A Study on Stock Market Volatility Pattern of BSE and NSE in India

Asthagaarwal

Independent Researcher, J.D. Birla Institution, Kolkata, West Bengal, India

ABSTRACT

Stock market volatility refers to the continuous change in the stock prices. This paper examines the relationship between the volatility clustering, level of volatility for the Indian Stock Markets viz. National Stock Exchange (NSE) and Bombay Stock Exchange (BSE) for the financial year 2015-16 to 2019-20. The GARCH model is applied to check for the volatility clustering, it is found that there is presence of clustering for the stock exchange indices, as well as for the sectoral indices. Thus, it is found that though both the Stock Exchanges follow the same trend of volatility, BSE indices are more volatile than NSE indices, and any investor investing through BSE listing is exposed to more Risk. Overall, in the study, comparison is being made at every step among the Bombay Stock Exchange and the National Stock Exchange.

KEYWORDS: Volatility, GARCH, NSE, BSE, Sectoral Volatility

How to cite this paper: Astha Agarwal "A Study on Stock Market Volatility Pattern of BSE and NSE in India" Published in International Journal of Trend in Scientific Research and Development (IJTSRD), ISSN: 2456-6470, Volume-4 | Issue-6, October 2020, pp.25-28, URL: www.ijtsrd.com/papers/ijtsrd33259.pdf

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1. INTRODUCTION

The stock market is a very volatile place to invest, but it also helps the economy to grow and have strong capital face. The securities market provides a platform for the trading of securities or transactions related to securities. The role that a stock market plays is indispensable for leading the economic growth of any country. The stock market of India extends a hand of help to get the funds mobilized from the small savings done by the investors. It further helps to channelize these resources for getting the various needs of the different sections of the economy of the country fulfilled.

In the stock market the companies issue the shares of their companies known as securities or stocks, which the investors initially buy in the primary market, where the company first issues the shares know as initial public offer. After that the investors trade the shares in the secondary market amongst each other. This trade in the secondary market create the fluctuations in the price of the shares of the company thus resulting to a fluctuation in the stock exchange indices. These fluctuations are referred to as the volatility, which may vary in the different stock exchanges. Today, NSE has roughly 66% of equity spot turnover and roughly 100% of equity derivatives turnover. Stock Exchange provides a trading platform, where buyers and sellers can meet to transact in securities. BSE and NSE are not the only stock exchanges in India. After the country gained independence, 23 stock exchanges were added not including the BSE. However, at present, there are only seven recognized stock exchanges.

2. Review of Literature

Ali Intaz (2016) examined the relationship between returns and volatility, volatility clustering, leverage effect and the persistence of volatility for the Indian stock markets viz. National Stock Exchange (NSE) and Bombay Stock Exchange (BSE) for the financial year 2005-06 to 2013-14. The study reveals that the volatility in both the markets exhibits the characteristics like volatility clustering, asymmetry effect and persistence of volatility in their daily returns.

Andrade & Sheriff (2018) examined the Indian stock market behaviour for short duration. To accomplish this purpose, the researchers evaluated the stock market behaviour (BSE and NSE) and the study revealed that: The market was persistent, following random walk movement which indicates that it is highly volatile in the short duration during the study period.

Raju & Paldon (2019) examined the Stock Market slightness of BSE and NSE in Indian economy as shown by the examination of Economic survey for the time of (2015 - 2018). With the Indian stock market going upside down paying little notice to whether there is a move changes in the global level, it is very worth thinking about whether one should put their money in the trading market or experience for some solid and safe decisions like land and bank FDs.

Azarmi (2005) examined the empirical association between stock market development and economic growth for a period of ten years around the Indian market "liberalization"
event. They found no support for the hypothesis that the Indian stock market development is associated with the economic growth in that country during the entire event study period of 1981 to 2001.

Khan A. A & Zia A(2019) examined investigate the effects caused by the announcement of mergers of SBI and its associate banks on the volatility of the return of SBI stock during the event window of 300 days. In order to achieve the proposed objective, this study applied Generalized autoregressive conditional heteroscedasticity (GARCH) class model to the return series to model their volatility because it is considered an important tool for time series data analysis. The results suggest that merger announcement was expected to cause a reaction in the returns, which is related to higher abnormal return in lesser time through merger announcement for investors.

Varadharajan P & Vikkraman P (2011) examined the context of globalization and the subsequent integration of the global markets this paper captures the trends, similarities and patterns in the activities and movements of the Indian Stock Market from 2002 to 2011. The researcher explores the impact of budget on stock market volatility and analyses how returns vary with it. Another important analysis done is to find the volatility of different months for a period of ten years for four major indices in India. Analysis of BSE, NSE market capitalisation is also done.

3. Aims and Objectives

- To find out the sectoral volatility pattern in the stock markets.
- To find out the short-term fluctuations pattern in the stock markets.
- To find out the long-term fluctuations pattern in the stock markets.

4. Research Methodology

The data is collected for the BSE Sensex-50, NSE Nifty-50 and for the sectoral indices for the short duration analysis, for the financial year of 2019-20. Data collected for long duration is from financial year 2015-16 up to 2019-20, for the BSE Sensex and NSE Nifty-50. The data is collected from the official websites of BSE and NSE. The analysis methods used for the paper is described as follows:

Descriptive statistics mainly is used for summarizing and organizing the data, and inferences are drawn to understand the data easily. Mean, median, mode, skewness, kurtosis, standard deviation, sample variation, of a data is interpreted by the help of descriptive statistics. There is no probability theory involved in this.

5. Analysis

H1: Short term volatility for stock market indices
H0: the BSE Sensex-50 index is not more volatile than the NSE Nifty-50 index
H1: the BSE Sensex-50 index is more volatile than the NSE Nifty-50 index

Table 1: Descriptive Statistics for NSE & BSE in the short run

<table>
<thead>
<tr>
<th></th>
<th>BSE Sensex-50</th>
<th>NSE Nifty-50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Deviation</td>
<td>177.6182</td>
<td>169.0576</td>
</tr>
<tr>
<td>Sample Variance</td>
<td>31548.23</td>
<td>28580.47</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>12.66159</td>
<td>12.39184</td>
</tr>
</tbody>
</table>

Source: Calculated by author, data collected from www.nseindia.com and www.bseindia.com
The above table describes the descriptive statistics for the data taken for change in the closing prices of indices in absolute terms, for a time period of one year which includes 247 trading days. From the above table, it can be seen that the for a short duration, BSE SENSEX 50 is more volatile as compare to the NSE NIFTY 50. The standard deviation of BSE is 177 as compared to NSE 169, which clearly implies that the investors are prone to more risk of approx. 8% if invested in the company through the BSE listing. The Kurtosis for both the indices are more than 3 (excess kurtosis), thus they are leptokurtic, i.e., the frequency distribution assigns a higher probability to returns around zero as well as very high positive and high negative returns. Thus, it can be stated that Sensex-50 is more volatile than the Nifty-50 and we accept the alternative hypothesis and reject the null hypothesis.

The ADF (Augmented Dickey Fuller) Test was conducted, to check for the stationarity of the time series data. The unit root test revealed that the log values for both the indices is not stationery at level i.e. I (0), so the test was again done at 1st order i.e. I (1), where it is found that the P value is 0.00 and the calculated T-statistics is less than the critical value. Thus, the data set taken is stationery and further analysis can be conducted.

The GARCH model shows that the coefficients $\alpha_1$ and $\beta_1$ are statistically significant and are within parametric restriction, thus implying a greater impact of shocks on volatility. A significant ARCH coefficient ($\alpha_1$) indicates that there is significant impact of previous period shocks on current period volatility. The GARCH coefficient ($\beta_1$) measures the impact of last period variance on current period volatility. A significant GARCH coefficient ($\beta_1$) indicates the presence of volatility clustering. A positive $\beta_1$ indicates that positive stock price changes are associated with further positive changes and vice versa. A relatively higher values of $\beta_1$implies a larger memory for shocks. The GARCH coefficient ($\beta_1$) also treated as old “news” component, which implies that the news that is old by more than one day plays a significant role in volatility. The sum of the ARCH and GARCH coefficients i.e. ($\alpha_1+\beta_1$) indicates the extent to which a volatility shock is persistent over time. A persistent volatility shock raises the asset price volatility. Here, it is observed that the degree of volatility persistent is very high as the sum of $\alpha_1$ and $\beta_1$ are approach to one, individually for both the indices.

**H2 : Long term volatility for stock market indices**

**H0 : the BSE Sensex index is not more volatile than the NSE Nifty-50 index**

**H1 : the BSE Sensex index is more volatile than the NSE Nifty-50 index**

### Table 2: GARCH model for NSE & BSE in the short run

<table>
<thead>
<tr>
<th>Indices</th>
<th>Variables</th>
<th>Co-efficient</th>
<th>Std. Error</th>
<th>Z-statistics</th>
<th>Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nifty-50</td>
<td>C</td>
<td>1421.1</td>
<td>749.88</td>
<td>1.8951</td>
<td>0.0481</td>
</tr>
<tr>
<td></td>
<td>RESID (-1) ^2</td>
<td>0.3692</td>
<td>0.0937</td>
<td>3.9402</td>
<td>0.0001</td>
</tr>
<tr>
<td></td>
<td>GARCH (-1)</td>
<td>0.6349</td>
<td>0.6349</td>
<td>6.8193</td>
<td>0.0000</td>
</tr>
<tr>
<td>Sensex-50</td>
<td>C</td>
<td>1723.3</td>
<td>847.95</td>
<td>2.0323</td>
<td>0.0421</td>
</tr>
<tr>
<td></td>
<td>RESID (-1) ^2</td>
<td>0.4056</td>
<td>0.0972</td>
<td>4.1716</td>
<td>0.0000</td>
</tr>
<tr>
<td></td>
<td>GARCH (-1)</td>
<td>0.6017</td>
<td>0.0919</td>
<td>6.5461</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

**Source: Calculated by author, data collected from www.nseiindia.com and www.bseindia.com**

The GARCH model s
tationary and further analysis can be conducted.

The above table describes the descriptive statistics for the data taken for change in the closing prices of indices in absolute terms, for a time period of five year which includes 1237 trading days. From the above table, it can be seen that the for a long duration, BSE SENSEX is more volatile as compare to the NSE NIFTY 50. The standard deviation of BSE is 339 as compared to NSE 169, which clearly implies that the investors are prone to more risk of approx. 200% if invested in the company through the BSE listing. The Kurtosis for both the indices are more than 3 (excess kurtosis), thus they are leptokurtic, i.e., the frequency distribution assigns a higher probability to returns around zero as well as very high positive and high negative returns. Thus, it can be stated that Sensex-50 is more volatile than the Nifty-50 and we accept the alternative hypothesis and reject the null hypothesis.

### Table 3: Descriptive Statistics for NSE & BSE in the long run

<table>
<thead>
<tr>
<th></th>
<th>BSE Sensex-50</th>
<th>NSE Nifty-50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Deviation</td>
<td>339.5906</td>
<td>101.3951</td>
</tr>
<tr>
<td>Sample Variance</td>
<td>115321.8</td>
<td>10280.97</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>25.78098</td>
<td>22.43117</td>
</tr>
</tbody>
</table>

**Source: Calculated by author, data collected from www.nseiindia.com and www.bseindia.com**

The above table describes the descriptive statistics for the data taken for change in the closing prices of indices in absolute terms, for a time period of one year which includes 247 trading days. From the above table, it can be seen that the for a long duration, BSE SENSEX is more volatile as compare to the NSE NIFTY 50. The standard deviation of BSE is 339 as compared to NSE 101, which clearly implies that the investors are prone to more risk of approx. 200% if invested in the company through the BSE listing. This huge amount of risk involved is due to the variation in the number of stocks being included in the indices. Like for Sensex only top 30 companies is considered while for the Nifty-50 there are 50 companies included. The Kurtosis for both the indices are more than 3 (excess kurtosis), thus they are leptokurtic, i.e., the frequency distribution assigns a higher probability to returns around zero as well as very high positive and high negative returns. Thus, it can be stated that Sensex is more volatile than the Nifty-50 and we accept the alternative hypothesis and reject the null hypothesis.

### Table 4: GARCH model for NSE & BSE in the long run

<table>
<thead>
<tr>
<th>Indices</th>
<th>Variables</th>
<th>Co-efficient</th>
<th>Std. Error</th>
<th>Z-statistics</th>
<th>Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nifty-50</td>
<td>C</td>
<td>227.27</td>
<td>79.815</td>
<td>2.8475</td>
<td>0.0044</td>
</tr>
<tr>
<td></td>
<td>RESID (-1) ^2</td>
<td>0.1191</td>
<td>0.0164</td>
<td>7.2391</td>
<td>0.0000</td>
</tr>
<tr>
<td></td>
<td>GARCH (-1)</td>
<td>0.8619</td>
<td>0.0236</td>
<td>36.501</td>
<td>0.0000</td>
</tr>
<tr>
<td>Sensex-50</td>
<td>C</td>
<td>1709.1</td>
<td>662</td>
<td>2.5816</td>
<td>0.0098</td>
</tr>
<tr>
<td></td>
<td>RESID (-1) ^2</td>
<td>0.1085</td>
<td>0.0148</td>
<td>7.3256</td>
<td>0.0000</td>
</tr>
<tr>
<td></td>
<td>GARCH (-1)</td>
<td>0.8816</td>
<td>0.0196</td>
<td>44.779</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

**Source: Calculated by author, data collected from www.nseiindia.com and www.bseindia.com**
The ADF (Augmented Dickey Fuller) Test was conducted, to check for the stationarity of the time series data. The unit root test revealed that the log values for both the indices is not stationary at level i.e. 1(0), so the test was again done at 1st order i.e. I(1), where it is found that the P values is 0.00 and the calculated T-statistics is less than the critical value. Thus, the data set taken is stationary and further analysis can be conducted.

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**Sectoral findings of NSE & BSE**

**National Stock Exchange (NSE):** The Nifty Bank Index is the most volatile amongst all the seven sector indices, with a SD of 531.88. The Nifty Realty Index is the least volatile amongst all the seven sector indices, with a SD of 5.39. There is presence of volatility clustering as found by the help of GARCH model.

**Bombay Stock Exchange (BSE):** The S&P BSE Bankex Index is the most volatile amongst all the seven sector indices, with a SD of 612.14. The S&P BSE Realty Index is the least volatile amongst all the seven sector indices, with a SD of 41.03. There is presence of volatility clustering as found by the help of GARCH model.

But it can stated that the sectoral indices of BSE are much more volatile as compared to the NSE indices.

The ADF test was also conducted for the sectoral indices and the results were stationery at 1st Order i.e. I(1). Henceforth, the GARCH model was also tested for the presence of Volatility Clustering, and it was fund that there is presence of Clustering for both the sectoral Indices.

**6. Conclusion**

The BSE market indices and sectoral indices both are more volatile than the NSE market indices and sectoral indices, shown by the help of descriptive statistics. The data observations, show that when there is upward trend prevailing in the market, that will be persistent for a long period and won't change very often. Similarly, when a downward trend starts that will be persistent for a long period of time, this phenomenon is also known as volatility clustering, shown by the help of GARCH model. It is also seen that from late January 2020, there is a downfall in the stock indices, and as per the existence Volatility clustering it can be said that this downfall will last for sometime before the stock markets hit the upward trend.

**7. References**


