derivative trading during the same year i.e. 2000-01, NSE has over taken BSE in terms of number of contracts traded and the turnover. The number of contracts registered in BSE in 2000-01 was 76,735 with a value of ₹ 1,653 cr and in NSE, it was 90,580 with a value of ₹ 2,365 cr respectively. In the initial year of introduction of derivatives, BSE had 45.86 per cent and NSE had 54.14 per cent share. By the year 2012-13, NSE captured more than 75 per cent share of total derivative market both in terms of absolute number of derivative contracts traded and volume. BSE with a volume of
26,24,59,311 contracts stands no-where near the NSE’s volume of 113,14,67,418 contracts.

2. The Derivative segment of NSE registered explosive growth since their inception compared with the Cash market. The share of Derivative segment, which was just 0.18 per cent in NSE’s total turnover in 2000-01 increased to 92.09 per cent by 2012-13. It is also observed that there is no consistency in the average daily turnover in cash segment. But, there is a consistent increase in the average daily turnover registered in derivative segment. This shows that there is an increasing interest and growing confidence of the market participants in Derivative instruments, which helps in managing stock market risk to their advantage.

3. This study revealed that Index Options dominate the derivative markets in India with 52 per cent of total turnover from 2000-01 to 2012-13 followed by Stock Futures. The CAGR of Index Options registered 115.55 per cent and 120.70 per cent in terms of number of contracts and turnover respectively. An important observation is that in the Options category, Index Options have dominated the Stock Options both in number and value of contracts. But in Futures, stock futures have dominated the Index Futures. This is quite understandable because by nature option contracts does not involve any obligation and hence Index Options, which involve huge investments can be left unexercised when it is not advantageous to the holder.

4. It is observed that in the Index Options segment, the National Stock Exchange has occupied the second rank in the world with 820 million contracts traded in 2012. In the Futures category, NSE occupied fourth
and fifth position in stock and Index Futures respectively. In Stock Options segment, NSE is not figured in the top five exchanges in the world. There is a decline in number of contracts traded compared to the previous year for four categories.

5. It is observed that there is a significant and consistent improvement in the rank of National Stock Exchange in terms of volume of trade both in Futures and Options segment in the world from 2001 to 2011. Its position rose from 42nd rank in 2001 to 5th rank in 2011, which is a remarkable achievement. Chicago Board Options group, which is a premier exchange in the options market in the world could not retain its 5th rank in which it was in the beginning of 2001.

6. S&P CNX NIFTY and BSE SENSEX are the two comprehensive indices out of 17 indices traded in Futures and Options segment in India. NSE’s S&P CNX NIFTY in F&O segment with its turnover of ₹ 2,62,98,030 Cr has over taken Sensex by 33 times, which has a turnover of ₹ 7,96,792 Cr.

7. It is observed that only 31 companies could fulfil the criteria laid down by SEBI for Futures & Options trading in 2001. By the year 2013, this number has increased to 143. The manufacturing sector retained its first position as the number has increased from seven companies in 2001 to 29 companies in 2013. There is a significant improvement in the number of Banks permitted for derivative trading in 2013. This number has increased from two banks in 2001 to 23 banks in 2013.

8. It is observed that there is no much gap in the introduction of various derivative products in Indian stock markets when compared to the stock
markets in other developed countries of the world. Index Futures, Index Options, Stock Options and Stock Futures have been introduced in India with a gap of one year five months both in NSE and BSE. In the American Market, which is the pioneer in derivative trading for instance, there is a gap of almost three years between the introduction of Options and Futures.

CHAPTER – III

This chapter analyses the impact of Index Futures and Stock Futures on stock market volatility. Index Futures were introduced in India on 12th June 2000 and stock Futures were introduced on 9th Nov 2001 in NSE. Four types of volatility models – open-to-open, close-to-close, high-low and open to close have been calculated both for short and long intervals to assess the impact of Futures on volatility.

Impact of Futures in S&P CNX NIFTY:

It is observed that there is a sharp decline in the volatility in S&P CNX NIFTY after the introduction of Index Futures both in Inter Day observations (Open-to-Open and close to close prices) and Intra Day observations (high-low and open to close prices) without any exception. It is observed that the stock markets have become informationally efficient after the introduction of Index futures and have infused more confidence in the investors and attracted them towards more active participation in stock market investments. This has led to increase in volumes of trade, diversification of risk and stability in the stock prices. The F-value is significant at 99 per cent level both in short and long run. Thus, the null hypothesis ($H_{01}$) that Index Futures have no impact on the Stock Market volatility has been rejected.
The results of the impact of Futures on selected stocks under this study are summarized below company wise:

**State Bank of India:(SBI)**

SBI is the market leader in the banking industry with a share of 25 per cent both in deposits and advances. It represents in NIFTY Index with a weightage of 3.07 per cent in total market capitalisation of NIFTY as on 30th April 2013. The four volatility models revealed uniform results i.e. sharp decline after the introduction of stock futures in SBI. The open-to-open and close to close prices volatilities (Inter-Day volatilities) were lower in 6 out of 10 and 9 out of 10 observations respectively during the post introduction of futures. The Intra-Day volatility models also revealed the same. The volatility in high-low (Parkinson’s Model) and open to close (Garman & Klass’ Model) were lower in 7 out of 10 and 10 out of 10 observations respectively after introduction of Futures in SBI. From these observations, it is very clear that there is a visible impact of Stock Futures in SBI on reducing volatility in SBI stock prices. F-value is found statistically significant at 99 per cent level in short and long intervals. Thus, the null hypothesis \((H_{01})\) that Stock Futures have no impact on the Stock Market volatility has been rejected both in short and long intervals.

**ITC**

ITC is the only Indian FMCG company to have figured in the Forbes 2000 list. It is the only company in FMCG sector India in the NIFTY Index with the shighest weightage of 9.46 per cent of total market capitalisation of NIFTY and 55 per cent of market capitalisation of FMCG companies included in index as on April 2013. It is observed that the volatilities in ITC stock have declined after
introduction of futures. The volatilities in open to open and close to close price (Inter day) were lower in 3 out of 4 and in 7 out of 10 observations respectively during the post introduction of stock futures. It is found that the same results have occurred in case of Intra-day volatilities. The high-low and open to close prices, the volatilities were lower in 5 out of 10 and 5 out of 10 observations respectively after the introduction of stock futures. Thus, it is observed that there is no scope for unexpected prospects in ITC stock after introduction of futures. The F-value is found statistically significant at 99 per cent level in short interval. Thus, the null hypothesis \( H_{01} \) that Stock Futures have no impact on the Stock Market volatility has been rejected in short run.

**Reliance Infrastructure Limited: (Reliance Infra)**

Reliance Infra is the India’s largest infrastructure company with a turnover of over ₹ 22,382 Cr as on March 2013. It represents infrastructure sector in CNX NIFTY apart from DLF and Jai Prakash Associates with 0.46 per cent weightage in total market capitalisation of NIFTY. The open-to-open and close to close volatilities were higher in 8 out of 10 during the post introduction of futures. In the same way the volatilities in high-low and open to close were lower in 8 out of 10 in both methods. Infrastructure is an upcoming sector in recent times and the Government is giving top priority to its development. Hence, the investors appear to be over optimistic to the happenings in this sector. It is also noticed that the volatility in Reliance Infra has not affected the Index significantly as its weight in the NIFTY Index is only 0.46 per cent. The F-value is found statistically significant at 99 per cent level in long run. Thus, the null hypothesis \( H_{01} \) that Stock Futures have no impact on the Stock Market volatility has been rejected in long run.
Ranbaxy Laboratories Ltd (Ranbaxy)

Ranbaxy is the market leader among pharmaceutical company in India with a gross turnover of ₹ 1,22,529 millions as on 31\textsuperscript{st} March 2013. It represents pharmaceutical sector in the NIFTY with 0.46 per cent weightage of total market capitalisation as on 29\textsuperscript{th} June 2012. Both the intra-day volatilities were lower in 8 out of 10 observations. In high-low and open to close prices (Intra-day), the volatilities were lower in 8 out of 10 observations in both methods during the post introduction of futures. Another important observation is that high-low and open-close price volatilities were lower in the long intervals during the post introduction of stock futures in RANBAXY. This is especially useful to genuine investors. The F-value is found statistically significant at 99 per cent level in long run. Thus, the null hypothesis (H\textsubscript{01}) that Stock Futures have no impact on the Stock Market volatility has been rejected in long run.

Mahanagar Telephone Nigam Ltd (MTNL)

It is observed that MTNL is one among top 5 companies based on their turnover in telecom sector in India for the year 2009-2010. It represents the telecommunication sector with 0.62 per cent weightage of total market capitalisation of NIFTY as on 31\textsuperscript{st} March 2007. It is observed that the volatilities declined after introduction of futures in MTNL. In the open-to-open and close to close prices (Inter day) the volatilities were lower in 9 out of 10 and in 10 out of 10 observations respectively during the post introduction of futures. In the same manner the volatilities were lower in 10 out of 10 both in high-low and open to close (Intraday) models. It is noticed that there is a sharp decline in movements of stock prices and the market. F-value is found statistically significant at 99 per
cent level long interval. Thus, the null hypothesis \(H_{01}\) that Stock Futures have no impact on the Stock Market volatility has been rejected in long run.

**Housing Development Finance Corporation Ltd. (HDFC)**

HDFC is a pioneer and the leader in housing finance in India. It is representing in CNX NIFTY Index from with 6.89 per cent weightage in the total market capitalisation. The open-to-open volatilities in HDFC were lower in 7 out of 10 observations during post introduction, but in case of close-to-close prices, the volatilities were higher in 9 out of 10 observations. In case of intraday, high-low price volatilities were lower in 7 out of 10 observations during the post introduction, but open-to-close prices the volatilities were high in 6 out of 10 observation after introduction. It is observed that the introduction of futures has fulfilled in case of HDFC stock in long run both in high-low and open to close prices. F-value is found statistically significant at 99 per cent level both in short and long intervals. Thus, the null hypothesis \(H_{01}\) that Stock Futures have no impact on the Stock Market volatility has been rejected both in short and long intervals.

**Infosys Technologies Ltd. (INFOSYS)**

INFOSYS is the market leader in the global information technology industry with a share of 5.5 per cent. INFOSYS has 5.66 per cent weightage in total market capitalisation of NIFTY. In open-to-open and close to close prices (intraday) the volatilities were lower in 8 out of 10 and in 9 out of 10 observations respectively during the post introduction period. The volatilities were lower in 8 out of 10 and in 9 out of 10 observations in case of high-low and open to close price respectively. Consequently, the unexpected prospects in INFOSYS stock have been reduced after introduction of stock futures. F-table
value is statistically significant at 95 per cent level in long interval. Thus, the null hypothesis \( (H_0) \) that there is no impact of Stock Futures on the Stock Market volatility has been rejected in long run.

**Reliance Petroleum Ltd : (RELIANCE PETRO)**

It represents the petrochemical sector in NIFTY with a share of 7.8 per cent. Volatilities in Reliance Petro declined after introduction of futures. The open-to-open volatilities were lower in 6 out of 10 observations and close-to-close volatilities were higher in 6 out of 10 observations during the post introduction period. Whereas in case of high-low prices, the volatilities were lower in all long-term periods during the post introduction of futures in RELIANCE PETRO. In open to close prices, the volatilities were lower in all the long-term intervals during the post period. This is useful to the genuine investors who wait for long time to get returns on their investments. F-value is found statistically significant at 99 per cent level both in short and long intervals. Thus, the null hypothesis \( (H_0) \) that Stock Futures have no impact on the Stock Market volatility has been rejected both in short and long intervals.

**Tata Steel Limited (TATA STEEL)**

Tata Steel is one among the top ten global steel companies with annual capacity of over 28 million tonnes per annum. It represents the steel sector in NIFTY with 1.79 per cent weightage. It is observed that open-to-open and close-to-close price volatilities were lower in 6 out of 10 and 8 out of 10 observations respectively during the post introduction of futures. In case of high-low and open to close prices, the volatilities were in 7 out of 10 observations in inter day methods. Another important observation is that the long interval volatilities in both high-low and open to close prices sharply declined for all periods without
any exception. This is especially useful to genuine investors whose investment horizon is long. It is very clear that there is a visible impact of stock futures in TATA STEEL on reducing volatility in TATA stock. F-value is found statistically significant at 99 per cent level both in short and long intervals. Thus, the null hypothesis \((H_{01})\) that Stock Futures have no impact on the Stock Market volatility has been rejected both in short and long intervals.

**Larsen & Toubro Ltd (L&T)**

LARSEN & TOUBRO is one of the largest players in the Indian engineering sector. L&T is the only company representing the engineering sector in the CNX NIFTY with 4.56% weightage. The four volatility models- open to open, close to close, high-low and open to close revealed same results. Though, the post Period-I inter day volatilities were high a sharp decline in them were noticed in during the recent periods. The same results were observed in intraday volatilities. It is observed that the introduction of L&T futures has imparted more confidence in the minds of investors in the recent period. F-value is found statistically significant at 99 per cent level both in short and long intervals. Thus, the null hypothesis \((H_{01})\) that Stock Futures have no impact on the Stock Market volatility has been rejected both in short and long intervals.

**Chapter-IV**

This chapter presents the impact of Options on the stock market volatility. Index Options were introduced in India on 4th June 2001, and Stock Options, were introduced on 2nd July 2001 in the NSE. The need to analyse separately the impact of Options on stock market volatility arises because of the differences in the nature of these contracts. While the futures are price fixing and linear contracts, the Options are price insurance and non-linear contracts. Further, the
Futures are binding contracts the execution of which is obligatory, but the execution of Options is not obligatory. Apart from these differences, Options are more popular derivative instruments than Futures among the Investors and occupy the first place with 56 per cent in the total turnover of derivative trading. Inter-day (open-to-open and close-to-close) and Intra-day (high-low and open to close) volatilities have been calculated both for short and long intervals to assess the impact of Options on volatility.

**Impact of Options in S&P CNX NIFTY:**

The S&P CNX NIFTY is a well-diversified 50 stock index accurately reflecting overall market conditions. The S&P CNX Nifty covers 22 sectors of the Indian economy and offers investment managers exposure to the Indian market in one portfolio. It is observed that there is a sharp decline in the volatility in S&P CNX NIFTY after the introduction of Index Options both in Inter-Day and Intra-Day observations without any exception. It is observed that the stock markets have become informationally efficient after the introduction of Index Options and have infused more confidence in the investors and attracted them towards more active participation in stock market investments. F-value is found statistically significant at 99 per cent level both in short and long intervals. Thus, the null hypothesis ($H_{02}$) that Index Options have no impact on the Stock Market volatility has been rejected both in short and long intervals.
The results of the impact of Options on selected stocks under this study are summarised below company wise:

ICICI Bank Limited: (ICICI)

ICICI Bank is the India's second-largest bank with total assets of ₹ 4,736.47 billion (US$ 93 billion) at March 31, 2012. It is the largest private sector bank in India, which represents the banking sector in the NIFTY with weightage of 7.05 Per cent as on 30th April 2013. The Inter-Day volatilities were lower in 10 out of 10 observations during the post introduction of Options. The Intra-Day volatility models also revealed the same. The Intra-day volatilities were lower in 9 out of 10 observations after introduction of Options in SBI. It is very clear that there is a visible impact of stock options in ICICI on reducing volatility. F-value is found statistically significant at 99 per cent level both in short and long intervals. Thus, the null hypothesis ($H_0$) that Stock Options have no impact on the Stock Market volatility has been rejected both in short and long intervals.

Hindustan Unilever Limited: (HUL)

Hindustan Unilever Limited (HUL) is the India's largest Fast Moving Consumer Goods Company with a heritage of over 75 years in India and touches the lives of two out of every three Indians. HUL represents FMCG sector in the NIFTY Index with a weightage of 3.15 per cent and 18.44 per cent of market capitalisation of CNX FMCG Index as on 30th April 2013. The volatilities in HUL stock have been declined after introduction of Options. The Inter-day volatilities were lower in 7 out of 10 observations during the post introduction of Stock Options. It is found that the same results have observed in case of Intra-day, the volatilities were lower in 7 out of 10 observations after the introduction of stock Options. There is no scope for unexpected prospects in HUL stock after
the introduction of stock options. F-value is found statistically significant at 99 per cent level both in short and long intervals. Thus, the null hypothesis ($H_02$) that Stock Options have no impact on the Stock Market volatility has been rejected both in short and long intervals.

**Jaiprakash Associates Limited: (JP ASSOCIATES)**

The Jaiprakash Associates is a ₹ 20,000 crore well-diversified infrastructural industrial conglomerate in India. It represents the infrastructure sector in the NIFTY Index with a weightage of 0.47 per cent and 3.34 per cent of market capitalisation of CNX Infrastructure Index as on 30th April 2013. The open-to-open volatilities were lower in 4 out of 7 observations and the close-to-close prices volatilities were higher in all periods. The Intraday volatilities were lower in 6 out of 7 (high-low) and in 5 out of 7 (open to close) observations during the post introduction of Options. The participant’s exposure to panic conditions has decreased. F-value is found statistically significant at 95 per cent level. Thus, the null hypothesis ($H_02$) that Stock Options have no impact on the Stock Market volatility has been rejected.

**Cipla Ltd: (CIPLA)**

Cipla is an Indian based company. It is one of the world’s largest generic pharmaceutical companies with its presence in 170 countries. It represents pharmaceutical sector in NIFTY with a weightage of 1.08 per cent and 15 per cent in pharmaceutical Index as on 30th April 2013. The open-to-open volatilities were higher in 5 out of 10 and close-to-close volatilities were higher 6 out of 10 observations during the post introduction of Options. In case of the intra-day volatilities were lower in 8 out of 10 in both methods. It is observed that there is visible impact of stock options in CIPLA on reducing volatility. F-value is found
statistically significant at 99 per cent level in short run. Thus, the null hypothesis \( (H_02) \) that Stock Options have no impact on the Stock Market volatility has been rejected both in short run.

**Bharti Airtel Limited: (BHARTI AIRTEL)**

Bharti Airtel is the world's third largest mobile telecommunications company with over 261 million subscribers across 150 countries as of August 2012. It represents telecommunication sector in the NIFTY with a weightage of 2.21 per cent of total market capitalisation of NIFTY Index as on 30\(^{th}\) June 2012. It is observed that the volatilities were declined after introduction of Options in BHARTI AIRTEL. The Inter day volatilities were lower in 8 out of 8 both in models during the introduction of Options. In the same manner, the volatilities were lower in 8 out of 8 both in high-low and open to close (Intraday) models. It is noticed that there is a sharp decline in movements of stock prices and the market. F-value is found statistically significant at 99 per cent level both in short and long intervals. Thus, the null hypothesis \( (H_02) \) that Stock Options have no impact on the Stock Market volatility has been rejected both in short and long intervals.

**Reliance Capital Limited: (RCL)**

RCL is one of India's leading and amongst most valuable financial services companies in the private sector. RCL represents Finance Sector in the NIFTY with a weightage of 1.02 per cent as on 30\(^{th}\) June 2012. In open to open volatilities were higher in 7 out of 10 observations during post introduction, but case of close-to-close volatilities were higher in 9 out of 10 observations respectively. In case of intra-day, (high-low and open to close) the volatilities were lower in 7 out of 10 observations in both models during the post
introduction. It is observed that the high volatility of RCL in the options market has not affected the Index significantly as its weight in the Nifty Index is only 1.02 per cent only. It is also observed that a sharp decline in volatilities in RCL stocks especially during the recent post period-II is a favourable sign and indicates improved market efficiency. F-value is found statistically significant at 99 per cent level in short run. Thus, the null hypothesis \( H_{02} \) that Stock Options have no impact on the Stock Market volatility has been rejected both in short run.

**Wipro InfoTech: (WIPRO)**

Wipro Infotech is a leading manufacturer of computer hardware and provider of IT services in India and the Middle East region. WIPRO represents Information Technology sector in the NIFTY with a weightage of 1.25 per cent as on 30\(^\text{th}\) June 2012. The open-to-open volatilities were lower in 5 out of 10 observations and close-to-close volatilities were higher in 6 out of 10 observations during the post introduction period. The volatilities were lower in 6 out of 10 observations in case of intra-day methods. The Intra-day volatilities were mostly lower in the long intervals than short intervals during the post introduction of stock options. It is observed that this trend attracts genuine investors for working long-term investments. F-value is found statistically significant at 99 per cent level both in short and long intervals. Thus, the null hypothesis \( H_{02} \) that Stock Options have no impact on the Stock Market volatility has been rejected both in short and long intervals.

**Oil and Natural Gas Corporation Limited: (ONGC)**

Oil and Natural Gas Corporation Ltd. (ONGC) is the leader in Exploration & Production (E&P) activities in India having 72 per cent contribution to India’s total production of crude oil and 48 per cent of natural gas.
ONGC represents petrochemical sector in the NIFTY with a weightage of 3.03 per cent as on 30\textsuperscript{th} June 2012. It is observed that the volatilities were lower after introduction of Options. The open-to-open volatilities were lower in 6 out of 10 observations and close-to-close volatilities were higher in 9 out of 10 observations during the post introduction period. In case of high-low price volatilities were lower in 9 out of 10 and open to close price volatilities were lower in 10 out 10 observations during the post introduction of Options in ONGC. It observed that there is no significant change in the perceptions of investors after the introduction of stock options in ONGC due to the stability brought in by the options trading in the stock. F-value is found statistically significant at 99 per cent level both in short and long intervals. Thus, the null hypothesis \( H_{02} \) that Stock Options have no impact on the Stock Market volatility has been rejected both in short and long intervals.

**Tata Motors Limited: (TATA MOTORS)**

Tata Motors Limited is the India's largest automobile company, with consolidated revenues of INR 1,88,818 crores (USD 34.7 billion) in 2012-13. TATA MOTORS represents manufacturing sector in the NIFTY with a weightage of 2.79 per cent as on 30\textsuperscript{th} June 2012. The open-to-open and close-to-close volatilities were lower in 7 out of 10 observations during the post introduction of Options. In case of high-low and open to close prices, the volatilities were lower in 7 out of 10 and 8 out of 10 observations. There is a visible impact of stock options in TATA MOTORS on reducing volatility in its stock prices. F-value is found statistically significant at 99 per cent level both in short and long intervals. Thus, the null hypothesis \( H_{02} \) that Stock Options have
no impact on the Stock Market volatility has been rejected both in short and long
intervals.

**Praj Industries Ltd: (PRAJ IND)**

PRAJ IND is a global Indian company that offers innovative solutions to
significantly add value in bio-ethanol, alcohol, brewery plants, process equipment
and water distillation and wastewater treatment systems for customers,
worldwide. It is observed that inter-day (open-to-open and close to close)
volatilities were higher in 6 out of 10 observations. In case of intra-day
volatilities, all observations were noticed high. The most recent observations
illustrate that the volatilities declined sharply for all period, the purpose of the
introduction of PRAJ IND stock options worked out in the recent days. F-value is
found statistically significant at 99 per cent level in long run. Thus, the null
hypothesis \((H_{02})\) that Stock Options have no impact on the Stock Market
volatility has been rejected both in long run.

**The following are the overall observations of the third and fourth chapters**

- It is observed that the open-to-open price volatility is higher than the other
three-volatility models i.e. close-to-close, high-low and open to close
price models both in case of Index Futures and Index Options Single
Stock Futures (SSFs) and Single Stock Options (SSOs). The reason for
this might be asymmetry of information. However, it is observed that
there is a sharp decline in this volatility also. This implies that there is no
significant change in the perceptions of investors after the introduction of
Futures and Options thereby indicating stability in the stock market.
• During all the time intervals both in short and long run it is observed that volatilities in open to open and close to close on the one hand and High-low and open to close on the other in one in the same direction. Hence, it can be concluded that there is a strong positive correlation between the volatilities both in inter day and intraday observations.

• The reduction in close-to-close price volatility conveys that there is no scope for unexpected prospects after the introduction of Futures and Options.

• The reduction in high-low volatility implies that there is decline in extreme movements in the stock prices which is a sign of efficiency of market and consequently the participants exposure to panic conditions has declined.

• Normally open to close volatility is expected to increase with the increase in time interval, as it is the function of the length of time. But it is observed that the open to close volatility has declined with increase in time interval during the study period. This further added to the favourable investment climate provided by the derivative instruments.

• To isolate the effect of the introduction of derivatives trading on the risk of the underlying stocks, in this study, A comparison was made between volatility in CNX NIFTY in which derivative trading is in existence and Junior NIFTY in which derivative trading is not in existence. This was done to test whether derivative trading had any differential effect. The Junior NIFTY has exhibited higher levels of volatility (1.71 per cent) than the volatility levels (1.45 per cent) in CNX NIFTY. This clearly indicates the impact of derivatives in reducing stock market volatility.
CHAPTER – V

This chapter dealt with the impact of Derivatives particularly the non-price variables like open interest and traded volume on the underlying cash market. Firstly, the relationship between derivative segment and cash segment is studied in terms of turnover, traded quantity, and market capitalisation in cash segment before and after the introduction of derivatives. Time series method of least squares has been applied to study the effect of derivatives segment on these variables. Data from 1994-1995 to 2012-2013 on turnover was processed.

To analyse the impact of non-price variables on cash market. The model used by Bhuyan and Choudhury (2001) which was later modified by Srivastava (2004) has been adopted because of its wide acceptance, flexibility and accuracy in results when relationship involves more than two variables. Regression equation is employed to assess the impact of non-price variables on cash market. The data relating to three different half-annual sub periods in NSE have been taken. Daily data relating to the price as well as non-price variables such as spot price index, (here CNX Nifty index) in underlying cash market, and open interest, trading volume, different strike prices etc. in Index Option market, have been collected for all the sub periods. The following are the major findings.

1. It is observed that before the introduction of derivatives the turnover of cash segment in NSE has been continuously increasing up to 2000-2001. But in the very next year of the introduction of derivatives more than 61 per cent of turnover in cash segment declined. This decline cannot be totally attributed to introduction of derivatives. Other factors like economic instability, bearish trend in the stock markets and financial crisis might have led to this decline. However, this decline did not
continue for long. The growth rate turned positive from the very next year and reached to 82.55 per cent by the year 2007-08. Thus, the introduction of derivatives strengthened the operations in cash segment by infusing more confidence in the minds of the investors.

2. It is observed that market capitalisation of cash segment has increased after 1994-2000 with a growth rate of 180.84 per cent over the base year. But, in the year of introduction of derivatives i.e. 2000-01, this has declined to 81.05 per cent, a decrease of about 100 per cent. This decline continued up to 2002-03. Since 2003-04, the growth rate has been increasing except in 2008-09 in which year the growth rate registered a decline of about 41 per cent and in 2011-12 in which the growth declined by 9 per cent. By the year 2012-13, the growth rate registered a peak per cent of 20,622.37 per cent over the base year and 1135.04 per cent over the previous year.

3. It is observed that there is a high degree of positive correlation between cash and derivatives segments. A high degree of positive correlation after the initial four year of introduction of derivatives indicates that both cash and derivative segments are affected by the same factors and the population of investors is the same for these two segments. From this analysis it is evident that introduction of derivatives has a positive impact on the trading activity in the cash segment.

4. It is observed from the first sub-period results, that there is a positive co-efficient in case of COP and Volume for call and the negative coefficients in the case of POP and volume for put and hence the results are quite encouraging. These results support the general argument that in a well
informed market co-efficient should be positive for COP and negative for POP. It is observed that the CNX NIFTY has experienced high volatility on the upper side during the first sub period indicating thereby bullish trend in the market. This also supports the investor’s choice for going long in call options leading to a positive co-efficient in COP.

5. It is observed from the second sub-period and third sub period results, that there is a negative co-efficient in case of COP and volume for call and the positive co-efficient in case of POP and volume for put due to high volatility of CNX Nifty on the down side. This is against the general argument. However, they are found to be statistically significant at one percent level of significance.

6. It observed that informed investors will buy out-of-the money call options (call options having a strike price higher than the market price) when they have specific information about increase in prices which leads to increase in COP. Alternatively they can write Put Options in such a situations. Similarly investors will buy out-of-the money put options (put options having a strike price lower than the market price) which leads to increase in POP. Alternatively, they can write call options. But in both cases, investors would prefer to buy options rather than writing options, because the writers of options are exposed to obligations and no rights. In this results first, second and third sub-periods this is clearly evident.

7. A comparison of the regression results between the inception and mid period reveals that the co-efficient of call open interest (2.022) was higher than the COP for the second sub-period (-2.071) and co-efficient of put open interest for the first sub period (-2.190) was lower than POP for the
second sub-period (2.013). The co-efficient of first sub-period for COP of 2.022 implies that for every unit increase in call open interest, a 2.022 unit increase is predicted in Stock Price at maturity date (I_T), holding all other variables constant. The higher call option during the first sub period was due to the bullish phase in the market.

8. A comparison of the regression results between the second sub-period (mid period of the study) and the third sub-period (Recent period) reveals that the co-efficient values of call open interest (-2.071) and put open interest (2.013) are higher than the COP (-0.613) and POP (0.593) of third sub-period respectively. The co-efficient of put option of 2.013 implies that for every unit increase in put open interest, a 2.013 unit increase is predicted in Stock Price at maturity date (I_T), holding all other variables constant. The bearish trend in the market might be the reason for positive POP during the second sub-period.

9. A comparison of the regression results between the inception period and recent period reveals that the co-efficient of COP (2.022) for the first sub-period was higher than the COP of the third sub-period (0.593) and co-efficient of put open interest (-2.190) for the first sub period is lower than POP (0.593) for the third sub period. The COP co-efficient of first sub-period of 2.022 implies that for every unit increase in call open interest, a 2.022 unit increase is predicted in Stock Price at maturity date (I_T), holding all other variables constant. The upward trend in the market might be the reason for positive COP.

10. The co-efficient for first sub-period of call volume (-0.876) was higher than the call volume for the second sub-period (-1.294) and co-efficient of
put volume for the first sub period (-0.642) was lower than put volume for the second sub-period (1.443) i.e. mid period. It could be interpreted from the negative call volume co-efficient of -0.876 that for every unit increase in call volume, a -0.876 unit decrease is predicted in Stock Price at maturity date ($I_T$), holding all other variables constant.

11. The co-efficient for mid period of call volume (-1.294) was lower than the call volume for recent period (-0.824) and co-efficient of put volume for the second sub-period (1.443) was higher than the put volume (-0.721) for the third sub-period. It could be interpreted from positive co-efficient of put volume of 1.443 that for every unit increase in put volume, a 1.443 unit increase is predicted in Stock Price at maturity date ($I_T$), holding all other variables constant.

12. The co-efficient for the first-sub period of call volume (-0.876) for the first sub-period was lower than the call volume for the third sub-period (-0.824) and co-efficient of put volume (-0.642) for the first sub period is higher than POP (-0.721) for the third sub period. It could be interpreted from negative co-efficient of put volume of -0.642 that for every unit increase in put volume, a -0.642 unit decrease is predicted in Stock Price at maturity date ($I_T$), holding all other variables constant.

13. It is observed that the impact of open interest based predictors is much more than the impact of trading volume based predictors on the future price movements in the underlying cash market, as the results of adjusted $R^2$ and F-value revealed the fact that the open interest based predictors values are higher than volume based predictors in exploring the price movements of underlying cash market.
SUGGESTIONS:

1. The study established that the derivatives have significant impact on reducing stock market volatility and increase in informational efficiency. However, the benefit of these instruments as of now is not available to the small and retail investors as the minimum investment in them is Rs. 2,00,000. Even though the investment limits have been reduced in derivatives by introducing instruments like Mini Nifty and Chota-Sensex, they are also outside the normal investment range of the retail investors. Hence, there is an immense need to reduce the investment limits in these instruments and make them accessible to all categories of investors. Such a step will further boost-up the volumes of trade in stock market. The market regulator SEBI has to initiate appropriate steps in this regard.

2. This study revealed that decline in volatilities is more in long intervals than the short intervals. As concluded earlier, this is useful to the genuine and long-term investors who have the patience to wait for long-term returns. However, the speculators who have shifted to derivative market from the cash market after the introduction of derivatives in search of high returns by reducing the transaction costs on the one hand and by not opting to exercise the contract in case of derivative instruments like options may have to contend with only low returns. Hence, the regulatory authorities have to give a serious thought to this aspect. Further reduction in transaction costs may help the speculators to improve their margins and evince more interest in trading in derivative instruments.

3. Derivatives are basically hedging instruments and not meant for making any extra returns. Trading in derivatives require special skills. Further,
genuine investors who have taken positions (long or short) in the cash market may have to take opposite positions in derivative market to hedge their risk. For most of the investors, investment is not a full time job only. A few investors have the knowledge to analyse the fundamentals and technicals before taking an investment decision. This is very important because retail investors adopt Buy and Hold or sell or move out strategies depending upon the market conditions rather than taking opposite positions in derivative market due to lack of awareness about there instruments on the one hand and fear of operating in a complex instruments like these on the other. Therefore, it is necessary to educate investors about the mechanism of derivative trading.

4. A comparison of the impact of Index Futures and Index Options revealed that the Index Options exerted high influence in reducing stock market volatility. In case of Inter-day, volatility the lowest volatility recorded in case of Index Futures was 1.28 per cent as against this, the lowest volatility recorded in the case of Index Options was only 0.95 per cent. In case of Intra-day volatility, the lowest volatility recorded by Index Futures was 1.27 per cent as against volatility of only 0.93 in Index Options.

5. Similar observation was made in case of SSFs and SSOs. In majority of the cases, volatilities were lower in SSOs rather than SSFs. The F-test also indicates that values obtained are more significant in Options rather than Futures. This indicates lager participation of investors in Index Option and SSOs rather than Index Futures and SSFs. Even though, by nature Options are attractive than Futures. To make the derivative, the derivatives in Futures segment still more steps can be initiated attractive,
the regulatory authorities have to re-look at the margin deposit insisted. This is particularly important because Futures are binding contracts and by the end of the expiry day of the contract, one of the counter parties have to loose heavily in case market movements are unfavourable to them. Even if they square-off their positions before the expiry day this is bound to happen.

6. Even after 13 years of the introduction of derivative instruments in India, only 143 stocks have been permitted for derivative trading out of a total 1,646 listed as on 31st March 2013 in NSE (8.68 per cent). In NYSE for instance, out of 5,370 stocks listed, 2,226 stock were permitted for derivative trading (41.45 per cent). Thus, the number of stocks permitted in India for derivative trading is quite insignificant. Therefore, it is suggested that SEBI should initiate the steps to improve this number by relaxing eligibility criteria. This will improve the trading activity in derivative market and contribute to the favourable investment climate in the country.

This study provided enough empirical evidence on the impact of Derivatives in reducing stock market volatility and in increasing informational and market efficiency. The comments of Alan Greenspan, the former Governor of Federal Reserve are worth mentioning here. He opined that although there is a spirited debate on the subject of benefits and costs of Derivatives, the performance of the economies and the financial systems worldwide in recent years suggest that the benefits of Derivatives have materially exceeded the costs of Derivatives.