Effect of Stock Index Futures Trading on Volatility and Performance of Underlying Market: The case of India

Dr. Manu K S,
Assistant Professor,
Department of Management Studies,
Christ University, India.

ABSTRACT

The study pertains to analyse the effect of stock index futures trading on volatility and performance of underlying market. The four stock index futures of National Stock Exchange (NSE) are selected for the study. The study used GARCH (1,1) model to test the effect of futures trading. Overall the study found that the introduction of stock index futures doesn’t have a significant effect on the performance of all the selected underlying stock indices but there is a significant difference in volatility of all the selected underlying market before and after introduction of stock index futures.

Keywords: Stock Index Futures, Volatility, GARCH (1,1) model and National Stock Exchange.

INTRODUCTION:

The National Stock Exchange (NSE) of India has continued as leading stock exchange among the major global stock exchanges. World Federation of Exchange (WFE) survey reveals that NSE India, ranked top two among the world stock exchanges for number of single stock futures contracts traded globally during the year 2016. Basically the derivatives were introduced in India to reduce the volatility in underlying assets. Many researchers and regulators made an attempt to understand whether the introduction of futures will reduce the volatility of spot markets assets. When theoretical futures price (Cost of Carry Model) exceeds the actual futures price then arbitragers take short position in futures market and long position in spot market. Primarily these mechanism create prices differences in futures and spot markets. M.Thenmozhi (2002) clearly stated that this process raises question of introduction stock and index futures effect on volatility of underlying assets. Volatility places a very vital role in global capital market. The market participant’s investment decisions are mainly depends on the market volatility. The researchers and academicians are not in consensus decision whether futures trading will decrease or increase the market volatility.

LITERATURE REVIEW:

Manasa and Suresh (2018) studied Indian stock market and found decrease in the volatility of underlying banking stocks after introduction of Bank nifty index futures. Yilgor and Charbelie (2016) found that derivatives trading reduce the spot market volatility and observed no relationship between spot market volume and derivatives trading. Singh and Tripathi, (2016) used GARCH model and found that the volatility of underlying stock market has reduced after introduction of stock index futures contract. Manmohan and Mishra (2011) conducted a study to observe the exchanging volume headway of neighbouring month index prospects is the most exceptional learn for volatility the prospects plug in India. Ruchika et al (2010) observed that introduction of futures does not influence the volatility of Bank Nifty and also individual banking stocks other than Axis, IDBI and ICICI banks. Sathyia and Debasish(2009) found that no changes in the volatility after the introduction of Futures Trading.Tripathy et al (2009) showed fall in Spot and hike in market efficiency after introduction of derivatives on the Spot Market due to increased impact of activities happening in the economy.Alberg et al. (2008) studied an empirical study using GARCH model and shown overall estimation of
measuring conditional variance has improved. Vipul(2006) has studied the fluctuations in volatility in the Indian Stock Market after the introducing the derivatives and it marks with the reduction in volatility of the spot market in the post introduction of derivatives. Nagaraj and Kiran (2004) shown there is no truly enormous (or basic) capacity in mean returns and intra-day volatility of the market list. Hetamsaria and Deb (2004) found reduction in spot market volatility after introduction of futures index and suggested that the domestic market factors had a significant impact, in determining the volatility of the Nifty index. Nath (2003) concluded that the volatility of Nifty index had fallen in the post future period. The GARCH model results show that there is no structural change in the conditional volatility of the component stocks after such introduction of derivatives. Shenbagaraman (2003) has investigated the influence of the introduction of derivatives trading on cash market and it displays the result of no change in volatility of underlying asset before and after introduction of derivative trading. Bandivadekar and Ghosh (2003) found decrease in the spot market volatility due to futures trading. Rahman (2001) found that the spot join volatility bears a positive relationship with sudden exchanging volume and open importance for futures markets. The results show that there is no structural change in the conditional volatility of the component stocks after such introduction of derivatives. Thenmozhi (2002), in her study has used Ordinary Least Square Multiple Regression Technique and the variance ratio test to study the influence of the introduction of Nifty index futures on the Nifty index volatility in the Indian markets. The author found reduction in spot market volatility. Guien and Mayhew (2000) found more volatility when open interest in stock index futures is high. Min and Najand (1999) found that trading volume influences volatility changes in spot and futures market. Bhari and Malliaries (1998) found that currency price volatility causes by the unexpected change in the currency trading volume.

METHODS:

OBJECTIVE OF THE STUDY:
The objective of the study is to analyse the impact of introduction of index futures on the volatility and performance of the underlying stock indices of NSE, India.

HYPOTHESIS:
H0a= The return series of selected underlying stock indices have unit root before and after introduction of respective stock index futures.
H0b= There is no significant difference in the performance (mean return) of the selected underlying index pre and post introduction of index futures.
H0c= There is no significant difference in the volatility of the selected underlying index pre and post introduction of index futures.

SELECTION OF INDICES:
The daily closing prices have been collected from 4 stock indices (NIFTY 50, NIFTY Midcap 50, NIFTY Bank, and NIFTY IT). The stock indices are selected based on their availability of trading in the stock exchange. The study selected all the indices which were introduced on or before 2007. Table (1) shows the date of introduction of respective stock indices.

| Index Futures  | Date of Introduction |
|----------------|----------------------|
| Nifty 50       | June 12, 2000        |
| Nifty IT       | August 29, 2003      |
| Nifty Bank     | June 13, 2005        |
| Nifty Midcap 50| October 5, 2007      |

Source: https://www.nseindia.com

Table 1 shows stock index futures and their introduction dates in National Stock Exchange (NSE). The study considered four stock index futures and its impact on underlying stock market.

METHODS OF DATA COLLECTION:
The study collected the daily closing prices of four underlying stock index (Nifty 50, Nifty Midcap 50, Nifty Bank and Nifty IT) of NSE. The data has been collected two years prior and post to respective index futures.
introduction date. The daily closing prices of four underlying stock index (Nifty 50, Nifty Midcap 50, Nifty Bank and Nifty IT) are collected from National Stock Exchange (NSE) website.

RESEARCH TOOLS:
The percentage return of selected index calculated using the following formula.
\[ Ri = \ln \left( \frac{P_1}{P_0} \right) * 100, \]
Where, \( P_1 \) = today’s closing price of the respective index, \( P_0 \) = yesterday’s closing price of the respective index, \( ln \) = natural logarithm.

**Augmented Dickey Fuller (ADF) test** - The study used ADF test to test whether the return series of the selected series is stationary or non-stationary.

**The GARCH (Generalized Auto-Regressive Conditional Hetero-skedasticity)**:- GARCH (1, 1) model is used to test if the introduction of stock index futures had any effect on the performance and the volatility of the respective stock indices before and after introduction of respective index futures.

**Generalized Autoregressive Conditional Heteroscedasticity (GARCH)** model, originally developed and proposed by Bollerslev the GARCH (1, 1) model, which can be written as:
\[ \sigma_t^2 = \alpha_0 + \alpha_1 u_{t-1}^2 + \beta \sigma_{t-1}^2 \]
Where \( \alpha_0 > 0, \alpha_1 > 0, \beta > 0, \alpha_1 + \beta < 1, \]
which explains that the conditional variance of \( \sigma_t \) at time \( t \) depends not only on the squared residual term in the previous time period \( t-1 \) as in ARCH(1) model but also on its conditional variance in the previous time period.

RESULTS AND DISCUSSION:

| Table 2: Descriptive statistics of selected four underlying stock indices. |
|---------------------------------------------------------------|
| **Index** | **Before** | **After** | **Before** | **After** | **Before** | **After** | **Before** | **After** |
| Nifty 50 | 0.0823 | -0.0543 | -0.0279 | 0.1048 | 0.1700 | 0.1053 | -0.0187 | -0.3183 |
| Median | 0.1157 | 0.0143 | 0.1284 | 0.2989 | 0.1253 | 0.1349 | 0.0014 | 0.2108 |
| Maximum | 7.5393 | 5.9960 | 13.0969 | 7.3930 | 11.4014 | 6.8761 | 10.7367 | 11.8673 |
| Minimum | -7.7098 | -6.3095 | -16.2046 | -8.1169 | -15.1381 | -7.38705 | -22.1257 | -23.8527 |
| Std. Dev. | 1.9737 | 1.5287 | 2.8399 | 1.7400 | 2.1531 | 1.8358 | 3.0120 | 10.7339 |
| Skewness | -0.0530 | -0.4718 | -0.4345 | -0.9467 | -1.04413 | -0.29441 | -0.85708 | -21.2264 |
| Kurtosis | 4.6688 | 4.9391 | 6.8504 | 6.8460 | 12.421 | 4.5800 | 10.3359 | 466.2726 |
| Sum | 41.2630 | -27.229 | -13.6466 | 51.1440 | 84.5262 | 52.3663 | -9.3302 | -158.841 |
| Observations | 501 | 501 | 488 | 488 | 497 | 497 | 499 | 499 |

Source: Researcher’s own calculation

Table (2) clearly shows the descriptive statistics of selected four underlying stock index futures (Nifty 50, Nifty Midcap 50, Nifty Bank and Nifty IT) before and after introduction of respective index futures. Table (2) shows the mean return of Nifty 50, Nifty Bank and Nifty IT has been decreased after introduction of respective index futures. The mean return of Nifty Midcap 50 index has been increased after introduction of respective index futures. Similarly, the mean volatility (standard deviation) of Nifty 50, Nifty Bank and Nifty Midcap 50 has been decreased after introduction of respective index futures. But the volatility has been increased after introduction of futures in case of Nifty IT index. Finally, the table (2) clearly shows the standard deviation of Nifty 50, Nifty Midcap 50, Nifty Bank has come down 29%, 38.72%, 14.37% respectively after introduction of stock index futures.

| Table 3: Summary of the Unit Root Test Results |
|-----------------------------------------------|
| **Underlying Stock Index** | **Index Futures Introduction Date** | **Before and After the introduction date** | **N** | **t statistic** | **P value** | **Conclusion** |
| NIFTY 50 | 12-Jun-00 | Before | 501 | -21.6332*** | 0 | I(0) |
| After | 501 | -8.5617*** | 0 | I(0) |
| NIFTY Midcap 50 | 5-Oct-07 | Before | 488 | -18.7193*** | 0 | I(0) |
| After | 488 | -6.386*** | 0 | I(0) |
At Level

| Underlying Stock Index | Index Futures Introduction Date | Before and After the introduction date | N | t statistic | P value | Conclusion |
|------------------------|---------------------------------|----------------------------------------|---|-------------|---------|------------|
| NIFTY Bank             | 13-Jun-05                       | Before                                 | 497 | -6.1557***  | 0       | I(0)       |
|                        |                                 | After                                  | 497 | -15.6521*** | 0       | I(0)       |
| NIFTY IT               | 29-Aug-03                       | Before                                 | 499 | -6.7251***  | 0       | I(0)       |
|                        |                                 | After                                  | 499 | -22.4586*** | 0       | I(0)       |

Note: *** indicates significant at 1% level (Source: Researcher’s own calculation)

Table (3) shows the ADF test results for all the underlying index return series before and after introduction of respective index futures. The p values in all the cases are clearly indicating that it’s significant at 1% level. Thus, the underlying index return series before and after introduction of respective index futures are stationary at level.

Table 4: shows the Results of GARCH (1, 1) Model test on NIFTY 50 (Mean Returns)

| Variable ( Var) | Coefficient (β) | Std. Error (SE) | t-Statistic | Prob (p) |
|----------------|-----------------|-----------------|-------------|----------|
| @YEAR>2000     | -0.0391         | 0.0936          | -0.4179     | 0.6761   |
| R²              | 0.000065        | Mean Depend Var(MDV) | 0.0186   |
| Adj R²          | 0.000065        | S.D. Depend Var (SDDV) | 1.7796   |
| S.E R           | 1.7796          | Akaike Info Crite (AIC) | 3.9916   |
| Sum Squ Err( SRE) | 3173.322   | Schwarz Crit (SC) | 3.9965   |
| Log Likelihood (LL) | -2000.815 | Hann-QuinCriter( HQC). | 3.9935   |
| DW stat (DW)    | 1.8654          |                 |             |          |

Note: *** indicates significant at 1% level (Source: Researcher’s own calculation)

The table (4) shows the test results of Nifty 50 index. The P value indicates it’s insignificant. Thus, unable to reject the null hypothesis (Hypothesis 2) which states that there is no significant difference in the performance (mean return) of the selected underlying index before and after the introduction of index futures (Year 2000).

Table 5: shows the results of GARCH (1, 1) model test on NIFTY 50 index (Standard Deviation)

| Var            | β     | SE    | t      | p     |
|----------------|-------|-------|--------|-------|
| C              | 0.54199 | 0.132032 |        |       |
| @YEAR>2000     | -0.2662 | 0.080138 | -3.3216*** | 0.0009 |

| Var            | SE    | t      | p     |
|----------------|-------|--------|-------|
| RESID(-1)^2    | 0.13341 | 0.025513 | 5.2289*** | 0.0000 |
| GARCH(-1)      | 0.72288 | 0.051349 | 14.0776*** | 0.0000 |
| @YEAR>2000     | -0.0001 | MDV    | 0.01863   |       |
| Adj R²         | 0.00009 | SDDV  | 1.77966   |       |
| S.E R          | 1.77887 | AIC    | 3.8723   |       |
| SRE            | 3173.88 | SC     | 3.89189   |       |
| LL             | -1938 | HQC    | 3.87974   |       |
| DW             | 1.86519 |        |         |       |

Note: *** indicates significant at 1% level (Source: Researcher’s own calculation)

Table (5) shows the results of GARCH (1, 1) model test on standard deviation of underlying Nifty 50 index before and after introduction of Nifty index Futures (Year 2000). The p value of coefficient @YEAR>2000 clearly indicating that it’s significant at 1% level. Thus, reject the null hypothesis (Hypothesis 3). Thus, it can be stated that, the volatility (standard deviation) of underlying Nifty 50 index is not remain same or equal before and after introduction of Nifty 50 index futures (Year 2000).
Table 6: Results of GARCH (1, 1) model test on NIFTY Midcap 50 (Mean Returns)

| Var     | β         | SE         | t       | p        |
|---------|-----------|------------|---------|----------|
| @YEAR>2007 | -0.097629 | 0.113245   | -0.862106 | 0.3888   |
| R²      | 0.000295  | MDV        | 0.050653 |          |
| Adj R² | 0.000295  | SDDV       | 2.345904 |          |
| S.E R  | 2.345559  | AIC        | 4.543947 |          |
| SRE    | 5369.606  | SC         | 4.548947 |          |
| LL     | -2218.718 | HQC        | 4.54585 |          |
| DW     | 1.701104  |            |         |          |

Note: *** indicates significant at 1% level (Source: Researcher’s own calculation)

Table 6 shows the results of GARCH (1, 1) model test on standard deviation of underlying Nifty 50 index before and after introduction of Nifty index Futures (Year 2000). The p value of coefficient @YEAR>2000 clearly indicating that it’s significant at 1% level. Thus, reject the null hypothesis (Hypothesis 3). Thus, it can be stated that, the volatility (standard deviation) of underlying Nifty 50 index is not remain same or equal before and after introduction of Nifty 50 index futures (Year 2000).

Table 7: Shows the results of GARCH (1, 1) model test on NIFTY Midcap index (Standard Deviation)

| GARCH = B(1) + B(2)*RESID(-1)^2 + B(3)*GARCH(-1) + B(4) * @YEAR>2007 |
|-----------------------|------------------------|------------------------|------------------------|------------------------|
| Var                  | β     | SE     | z         | p        |
| C                    | 0.2526 | 0.0578 | 4.3693*** | 0.0000 |
| RESID(-1)^2           | 0.1970 | 0.0205 | 9.6274*** | 0.0000 |
| GARCH(-1)             | 0.7214 | 0.0294 | 24.5421*** | 0.0000 |
| @YEAR>2007            | 0.5690 | 0.1258 | 4.5223*** | 0.0000 |
| R²                   | -0.0005 | MDV  | 0.0507 | |
| Adj R²               | 0.0006 | SDDV  | 2.3459 | |
| S.E R                | 2.3453 | AIC  | 4.2251 | |
| SRE                  | 5373.6950 | SC  | 4.2451 | |
| LL                   | -2059.9800 | HQC | 4.2327 | |
| DW                   | 1.6998 |        |         | |

Note: *** indicates significant at 1% level (Source: Researcher’s own calculation)

Table 7 shows the results of GARCH (1, 1) model test on standard deviation of underlying Nifty 50 index pre and post introduction of Nifty index Futures (Year 2000). The p value of coefficient @YEAR>2000 clearly indicating that it’s significant at 1% level. Thus, reject the null hypothesis (Hypothesis 3). Thus, it can be stated that, the volatility (standard deviation) of underlying Nifty 50 index is not remain same or equal pre and post introduction of Nifty 50 index futures (Year 2000).

Table 8: Results of GARCH (1, 1) model test on NIFTY Bank (Mean Return)

| Var     | β         | SE         | t       | p        |
|---------|-----------|------------|---------|----------|
| @YEAR>2005 | 0.084901 | 0.105513   | 0.804652 | 0.4212   |
| R²      | -0.003839 | MDV        | 0.13368 |          |
| Adj R² | -0.003839 | SDDV       | 1.99536 |          |
| S.E R  | 1.999184  | AIC        | 4.22436 |          |
| SRE    | 3972.754  | SC         | 4.22929 |          |
| LL     | -2100.619 | HQC        | 4.22623 |          |
| DW     | 1.676876  |            |         |          |

Note: *** indicates significant at 1% level (Source: Researcher’s own calculation)

Table 8 shows the results of GARCH (1, 1) model test on NIFTY Bank (Mean Return). The P value indicates it’s insignificant. Thus, unable to reject the null hypothesis (Hypothesis 2) which states that there is no significant difference in the performance (mean return) of the selected underlying index pre and post introduction of index futures (Year 2000).
Table 9: Results of GARCH (1,1) model test on NIFTY Bank (Standard Deviation)

GARCH = B(1) + B(2)*RESID(-1)^2 + B(3)*GARCH(-1) + B(4)

| Var      | β    | SE   | z     | p    |
|----------|------|------|-------|------|
| C        | 0.4402 | 0.1053 | 4.1817*** | 0.0000 |
| RESID(-1)^2 | 0.1493 | 0.0242 | 6.1722*** | 0.0000 |
| GARCH(-1) | 0.7274 | 0.0433 | 16.8061*** | 0.0000 |
| @YEAR>2005 | 0.0886 | 0.0612 | 1.4478*** | 0.1477 |
| R^2      | -0.0045 | MDV   | 0.133682 |
| Adj R^2  | -0.0035 | SDDV  | 1.995357 |
| S.E R    | 1.9988 | AIC   | 4.079929 |
| SRE      | 3975.3420 | SC   | 4.099638 |
| LL       | -2025.7650 | HQC  | 4.087422 |
| DW       | 1.6757 |       |       |      |

Note: *** indicates significant at 1% level (Source: Researcher’s own calculation)

Table (9) shows the results of GARCH (1, 1) model test on standard deviation of underlying Nifty 50 index pre and post introduction of Nifty index Futures (Year 2000). The p value of coefficient @YEAR>2000 clearly indicating that it’s significant at 1% level. Thus, reject the null hypothesis (Hypothesis 3). Thus, it can be stated that, the volatility (standard deviation) of underlying Nifty 50 index is not remain same or equal pre and post introduction of Nifty 50 index futures (Year 2000).

Table 10: Results of GARCH (1,1) model test on NIFTY IT (Mean Return)

| Var       | β    | SE   | t     | p     |
|-----------|------|------|-------|-------|
| @YEAR>2003 | -0.4858 | 0.38327 | -1.267467 | 0.2053 |
| R^2       | 0.00114 | MDV   | -0.167121 |
| Adj R^2   | 0.00114 | SDDV  | 7.849765 |
| S.E R     | 7.84528 | AIC   | 6.958694 |
| SRE       | 61856.1 | SC    | 6.963579 |
| LL        | -3499.2 | HQC   | 6.96055 |
| DW        | 2.01379 |       |       |      |

Note: *** indicates significant at 1% level (Source: Researcher’s own calculation)

The table (10) shows the test results of Nifty 50 index. The P value indicates it’s insignificant. Thus, unable to reject the null hypothesis (Hypothesis 2) which states that there is no significant difference in the performance (mean return) of the selected underlying index pre and post introduction of index futures (Year 2000).

Table 11: Shows Results of GARCH (1,1) model test on CNX IT (Standard Deviation)

GARCH = B(1) + B(2)*RESID(-1)^2 + B(3)*GARCH(-1) + B(4)

| Var      | β    | SE   | z     | p    |
|----------|------|------|-------|------|
| C        | 0.2777 | 0.0731 | 3.7965*** | 0.0001 |
| RESID(-1)^2 | 0.0025 | 0.0002 | -11.9723*** | 0.0000 |
| GARCH(-1) | 0.9653 | 0.0093 | 103.7697*** | 0.0000 |
| @YEAR>2003 | 4.9265 | 1.1836 | 4.1625*** | 0.0000 |
| R^2      | -0.0005 | MDV   | 0.1671 |
| Adj R^2  | 0.0005 | SDDV  | 7.8498 |
| S.E R    | 7.8476 | AIC   | 6.0526 |
| SRE      | 61955.0000 | SC   | 6.0722 |
| LL       | -3040.4760 | HQC  | 6.0601 |
| DW       | 2.0105 |       |       |      |

Note: *** indicates significant at 1% level (Source: Researcher’s own calculation)

Table (11) shows the results of GARCH (1, 1) model test on standard deviation of underlying Nifty 50 index pre and post introduction of Nifty index Futures (Year 2000). The p value of coefficient @YEAR>2000 clearly indicating that it’s significant at 1% level. Thus, reject the null hypothesis (Hypothesis 3). Thus, it can be stated that, the volatility (standard deviation) of underlying Nifty 50 index is not remain same or equal before and after introduction of Nifty 50 index futures ( Year 2000).
CONCLUSION:

The study has attempted to examine the effect of the introduction of index futures and its subsequent effect on the stock market volatility and performance. From the results of the GARCH (1, 1) model it is found that the introduction of stock index futures doesn’t have a significant effect on the performance of all the selected underlying stock indices but there is a significant difference in volatility of all the selected underlying market pre and post introduction of stock index futures. The results have shown that introduction of futures has resulted in a reduction in the spot market volatility. Further, the study suggests that market participants can have a close look on the behaviour of futures trading to predict stock market volatility. It is essential that the investors are aware of the introduction of futures on underlying stock exchanges and accordingly make wise decisions while estimating the volatility of the stock.

REFERENCES:

Alberg, Razan, Peter, Handscomb, Siddle, & Sampras P. (2008). A study on empirical analysis of mean return and conditional variance. *Journal of Management and Statistics*, 12-23.

Bandivadekar & Ghosh (2003). A study on the behaviour of volatility in cash market in futures trading era. *Business and Economics Journal*, 79-85.

Bhari & Malliaris. (1998). A study on price, trading volume, short and long-term relationships between price and volume and the factors of trading volume in foreign currency futures. *Journal of Management and Reviews on Finance*, 25-34.

Debashish S. S. (2009). A study on Futures Market in India. *Management Excellence Journal*, 12-21.

*Derivatives Market in India*. (n.d.). Retrieved from BSE: http://www.bseindia.com/markets/Derivatives/DerilReports/introduction.aspx?expandable=5

Gahlot R. & Datta, S. K. (2010). Future Trading and Stock Market Volatility: A study of Bank Nifty. *Drishtikon: A Management Journal*.

Guin & Mayhew (2000). A study on the influence of futures trading activity on international equity market volatility. *Journal of Applied Finance and Stock Markets*, 2-9.

Hetamsaria& Deb. (2004). A study on the effect of index futures on Indian stock market volatility by using GARCH model. *Journal of Financial Economics and Management*, 55-63.

Mannohman, P. K. Mishra (2011). Volatility of India's Stock Index Futures Market: An Empirical Analysis. *Educational Research Multimedia & Publications*.

Manasa and Suresh (2018). A Study on Impact of Banknifty Derivatives Trading on Spot Market Volatility In India, *Academy of Accounting and Financial Studies Journal*, 22(1), 1-9.

Min & Najand. (1999). A study on the lead and lag association in returns and volatilities between cash market and KOSPI 200 futures interactions. *Journal of Business and Financial Affairs*, 79-88.

Ministry of External Affairs (n.d.). *Growth of Financial Sector in India*. Retrieved from India Business: http://indiaimbusiness.nic.in/newdesign/index.php?param=industryservices_landing/401/3

Nagaraj& Kiran. (2004). A study on the influence of introduction of the NSE Nifty index futures on the Nifty Index volatility. *Journal of Management and Finance Reviews*, 22-32.

Nath (2003). A study on the behaviour of stock market volatility after the introduction of futures and concluded that the volatility of Nifty index had fallen in the post future period, *International Journal of Management Research and Reviews*, 49-57.

*National Stock Exchange* (n.d.). Retrieved from NSE India: https://www.nseindia.com/

NSE makes India proud, Retrieved from https://www.nseindia.com/content/press/PR_cc_12052016.pdf

Rahman (2001). A study on the impact of trading in DJIA index futures and futures options on the conditional volatility of component stocks. *Journal of Financial Economics*, 19-29.

Shenbagaraman (2003). Effect of derivative trading on cash market. *Indian Journal of Management Research*, 12-18.

Thenmozhi (2002). A study on the influence of the introduction of Nifty index futures on the Nifty index volatility in the Indian markets. *Journal of Management trends and movements*, 25-35.

Tripathy, N., Rao, S. R., & Kanagaraj, A. (2009). Impact of Derivative Instruments and Assymetric effect on Stock Market Volatility. *Academy Journal of Management*, 50-63.

Vipul. (2006). An insight into intraday trading and futures market relatability. *Noida Journal of Business and Management*, 29-35.

*What's Stock Market Volatility?* (2008). Retrieved from Stock Market Information: http://www.commonwealth.com/RepSiteContent/stock_volatility.htm

****