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Impact of Index Futures and Options Introduction: A Case of Spot Market Volatility in BSE

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Derivatives in India were introduced in June 2000 with the introduction of stock index futures in the Bombay Stock Exchange (BSE) and the National Stock Exchange (NSE). An important reason for the introduction of futures and options in India was the high trading volatility of the Indian stock market. This paper seeks to provide evidence on the impact of futures and options on spot market volatility. The sample data consist of daily opening and closing price returns of Sensex from January 1, 1997 to December 31, 2007. This paper uses family of GARCH techniques to capture the time-varying nature of volatility and volatility clustering phenomenon in the data. The study found that there are no significant changes in the volatility of the spot market due to the introduction of index futures and options in the Sensex Index.

Keywords: *Sensex, Futures, Options, Volatility, GARCH*

Introduction

During the past decades, there has been phenomenal growth in trade and industry the world over. Gone are the days when capital used to remain within the boundaries of a nation. In the present era of LPG and technology, capital and other resources are moving across national borders easily and increase the volume of international trade in the process. Besides, a new set of financial instruments called Derivatives have entered the capital market. Derivatives are financial instruments whose values are derived from the price of an underlying item. The underlying item can be equity, index, foreign exchange, commodity or any other assets. Derivatives include futures, forwards, options and swaps. These can be combined with each other or with traditional securities. Derivative products such as futures and options have become important instruments for price discovery, portfolio diversification and risk hedging in the Indian stock market in recent years. Often, the futures and options price increases as the volatility of the stock increases. The difficulty in predicting the behavior of a volatile stock permits the options seller to command a higher price for the additional risk. The increased volatility in asset prices in financial markets, increased integration of national financial markets with international markets and improvement in communication facilitated the introduction of derivatives in India. Derivatives in India were introduced in June 2000 with the introduction of stock index futures in the Bombay Stock Exchange (BSE). This was followed by the introduction of the index options (June 2000), stock options (July 2001) and stock futures (November 2001). The BSE introduced on 9th June 2000 stock index futures based on the sensitive index (also called SENSEX comprising 30 scrips) named BSX.

Review of Literature

The derivatives introduction made impact in the stocks of companies listed in the stock exchanges in India and around the world. While the introduction of index derivatives i.e. futures and options on the underlying index made impact on that index is an important empirical question. A number of studies have been carried out in the spot market of Indian stock exchange namely NSE and there was no study conducted in BSE based on this present attempt. For studying this volatility, the earlier studies used different statistical tools. Some of the empirical results are reviewed to understand the development.

Golaka C. Nath (2003) in his study "Behavior of Stock Market Volatility after Derivatives" studied the behavior of stock market volatility after derivatives for indices, as well as individual stocks. The study captured the impact of the introduction of derivatives trading over a longer period of time, i.e., from January 1999 to October 2003. The author used two bench mark indices, S & P CNX Nifty and S & P CNX Nifty Junior. The study revealed that volatility, as measured by standard deviation, came down for most stocks after derivatives.

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A study on "Price Discovery and Volatility on NSE Futures Market" by Raju. MT, et al (2003) examined the price discovery between the S&P CNX Nifty and its corresponding futures using co-integration analysis. The analysis measured the extent to which two markets have achieved long run equilibrium. They also examined the effects of introduction of S&P CNX Nifty Index Futures on the underlying spot market by using the ARCH family of models to study volatility between June 2000 and October 2002. The results of the study indicated that the volatility was reduced after the introduction of index futures.

Ramana Rao S. V. (2007) in his paper "Impact of financial derivatives products on spot market volatility: A study on Nifty" examined the impact of financial derivatives products on spot market volatility. This study examined the empirical relationship between financial derivatives products and the nifty spot market volatility. The analysis was made by using the GARCH models to study volatility between June 1999 and December 2005. The empirical evidence suggested that there was enhancement in the volatility of spot market index in the post-derivative period.

A study on the Impact of Futures and Options on Spot Market Volatility: A Case of S & P CNX Nifty Index by Sibani Prasad Sarangi and Uma Shankar Patnaik (2007) analyzed the impact of futures and options on spot market volatility. The sample data consist of daily opening and closing price returns of S & P CNX Nifty, Nifty Junior and S & P 500 index from January 1, 1997 to march 31, 2005. This paper used OLS and family of GARCH techniques to capture the time-varying nature of volatility and volatility clustering phenomenon in the data. The results suggested that there are no significant changes in the volatility of the spot market of the S & P CNX Nifty index, but the structure of volatility has changed to some extent.

Similarly, another study on "Futures, Trading, Information and Spot Price Volatility of NSE-50 Index Futures Contract" by Thenmozhi M (2003) analyzed the volatility of spot market before and after introduction of the stock index futures, and also the lead lag relationship between stock index futures and spot index returns. The standard deviation of daily returns was used to assess the impact of derivatives on spot market volatility. The author felt that GARCH model is not relevant for measuring volatility, since the study period is short.

A study on "Impact of Index Derivatives on S & P CNX Nifty Volatility: Information Efficiency and Expiration Effects" by Thenmozhi.M and Sony Thomas.M (2004) examined the impact of derivatives trading and cash market volatility in the Indian context. The volatility is examined considering the day-of-the week effect, domestic market factors and world market movements using GARCH models. The changes in volatility and information efficiency were examined for pre and post derivatives period. The analysis shows that the introduction of index futures and options has reduced spot market volatility. The persistence of volatility is reduced in post-derivatives period and day-of-the week effect is found to be insignificant after the introduction of derivatives.

From the above studies it is found that derivatives introduction has had made significant impact on spot market volatility in India too at different time periods. Based on these studies the present study made an attempt to study in the BSE index.

Statement of the Problem

Volatility is one of the key determinants of an options price and its change will affect an options value even if the underlying asset price risk is hedged. The more volatile an underlying asset is, the higher its options price. Pricing an option requires the seller to estimate how volatile an asset will be during the life of the option. The trading in derivatives is expected to affect the spot market for the underlying assets. Thus the introduction of index futures and options should not have any direct effect on the underlying spot market. Previous research studies have been conducted to examine the role of futures and options market, their contribution to improving the quality of underlying asset market, compare the volatility of the index before and after the introduction of the futures contract, either using an unconditional measure of volatility or using ARCH/GARCH framework and to test whether the introduction of stock index futures affects the volume-volatility relationship in the spot market. Hence the aim of this study is to examine the impact of futures and options trading on the spot market volatility in the Indian context using the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) class of models.

Objectives of the Study

The present study is carried out with the following objectives:

(i) To test the impact of index futures (Sensex) introduction on the stock market volatility in BSE, and

(ii) To test the impact of index options (Sensex) introduction on the stock market volatility in BSE.

Hypotheses of the Study

The present study tested the following two hypotheses.

(i) The introduction of index futures (Sensex) trading does not influence the underlying spot market volatility.

(ii) The introduction of index options (Sensex) trading does not influence the underlying spot market volatility.

Methodology of the Study

The objective of this study is to study the impact of introduction of index futures and options on the stock market volatility. As BSE Sensex is still the popular index and barometer for the Indian stock exchanges, an attempt is made to study the impact of index futures at BSE.

Sample Design

The daily closing prices of BSE Sensex are taken to study the impact of introduction of index futures and options on the stock market volatility. The daily closing prices of Sensex are collected before and after introduction of index futures and options. The data contain approximately 2752 observations which include 853 pre futures observations, 1899 post futures observations and 1099 pre options observations and 1653 post option. In order to examine the nature of volatility after the introduction of Futures and options, the sample period is divided into pre- and post-introduction and calculations are made separately under the GARCH model for each period. Similarly to examine the nature of volatility after the introduction of Options, the sample period is divided into pre-options and post-options with the cut-off date of June 01, 2001 and then separately calculations are made under the GARCH model for each period.

Sources of Data

The data for this study constitute BSE SENSEX daily returns. The price volume series (open, close, low, high) were obtained from BSE website. The other required data relating to this study were colleted from Journals, Magazines, Books, etc.

Period of the Study

The daily closing prices for the period from January 1, 1997 to December 31, 2007 were collected for BSE Sensex to cover the period of pre- and post-introduction of futures and options. The pre futures covered a period from January 1, 1997 to June 8, 2000 and the post futures included a period from June 9, 2000 to December 31, 2007. Similarly, the pre options period covered a period from January 1, 1997 to May 31, 2001 and the post options period included a period from June 1, 2001 to December 31, 2007.

Tools Used for Analysis

For the purpose of analysis of this study, calculations were made with the help of EVIEW 5.1 package. The following tools were used.

a) Returns

The daily returns based on closing prices were computed using the following equation.

$$R_t = \log (P_t / P_{t-1}) \quad (1)$$

Where,

P_t - closing price on day t

P_{t-1} - closing price on day t-1

R_t - returns in relation to day t

b) Jarque-Bera Test

The Jarque-Bera test is a goodness-of-fit measure of departure from normality, based on the sample kurtosis and skewness. The test statistic *JB* is defined as

$$JB=n/6(s^2+ (k-3)^2/4) \quad (2)$$

Where,

n = number of observations (or degrees of freedom in general)

S = sample skewness

K = sample kurtosis.

c) Unit Root Test

A unit root test tests whether a time series variable is non-stationary using an autoregressive model. The most famous test is the Augmented Dickey-Fuller test. Another Test is the Phillips-Perron test. Both these tests use the existence of a unit root as the null hypothesis.

- **Augmented Dickey-Fuller Test**

An Augmented Dickey-Fuller Test (ADF) is a test for a unit root in a time series sample. It is an augmented version of the Dickey-Fuller test for a larger and more complicated set of time series models. The augmented Dickey-Fuller (ADF) statistic, used in the test, is a negative number. The more negative it is, stronger the rejection of the hypothesis that there is a unit roots at some level of confidence.

$$\Delta Yt = \alpha + \hat{a}_t + \gamma y_{t-1} + \delta_1 \Delta y_{t-1} + \ldots\ldots + \delta_p \Delta y_{t-p} + \varepsilon_t \quad (3)$$

Where,

á = constant
â = the coefficient on a time trend
p = the lag order of the autoregressive process.

Imposing the constraints á = 0 and â = 0 corresponds to modelling a random walk and using the constraint â = 0 corresponds to modelling a random walk with a drift.

- **Phillip-Perron Test**

Phillip-Perron Test is a non-parametric modification of the standard Dickey-Fuller t-statistic to account for the autocorrelation that may be present if the underlying DGP is not AR (1). Thus, ADF and PP tests suffer from quite opposite problems. While the ADF test does not suffer from as severe a size distortion, it is not as powerful as the PP test.

d) ARCH

An Autoregressive Conditional Heteroskedasticity (ARCH, Engle (1982)) model considers the variance of the current error term to be a function of the variances of the previous time period's error terms. ARCH relates the error variance to the square of a previous period's error. It is employed commonly in modeling financial time series that exhibit time-varying volatility clustering, i.e. periods of swings followed by periods of relative calm.

e) GARCH

If an autoregressive moving average model (ARMA model) is assumed for the error variance, the model is a Generalized Autoregressive Conditional Heteroskedasticity (GARCH, Bollerslev (1986)) model. In that case, the GARCH (p, q) model has two equations and can be written as

$$Yt = C + \varepsilon_t \quad (4)$$

$$ó_n^2 = k + G_1 ó_{t-1}^2 + A_1 \varepsilon_{t-1}^2 \quad (5)$$

In the conditional mean (Y_t) the returns consist of a simple constant, plus an uncorrelated, white noise disturbance. This model is often sufficient to describe the conditional mean in a financial returns series. In the conditional variance mode ($ó_n^2$), the variance forecast consists of a constant plus a weighted average of last period's forecast ($G_1 ó_{t-1}^2$) and last period's squared disturbance ($A_1 \varepsilon_{t-1}^2$).

Impact of Index Futures and Options introduction on the Spot Market Volatility in BSE (SENSEX)

(i) Analysis of Returns under GARCH Model

Chart 1 shows the time series of BSE SENSEX returns. The time series is a sequence of observations taken in time i.e. the daily price of a stock. The plots look stationary though there may be GARCH effects. The study is based on the stock index price returns. The daily returns based on closing prices were computed using log returns. A stochastic process whose probability distribution is unchanged by shifts

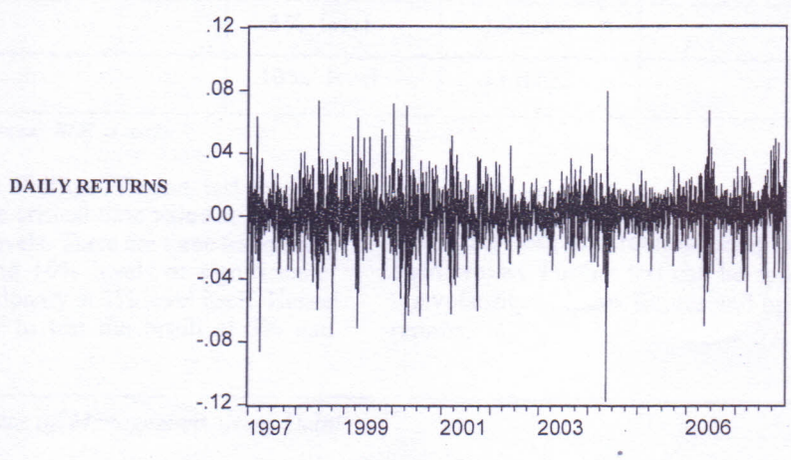

Chart 1: Time series of daily SENSEX returns

in time is said to be stationary and the daily returns are stationary. It is clear that the prices become less volatile as they get closer to 0 while the log prices have constant volatility. The mean and variance do not change with time.

(ii) Testing the Stationary in Time Series

The study relies on time series data and this step is to verify whether the series is stationary or not. Unit root test like Augmented Dickey-Filler (ADF) and Philips-Perron (PP) were applied to detect the problem of stationary in the series.

(a) Augmented-Dickey Filler (ADF) Test for Sensex Returns

Table 1 shows the result of unit root ADF test. An ADF is a test for a unit root in a time series sample. The ADF statistic, used in the test, is a negative number. It is clear that the ADF unit root test is sensitive towards the lag length included in the regression equation. Hence the lag length is chosen on Akaike Information Criterion (AIC).Hence, the ADF test is -16.73811 which is stationary at its level and it is significant at 1% level (-3.432549).

Table 1: ADF Unit Root Test Results for Sensex

		t-statistic	Probability
Augmented Dickey-Fuller test statistic		-16.73811	0.0000
Test critical values:	**1% level**	-3.432549	
	5% level	-2.862397	
	10% level	-2.567271	

Sources: Prowess, BSE website

From this test, returns being stationary have been proved. Further test can be applied for testing the volatility of index futures and options in BSE Sensex returns.

There are three test critical values at 1%, 5% and 10% levels of significance. The test is proved stationary at 1% level itself. Hence there is no necessity to test the result at 5% and 10% levels of significance.

(b) Philips-Perron (PP) Test for Sensex Returns

The result of unit root Phillips- Perron test statistic is shown in Table 2. From this table, Phillips- Perron test statistic shows stationary (-48.85638) in time series at its level and it is significant at 1% level (-2.565805).

Table 2: PP Unit Root Test Results for Sensex

		t-statistic	Probability
Phillips- Perron test statistic		-48.85638	0.0000
Test critical values:	**1% level**	-2.565805	
	5% level	-1.940939	
	10% level	-1.616622	

Sources: Prowess, BSE website

It is interesting that Phillips- Perron test statistic values far exceeds the critical time value at 1%, 5%, and 10% significant levels. There are three test critical values at 1%, 5% and 10% levels of significance. The test is proved stationary at 1% level itself. Hence there is no necessity to test the result at 5% and 10% levels of significance.

From this test, the returns being stationary have been proved. Further test can be applied for testing the volatility of Index futures and options in Sensex returns.

(iii) Analysis of Volatility

Forecasting a stock's volatility is a key aspect of the determination of pricing, especially in the options market. The volatility refers to the fluctuations in the stock price. Forecasting these fluctuations is important to an options trader, as higher fluctuation in the stock price means higher options price, and hence more profits. This study examined a) Index futures and b) Index options.

(A) INDEX FUTURES- Pre Futures and Post Futures

(i) Descriptive Statistics for Index Futures

The descriptive statistics for index returns is provided in Table 3. As stated earlier, the overall sample has 2753 time series observations. The average mean return on the Sensex was 0.0289% per day with an average standard deviation of 0.70% per day. The mean of 0.0191% for pre-futures period has increased to 0.0333% for post-futures period.

Table 3: Descriptive Statistics for Index Futures

Particulars	Pre-futures	Post-futures	Overall
Mean	0.000191	0.000333	0.000289
Std. Dev.	0.008363	0.006312	0.007005
Probability	0.000000	0.000000	0.000000
Maximum	0.031764	0.034444	0.034444
Minimum	-0.037445	-0.051286	-0.051286
Skewness	-0.150721	-0.635321	-0.407954
Kurtosis	4.815588	5.045028	3.456035
Jarque-Bera	119.2473	179.2727	119.2473
Probability	0.000000	0.000000	0.000000
Sum Sq. Dev.	0.091449	0.079449	0.083701
Observations	856	1896	2753

Sources: Prowess, BSE website

The standard deviation, which is considered to be a measure of volatility, shows that the volatility in the post-futures period (0.6312%) is less than that of pre introduction of futures (0.8363%). It is true that drawing conclusions based only on the descriptive statistics may prove to be incorrect. Hence there is a need for further investigation of the impact of financial derivatives on the underlying spot market volatility. The table clearly shows the maximum values of 3.44% for Sensex and minimum value of -5.12% for Sensex. If the returns are normally distributed, then co-efficient of skewness should be equal to zero. From this table, pre-futures show negative skewness (-0.15072), indicating a long left tail but it increased to negative skewness (-0.6353).

Every normal distribution has a kurtosis of three. The table clearly reveals that both in pre-futures and post-futures, the kurtosis exceeds three and therefore, it is fat tail. A high kurtosis distribution has a sharper "peak" and fatter "tails". Jarque- Bera test is a test of the null hypothesis of normality in which the skewness and kurtosis of the series are compared to the normal distribution. The evidence of leptokurtosis or positive excess kurtosis of returns supports the existence of ARCH effects in these time series. The variance in post-futures (0.079449) is lower than the pre-futures (0.91449). A significant and negative co-efficient would indicate a decrease in volatility.

(ii) Testing Volatility for Index Futures

The results of the structure of volatility in pre and post-futures regime are given in **Table 4**. The estimates show that coefficient of ARCH was -0.016104 and -0.009862 before the introduction of futures and after the introduction of futures trading respectively. There is a marginal decline in the value of 'á' and it indicates that there is a decrease in the impact of the recent news on spot market volatility.

Table 4: Testing the Volatility using GARCH Model

Particulars	Pre-futures	Post-futures	Overall
C	0.483569	0.489079	0.481358
ARCH	-0.016104	-0.009862	-0.017685
GARCH	0.514548	0.520195	0.511962

Sources: Prowess, BSE website

The coefficient of GARCH is 0.514548 in pre-futures and 0.520195 in post-futures. It indicates that there is a marginal increase in the value of 'â' and the effect of the old news has increased in the post-futures period. á + â= 0.498444(before futures) and á + â= 0.510333 (after futures) show that the spot market is absorbing information faster in the post derivative period and the level of persistence of volatility has marginally increased.

Test of hypothesis-I

H_0: The hypothesis, namely, "The introduction of index futures (Sensex) trading does not influence the underlying spot market volatility" is rejected. The findings of this study do not accept the hypothesis that the introduction of stock index futures has no effect on underlying spot market volatility.

(B) INDEX OPTIONS - Pre Futures and Post Futures

(i) Descriptive Statistics for Index Futures

Table 5 provides the descriptive statistics for Sensex index returns. As stated earlier, the average mean returns on the Sensex is 0.0289% per day with an average standard deviation of 0.70% per day. The mean of 0.0043% for pre-options period has increased to 0.0067% for post-options period.

Table 5: Descriptive Statistics for Index Options

Particulars	Pre-option	Post-option	Overall
Mean	0.000043	0.000067	0.000289
Std. Dev.	0.008250	0.007376	0.007005
Probability	0.000000	0.000000	0.000000
Maximum	0.031765	0.031765	0.034444
Minimum	-0.037445	-0.037445	-0.051286
Skewness	-0.202113	-0.237850	-0.407954
Kurtosis	4.815588	11.54988	3.456035
Jarque-Bera	119.2473	2690.256	119.2473
Probability	0.000000	0.000000	0.000000
Sum Sq. Dev.	0.09083425	0.085887468	0.0837
Observations	1102	1650	2753

Sources: Prowess, BSE website

The standard deviation clearly shows that the volatility in the post-options period (0.7376%) is less than that of pre introduction of options (0.8250%). It is true that drawing a conclusion based only on the descriptive statistics may prove to be incorrect. Hence there is a need to further investigate the impact of financial derivatives on the underlying spot market volatility. The table shows maximum value of 3.44% for Sensex and the minimum value of -5.12% for Sensex. If the returns are normally distributed, then co-efficient of skewness should be equal to zero. According to the table, pre-options show negative skewness (-0.202113), indicating a long left tail but it declined to negative skewness (-0.2378).

Every normal distribution has a kurtosis of three and this table gives that both in pre-options and post-options, the kurtosis exceeds three; therefore, it is fat tail. A high kurtosis distribution has a sharper "peak" and fatter "tails". Jarque-Bera test is a test of the null hypothesis of normality in which the skewness and kurtosis of the series are compared to the normal distribution.

The evidence of leptokurtosis or positive excess kurtosis of returns supports the existence of ARCH effects in these time series. The variance at post-options (0.085887468) was lower than that of pre-options (0.09083425).A significant negative co-efficient would indicate a decrease in volatility.

(ii) Testing Volatility for Index Futures

Table 6 reports the results of the structure of volatility in pre and post-options regime. The estimates show that coefficient of ARCH was -0.014719 and -0.0489 before the introduction of futures and after the introduction of futures trading. There is a marginal increase in the value of 'á' and it indicates that there is an increase in the impact of the recent news on spot market volatility.

Table 6: Testing the Volatility using GARCH Model

Particulars	Pre-options	Post-options	Overall
C	0.485268	0.458794	0.481358
ARCH	-0.014719	-0.048969	-0.017685
GARCH	0.516458	0.489816	0.511962

Sources: Prowess, BSE website

The coefficient of GARCH was 0.516458 in pre-options and 0.489816 in post-options. It clearly indicates that there is a marginal decrease in the value of 'â' and the effect of the old news has declined in the post-futures period. á + â= 0.501739(before futures) and á + â= 0.440847 (after futures) show that the spot market is absorbing information faster in the post derivative period and the level of persistence of volatility has marginally declined.

Test of hypothesis-II

$H_{0:}$ The hypothesis, namely, "The introduction of index options (Sensex) trading does not influence the underlying spot market volatility" is rejected. The findings of this study do not support the hypothesis that the introduction of stock index options has no effect on underlying spot market volatility.

Findings of the Study

The following are important findings of the study.

(i) A comparison of Sensex volatility, as measured by standard deviation, clearly shows that the volatility in the post futures and options period is less than the volatility before the introduction of futures and options.

(ii) The volatility has increased in post- futures period (0.520195) compared to pre-futures period (0.514548) using GARCH model in BSE Sensex.

(iii) The volatility has decreased in post- futures period (0.489816) compared to pre-futures period (0.516458) using GARCH model in BSE Sensex.

(iv) Sensex index has gained more mean returns in the post futures and options period.

Suggestions

The following are the important suggestions to reduce the volatility effects and increase the returns.

(i) Introduction of index futures and options has an impact on the spot market volatility. Hence the investors should follow appropriate strategy in order to gain from futures and options trading.

(ii) The Regulating Authority of stock exchanges has to take measures to monitor and control the stock price volatility.

(iii) The sample size consisted of only the index. The sample size may be increased to individual stocks to get accurate results for the investors.

(iv) Every stock exchange should follow some framework in order to minimize the

fluctuations due to the introduction of futures and options trading.

Conclusion

The impact of futures and options trading on the volatility of spot market has been examined by using GARCH model. The study has indicated either a significant decrease or increase in the volatility of the underlying spot market due to the introduction of futures and options in the stock market. Derivatives help to increase the trading volume of the cash market resulting in the reduction of transaction cost in the long run. The study reveals that there is a fall in volatility since the inception of futures trading which may be attributed to increase in the trading in cash markets, due to faster dissemination of information, making cash markets more liquid and, therefore, less volatile.

Scope for Further Research

The present study is carried out to analyze the volatility in the spot market due to the introduction of option and future in Bombay Stock Exchange index, i.e. Sensex. The further study may be attempted to focus on other stock exchanges like Madras Stock Exchange, Hyderabad Stock Exchange, etc. The present study is related to the stock exchange in India. Further study may be conducted with other exchanges around the world like Asian stock exchanges, US stock exchanges, etc. The study is related to index futures and options. Further study may be attempted to study the individual stock futures and options.

References

Golaka. C. Nath (2003), Behavior of Stock Market Volatility after Derivatives, NSE Publication.

Raju, M. T. and Kiran Karande (2003), "Price Discovery and Volatility on NSE Futures Market", SEBI Working Paper.

Ramana Rao, S. V. (2007), "Impact of Financial Derivatives Products on Spot Market Volatility: A Study on Nifty", *The ICFAI Journal of Derivatives Markets*, Vol. 4 (1), pp. 7-16.

Sibani Prasad Sarangi and Uma Shankar Patnaik (2007), "A study on the Impact of Futures and Options on Spot Market Volatility: A Case of S & P CNX Nifty Index", *The ICFAI Journal of Applied Finance,* Vol. 13 (3), pp. 16-36.

Thenmozhi, M. (2003), "Futures, Trading, Information and Spot Price Volatility of NSE-50 Index Futures Contract", NSE Publication.

Thenmozhi, M. and Sony Thomas, M. (2004), "Impact of Index Derivatives on S & P CNX Nifty Volatility: Information Efficiency and Expiration Effects", *The ICFAI Journal of Applied Finance*, Vol. 10, pp. 36-55.