

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

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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

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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

ADF (Augmented Dickey Fuller) Test, is a very common statistical tool used to test the stationarity of the given time series data. One of the main utility of this tool is to check for the stationarity of the given series, for which the null hypothesis assumes the presence of unit root, that is $\alpha=1$, the P-value obtained should be less than the significance level of 0.05 in order to reject the null hypothesis. Thus, selecting the alternative hypothesis and stating that the series is stationery.

GARCH (Generalised Autoregressive Conditional Heteroskedasticity) models help to describe financial markets in which volatility can change, becoming more volatile during periods of financial crises or world events and less volatile during periods of relative calm and steady economic growth. In the time period of a crisis, however, returns may swing wildly from negative to positive territory. Moreover, the increased volatility may be predictive of volatility going forward. Volatility may then return to levels resembling that of pre-crisis levels or be more uniform going forward. The ARCH (Autoregressive Conditional Heteroskedasticity) model assumes that heteroskedasticity or unequal variance has an autoregressive structure, which implies that heteroskedasticity observed over different periods is auto correlated. When heteroskedasticity observed over different periods are auto correlated, it is said that the ARCH effect is present, i.e. there is volatility clustering in data.

The GARCH (1,1) model used for the analysis is $\sigma^2_t = \alpha_0 + \alpha_1 u^2_{t-1} + \beta_1 \sigma^2_{t-1}$

In the GARCH model the conditional variance of (u) at time (t) depends not only on the squared error term in the previous period but also on its conditional variance in the previous period. The result shows that the coefficients α_1 and β_1 are statistically significant and are within parametric restriction, thus implying a greater impact of shocks on volatility. A significant ARCH coefficient (α_1) indicates that there is significant impact of previous period shocks on current period volatility. The GARCH coefficient (β_1) measures the impact of last period variance on current period volatility. A significant GARCH coefficient (β_1) indicates the presence of volatility clustering. A positive β_1 indicates that positive stock price changes are associated with further positive changes and vice versa. A relatively higher values of β_1 implies a larger memory for shocks. The GARCH coefficient (β_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.

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

	BSE Sensex-50	NSE Nifty-50
Standard Deviation	177.6182	169.0576
Sample Variance	31548.23	28580.47
Kurtosis	12.66159	12.39184

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.

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

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

Source: Calculated by author, data collected from www.nseindia.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 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 values 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 α_1 and β_1 are statistically significant and are within parametric restriction, thus implying a greater impact of shocks on volatility. A significant ARCH coefficient (α_1) indicates that there is significant impact of previous period shocks on current period volatility. The GARCH coefficient (β_1) measures the impact of last period variance on current period volatility. A significant GARCH coefficient (β_1) indicates the presence of volatility clustering. A positive β_1 indicates that positive stock price changes are associated with further positive changes and vice versa. A relatively higher values of β_1 implies a larger memory for shocks. The GARCH coefficient (β_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 α_1 and β_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 3: Descriptive Statistics for NSE & BSE in the long run

	BSE Sensex-50	NSE Nifty-50
Standard Deviation	339.5906	101.3951
Sample Variance	115321.8	10280.97
Kurtosis	25.78098	22.43117

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 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 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

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

Source: Calculated by author, data collected from www.nseindia.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 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 values 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 α_1 and β_1 are statistically significant and are within parametric restriction, thus implying a greater impact of shocks on volatility. A significant ARCH coefficient (α_1) indicates that there is significant impact of previous period shocks on current period volatility. The GARCH coefficient (β_1) measures the impact of last period variance on current period volatility. A significant GARCH coefficient (β_1) indicates the presence of volatility clustering. A positive β_1 indicates that positive stock price changes are associated with further positive changes and vice versa. A relatively higher values of β_1 implies a larger memory for shocks. The GARCH coefficient (β_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 α_1 and β_1 are approach to one, individually for both the indices.

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.

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