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Impact of Index Futures and Options Introduction: A Case of *Spotmarket* Volatility in NSE

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Abstract

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 Nifty from January 1, 1997 to December 31, 2007. This paper uses 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 NSE.

Key Words: *Index Futures- Index Options- Spot Market- NSE.*

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 era of globalization and liberalization, technology, capital and other resources are moving across national borders easily and increasing the volume of international trade. There have been rapid changes in Corporate, Bank, Investment finance in recent years, under new set of financial instruments called Derivatives have come into beginning. 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 assert. Derivatives include futures, forwards, options and swaps. These can be combined with each other or with traditional securities and loan to create hybrid instruments. 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. There were two main reasons for choosing index futures as introductory derivative securities. The first was that index futures provide the required mechanism for hedging risk of investment in equity. The second, and perhaps the more important reason from the regulator's perspective, was that, unlike derivatives on individual stocks, manipulation of prices of instruments based on indices is difficult.

The volatility of the underlying stock is one of the key factors in determining the value of an option. Often, the futures and options price increases as the volatility of the stock increases. The difficulty in predicting the behaviour of a volatile stock permits the option seller to command a higher price for the additional risk. The most notable of development in the history of secondary of the Indian stock market is the commencement of derivatives trading in June, 2000. The SEBI approved derivatives trading based on futures contracts at National Stock Exchange (NSE) and Bombay Stock Exchange (BSE) in accordance with the rules/bye-laws and regulations of the stock exchanges. To begin with, the SEBI permitted equity derivatives named Stock Index futures. The NSE started on June 12, 2000 stock index futures based on its index S&P CNX NIFTY (comprised 50 scripts) in the name of N FUTIDX NIFTY.

Review of Literature

The impact of futures and options on the underlying index volatility is an important empirical question. A number of studies have been carried out on the subject across the countries. Some of the empirical results are reviewed for this study. Ramana Rao.S.V. (2007) in his paper entitled "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 is done using the GARCH models to study volatility between June 1999 and December 2005. The empirical evidence is mixed and the results suggest that there has been an enhancement in the volatility of spot market index in the post-derivative period. A paper "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 option 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 GARCH techniques to capture the time-varying nature of volatility and volatility clustering phenomenon in the data. The results suggest 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.

Nupur Hetamsaria and Niranjan Swain (2003) in his paper "Impact of the introduction of futures market on the spot market: An empirical study" tested how the introduction of index futures affects the underlying market. The relative volatility of Nifty index pre and post futures and relative volatility of the two markets (futures and spot) have been studied and tested for statistical significance by using F-test. A multiple regression model is used to test the impact of the introduction of futures market on the spot market. The empirical evidence suggests that the introduction of futures market does not destabilize the underlying market, that there is a decline in volatility. A study on "Impact of index derivatives on S & P CNX Nifty volatility: information efficiency and expiration effets" 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 change in volatility and information efficiency is examined for pre and post derivatives period. The analysis shows that the introduction of index futures and options has reduced spot market volatility. 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. A study entitled "Does futures trading impact spot market volatility: Evidence from Indian financial market" by Singh.Y.P and Shalini Bhatia(2006) found that daily spot market volatility using GARCH model in India has marginally declined since the introduction of future trading in India . The study also shows a simultaneously significant improvement in the information coefficient α and reduction in β, the persistence coefficient that we forward as case in growing efficiency of the Indian stock market.

Nupur Hetamsaria and Saikat Sovan Deb (2004) in their study "Impact of index futures on Indian stock market volatility: An application of GARCH model" studied the impact of the introduction of stock index futures in the volatility of the Indian spot markets. The issues addressed in this paper are : firstly ,does the introduction of stock index futures reduce stock market volatility secondly, if there is a reduction in the volatility of the stock market post futures, are there no other reasons that could have caused such a reduction thirdly if their future effect confirmed, is the effect immediate or delayed. The amended GARCH model is used to study the above objectives. There results obtained show that the results remain consistent with the studies for other emerging markets. A study entitled "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. This analysis measures 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. They found that both cash and futures market are integrated; information flows from one market to another, with information being reflected first in the futures

market, and the results indicated that the volatility was reduced after the introduction of index futures. Golaka C nath (2003) in his study "Behaviour of stock market volatility after derivatives" studied the behaviour 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 has used two bench mark indices, S & P CNX Nifty, S & P CNX Nifty Junior and 20 selected stocks, 13 of which have single stock futures and options. The study revealed that volatility, as measured by standard deviation came down for most stocks after derivatives.

A study entitled "Futures, trading, information and spot price volatility of NSE-50 index futures contract" by Thenmozhi M (2002) 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 with the help of data between June 15, 1998 and July 26, 2002. The standard deviation of daily returns has been 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. In this study NSE-50 junior was used as a proxy to capture market wide influence on price volatility, as it is not very highly correlated with NSE-50 index. The above studies were found that derivatives introduction has had made significant impact on spot market volatility in India too at different time periods.

Statement of the Problem

Volatility is one of the key determinants of an option's price so its change will affect an option's value even if the underlying asset price risk is hedged. The more volatile an underlying asset is the higher its option price. Pricing an option requires the seller to estimate how volatile an asset will be during the life of the option. Derivatives, as the name suggest, basically derive their value from some underlying asset like, a commodity, a stock, or a stock index. Hence, the trading in derivatives is expected to affects 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. However, in practice financial markets are never perfect and hence some effects of derivative markets are bound to exist on the underlying spot market. Several research studies have been conducted to examine the role of futures and options market and its contribution in improving the quality of underlying asset market. Empirical studies, more often, involve investigation of futures and option effects on stock price behaviour at two points in time (before and after introduction) separated by an event that might affect this behaviour. With these background the present study is attempt to test the volatility of stock with help of GARCH model.

Objectives of the Study

The present study is carried out with following objectives.

1) To study the impact of index futures (Nifty) introduction on the stock market volatility in NSE.
2) To study the impact of index options (Nifty) introduction on the stock market volatility in NSE.

Hypotheses of the Study

The present study tested the following two hypotheses.

1) The introduction of index futures (Nifty) trading does not influence the underlying spot market volatility.
2) The introduction of index options (Nifty) trading does not influence the underlying spot market volatility.

Methodology of the Study

The objectives of this study are to study the impact of introduction of index futures and options on the stock market volatility. As NSE Nifty is still index in India, it is decided to study Nifty.

Sample Design

The daily closing price of NSE Nifty is taken to study the impact of introduction of index futures and options on the stock market volatility. Daily closing prices of Nifty are collected for before and after the introduction of index futures and options. The data contains approximately 2752 observations out of which 856 and 1102 were related to the period prior to the introduction of futures and options trading respectively and the remaining 1896 and 1650 observations related to the period, post- introduction of futures and options trading respectively. The data price volume series (open, close, low, high) has obtained from the NSE website. To examine the nature of volatility after the introduction of futures and options, the sample period is divided into pre- and post-introduction and separately calculates the GARCH model for each period. 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 calculates the GARCH model for each period.

Sources of Data

The data for the study constitutes NSE Nifty daily returns. The price volume series (open, close, low, high) were obtained from NSE website. The other required data relating to this study were collected from Journals, Magazines, Books, etc.

Period of the Study

The daily closing prices for the period from January 1, 1997 to December 31, 2007 are collected for NSE Nifty, so as to have the period of pre- and post- introduction of options and futures. The pre futures period included period from January 1, 1997 to June 11, 2000 and the post futures period included the period from June 12, 2000 to December 31, 2007. Similarly, the pre option period included period from January 1, 1997 to June 3, 2001 and the post futures period included period from June 4, 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.

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

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

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

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.

$$\Delta Yt = \propto + \beta_t + \gamma\, y_{t-1} + \delta_1\, \Delta y_{t-1} + \ldots\ldots + \delta_p \Delta y_{t-p} + \varepsilon_t$$

Where,

α = constant

β = the coefficient on a time trend

p = the lag order of the autoregressive process.

Imposing the constraints $\alpha = 0$ and $\beta = 0$ corresponds to modelling a random walk and using the constraint $\beta = 0$ 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 size distortions, 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

$$Yt = C + \varepsilon_t$$

$$\sigma_n^2 = k + G_1 \sigma_{t-1}^2 + A_1 \varepsilon_{t-1}^2$$

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 (σ_n^2), the variance forecast consists of a constant plus a weighted average of last period's forecast ($G_1\sigma_{t-1}^2$) and last period's squared disturbance ($A_1\varepsilon_{t-1}^2$).

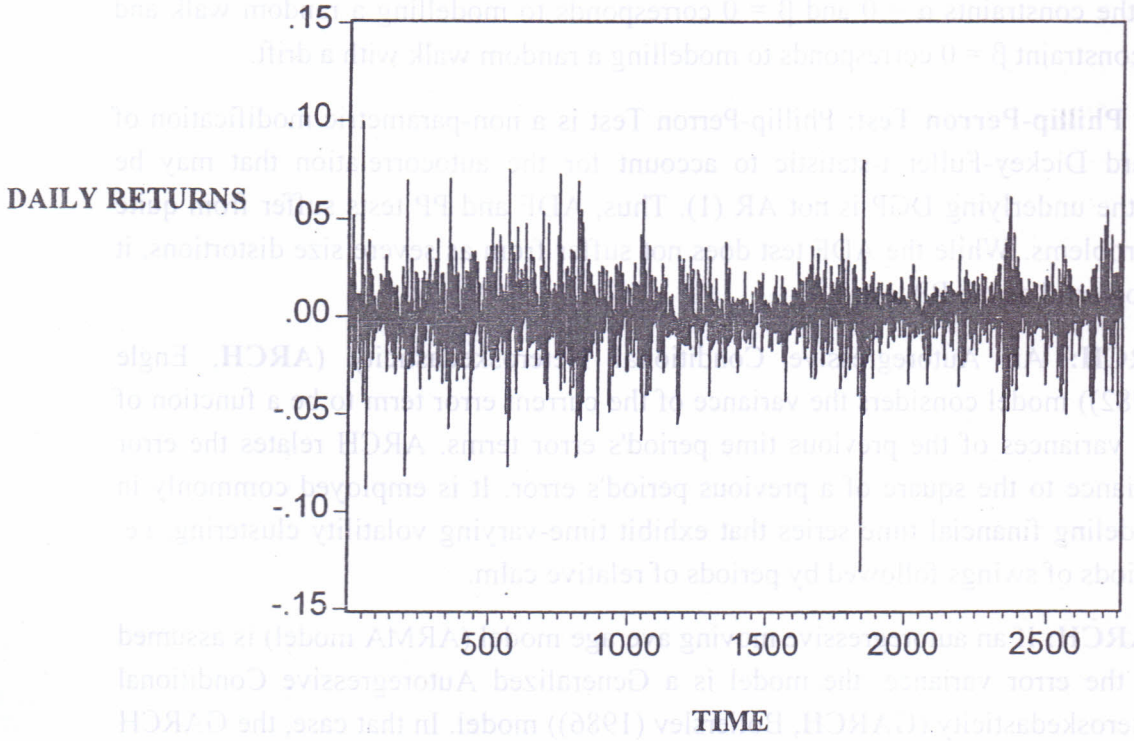
Impact of Index Futures and Options introduction on the Spot Market Volatility in NSE (NIFTY)

I. Analysis of Return under GARCH Model

Chart - 1, shows the time series of S & P CNX Nifty returns. Time series is a sequence of observations taken in time i.e. the daily prices 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. Returns are calculated to have stationary. A stochastic process whose probability distribution is unchanged by shifts in time is said to be stationary. One advantage of using

log returns is simplicity of multi-period returns. 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.

Chart - 1: Time Series of Daily S & P CNX Nifty Returns



II. Testing the Stationary in Time Series

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

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

Table - 1 ADF Unit Root Test Results for Nifty

		t-statistic	Probability
Augmented Dickey-Fuller test statistic		-15.55030	0.0000
Test critical values:	1% level	-3.432542	
	5% level	-2.862394	
	10% level	-2.567269	

Sources: Prowess, NSE website.

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 **(-15.55030)** which is stationary at its level and it is significant at 1% level **(-3.432542).**

From this test, the returns is stationary has been proved. So, further test can be applied for testing the volatility of index futures and options in S & P CNX Nifty returns.

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

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

Table - 2 PP Unit Root Test Results for Nifty

		t-statistic	Probability
Phillips- Perron test statistic		-49.21911	0.0000
Test critical values:	**1% level**	-3.432534	
	5% level	-2.862391	
	10% level	-2.567268	

Sources: Prowess, NSE website

Table - 2 shows the result of unit root Phillips- Perron test statistic test. From this table, Phillips- Perron test statistic test shows stationary **(-49.21911)** in time series at its level and it is significant at 1% level **(-3.432534).**

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

From this test, the returns is stationary has been proved. So, further test can be applied for testing the volatility of Index futures and options in S & P CNX Nifty returns.

III. Analysis of Volatility

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

(A) INDEX FUTURES- Pre Futures and Post Futures

Table - 3 Descriptive Statistics for Index Futures

Particulars	Pre-futures	Post-futures	Overall
Mean	0.000521	0.000765	0.000682
Std. Dev.	0.018963	0.014690	0.016139
Maximum	0.099339	0.079691	0.099339
Minimum	-0.088405	-0.130539	-0.130539
Skewness	0.004675	-0.779704	-0.407176
Kurtosis	6.047221	8.734432	7.698743
Jarque-Bera	331.1879	2789.921	2608.623
Probability	0.000000	0.000000	0.000000
Sum Sq. Dev.	0.307458	0.408943	0.716802
Observations	856	1896	2752

Sources: Prowess, NSE website

(i) Descriptive Statistics for Index Futures

Table - 3 provides the descriptive statistics for nifty index returns. The overall sample has 2753 time series observations. The average mean return on the nifty is 0.0682% per day with an average standard deviation of 1.61% per day. The mean is 0.0521% for pre-futures period has increased to 0.0765% for post-futures period. The standard deviation which is considered to be a measure of volatility shows that the volatility in the post-futures period (1.469%) is less than the volatility before the introduction of futures volatility (1.896%). But drawing conclusions 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. From the table it also found that the maximum of 9.93% values for nifty and then minimum value of -13.05% for nifty. If the returns are normally distributed then co-efficient of skewness should be equal to zero. From this table, pre-futures show positive skewness (0.0047) indicating a long right tail but it declined to negative skewness (-0.779). Every normal distribution has a kurtosis of three. This table shows that both in pre-futures and post-futures 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. Variance has post-futures (40%) higher than the pre-futures (30%). A significant negative co-efficient would indicate a decrease in volatility.

(ii) Testing Volatility for Index Futures

GARCH equation has two effects, namely ARCH effect and GARCH effect. GARCH (1, 1) refers to the first order ARCH term and the first order GARCH term in the conditional variance equation. 'α' (ARCH1) is the "news" coefficient, with a higher value implying that recent news has a greater impact on price changes. It relates to the impact of yesterday's news on today's price changes. In contrast 'β' (GARCH1) reflects the impact of "old news" on price changes. It indicates the level of persistence in information and its effect on volatility.

Table - 4 Testing the Volatility Using GARCH Model

Particulars	Pre-futures	Post-futures	Overall
C	0.483012	0.480129	0.481247
ARCH	-0.016495	-0.018379	-0.017751
GARCH	0.513909	0.510566	0.511837

Sources: Prowess, NSE website

Table - 4 reports the results of the structure of volatility in pre and post-futures regime. The estimates show that coefficient ARCH was -0.016495 and -0.018379 before the introduction of futures and after the introduction of futures trading. There is a marginal increase in the value of 'α' indicates that there is an increase in the impact of the recent news on spot market volatility. The coefficient of GARCH is 0.513909 in pre-futures and 0.510566 in post-futures. It indicates that there is a marginal decrease in the value of 'β' that the effect of the old news has declined in the post-futures period. $\alpha + \beta =$ 0.497414(before futures) and $\alpha + \beta =$ 0.492187(after futures). These statistics shows 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-I

H_0: The hypothesis namely "The introduction of index futures (Nifty) trading does not influence the underlying spot market volatility (H_0)"is rejected. The findings 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

Table - 5 Descriptive Statistics for Index Options

Particulars	Pre-option	Post-option	Overall
Mean	0.000182	0.001027	0.000682
Std. Dev.	0.018559	0.014290	0.016139
Maximum	0.099339	0.079691	0.099339
Minimum	-0.088405	-0.130539	-0.130539
Skewness	-0.059600	-0.844648	-0.407176
Kurtosis	5.822261	9.907308	7.698743
Jarque-Bera	366.3858	3476.318	2608.623
Probability	0.000000	0.000000	0.000000
Sum Sq. Dev.	0.379212	0.336756	0.716802
Observations	1102	1650	2752

Sources: Prowess, NSE website.

(i) Descriptive Statistics for Index Futures

Table - 5 provides the descriptive statistics for index options. The overall sample has 2753 time series observations. Table 3.5.A indicates that the daily mean return on NIFTY is 0.000682 and the average standard deviation is 0.016139. If we divide the sample into before and after options using June 4, 2001 as the cut-off date, the mean return has increased from 0.000182 to 0.001027. There is a decline in the standard deviation from 0.018559 to 0.014290. This suggests that there has been a marginal decline in volatility after introduction of index options on the Indian stock market. However, inferences cannot be drawn from these figures and further investigation is required. From the table it also found that the maximum of 9.93% values for Nifty and then minimum value of -13.05% for Nifty. Every normal distribution has a Skewness of 0. Both the distributions are negatively skewed and their Skewness has decreased overtime from -0.059600 to -0.844648. Every normal distribution has a kurtosis of 3. This table shows that both in pre-option and post-option, the kurtosis exceeds 3; therefore, it is fat tails. A high kurtosis distribution has a sharper "peak" and fatter "tails". According to the test statistics of Jarque-bera normality test, the null hypothesis of normality distributed returns can only be accepted for index of small capitalized companies. In contrast, the evidence of leptokurtosis or positive excess kurtosis of hedge fund returns supports the existence of ARCH effects in these time series. Variance has post-option of 34% which lower than the pre-options of 38%.

(ii) Testing Volatility for Index Futures

Table - 6 Testing the Volatility Using GARCH Model

Particulars	Pre-option	Post-option	Overall
C	0.485013	0.487637	0.481247
ARCH	-0.014934	-0.009781	-0.017751
GARCH	0.516166	0.518692	0.511837

Sources: Prowess, NSE website.

Table - 6 reports the results of the structure of volatility in pre and post options regime. The estimates show that co-efficient ARCH was -0.014934 and -0.009781 before the introduction of options and after the introduction of option trading. There is a marginal decrease in the value of 'α' indicates that there is a decrease in the impact of the recent news on spot market volatility. The co-efficient of GARCH is 0.516166 in pre-options and 0.518692 in post-options. It indicates that there is a marginal increase in the value of 'β' that the effect of the old news has increased in the post-option period. α+ β= 0.501232 (before option) and α+ β=0.508911 (after option). These statistics shows that the spot market is absorbing information faster in the post option period and the level of persistence of volatility has marginally increased.

Test of hypothesis-II

H_0: The hypothesis namely "The introduction of index options (Nifty) trading does not influence the underlying spot market volatility" is rejected. The introduction of index options resulted in increase the stock market volatility. The findings do not accept the hypothesis that the introduction of stock index option has no effect on underlying spot market volatility.

Findings of the Study

The following are important findings of the study.

1. A comparison of Nifty volatility as measured by standard deviation shows that the volatility in the post futures and options period is less than the volatility before the introduction of futures and options volatility.
2. The volatility has decreased in post futures period (0.510566) compared to pre-futures period (0.51390) using GARCH model in NSE Nifty.
3. The volatility has increased in post futures period (0.518692) compared to pre-futures period (0.516166) using GARCH model in NSE Nifty.
4. Nifty index has gained more mean returns in the post futures and options period.

Suggestions

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

1. Introduction of index futures and options has an impact on the spot market volatility. So, the investors should follow some strategy in order to gain from futures and options trading.
2. The regulating authority of stock exchanges has to take measures to monitor and control the stock price volatility.
3. The sample size is consisted only the index. The sample may be increased to individual stocks to get the accurate results for the investors.
4. Every stock exchange should follow some framework in order to minimize the fluctuations due to the introduction of futures and options trading.
5. The sample size is consisted only the index. The sample may be increased to individual stocks to get the accurate results for the investors.
6. 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 increased 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 related to Indian market. The further study may be attempted to focus on other markets like Asian market, US market. The present study is related to two stock exchanges. The further study may be conducted with other exchanges like Madras stock exchange, Hyderabad stock exchange. The study is related to index futures and options. The further study may be attempted to study the individual stock futures and options.

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