ORIGINAL RESEARCH PAPER

Management

KEY WORDS: Stock Market Volatility, Cross Correlation, Auto Correlation, BSE (Bombay Stock Exchange) NSE (National Stock Exchange)

INDIAN STOCK MARKET VOLATILITY - A CASE STUDY OF BSE AND NSE

Pratibha Jenifer Andrade Assistant Professor, Department of Management, Government Women's College, Hunsur, MYSORE.

Dr. Aisha M. Sheriff Professor and Dean, DOS in business Administration, University of Mysore, MYSORE.

ABSTRACT

Volatility of the stock market refers to the variations in the indices of the securities within the markets. This research paper intends to study and analyzes the Indian stock market behavior for short duration. To accomplish this purpose, the researchers evaluated the stock market behavior (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. Both BSE and NSE are exhibiting the same pattern of behavior and hence they are perfectly positively correlated.

Introduction:

The stock market is the market in which securities of publicly held companies are issued and traded either through exchanges or over-the-counter markets. A stock market is a public body for the trading of listed securities at an agreed price.The stock market is one of the most vital components of a free-market economy, as it provides companies with access to capital in exchange for giving investors a wedge of ownership in the company.

Indian stock market is one of the oldest in Asia. Its history dates back to nearly 200 years ago.The Indian stock market has seen a turbulent rise and fall. In recent time spreading over few years, market slipped from the peak of twenty one thousand points at the BSE index to the fall till seven thousand and again the consistent rise. There are several factors that have lead to these happenings.National stock exchange and the Bombay stock exchange, accounting for the bulk of the business done on the Indian stock market. Market capitalization as of 31 January 2015, was BSE: 1682 (USD in Bn) and NSE: 1642 (USD in Bn).

Even though our Indian stock market is doing well, but the retail investors who have invested in the stock markets do spend sleepless nights because of the sudden changes in prices which have occurred many times in the past.The volatility in the share price takes place based on speculation and over sensitiveness and reactions among the investors. Investors' attitude towards risk has increasingly been cited as a key factor driving the movement in asset prices.

Market Volatility:

The term volatility (the ups and downs) is simply synonymous with risk. To be volatile means lively, unstable and momentary. As a concept volatility is simple and sensitive. It measures variability or dispersion about a central tendency. To be more meaningful, it is a measure of how far the current price of an asset deviates from its average past prices. Greater the deviation, greater is the volatility. At a more fundamental level, volatility can indicate the strength or conviction behind a price move. In pure financial terms, volatility is defined as, "the degree to which the price of a security, commodity, or market rise or falls within a short-term period". In the context of the stock market, volatility of the market refers to the variation in the indices of the securities within the market. Merton Miller (1991) the winner of the 1990 Nobel Prize in economics - writes in his book Financial Innovation and Market Volatility "*By volatility public seems to mean days when large market movements, particularly down moves, occur. These precipitous market wide price drops cannot always be traced to a specific news event. Nor should there is lack of smoking gun be seen as in any way anomalous in market for assets like common stock whose value depends on subjective judgment about cash flow and resale prices in highly uncertain future. The public takes a more deterministic view of stock prices; if the market crashes, there must be a specific reason.*" Many indicators have been developed during the past yeas such as S&P 500 Volatility Index (VIX) and ASDAQ Volatility Index (VXN) to track the market volatility and help the investors to take their buying and selling decisions easily.

Causes of market volatility:

The empirical studies evidencing that the factors which have causes the markets to become more volatility are many which can be broadly classified as economic factors, financial factors, and social factors. The existence of asymmetric information problems, Runs on financial intermediaries, Herd behavior on the part of investors, Excessive speculation, Fluctuations in the prices of real assets, Changes in exchange rate more than justified by changes in economic fundamentals, Instability of commodity prices, The January effect, The weekend effect andThe persistence of technical analysis.

In the recent past there have been perceptions that volatility in the market has gone up. SEBI undertook a comprehensive and deep analysis of volatility by using several statistical techniques to measure and analyze it in 2004. 18 countries covering almost all continents- developed as well as emerging markets and young and old markets- have been analyzed. The results show that the volatility has not gone up much in the recent past as it has been perceived. Indian stock market provides a very high rate of return and comparatively moderate volatility.

Reviews:

***LathaRamchand and Raul Susmell*(1998)** in their study 'Volatility and Cross Correlation across major stock markets', have tested for the fact that correlations across major stock markets are higher when markets are more volatile. And they documented that the correlations between US and other world markets are on average 2 to 3.5 times higher when US market is in a high variance state as compared to low variance regime. ***Aggarwal et al.* (1999)** examined the events that caused large shifts in volatility in emerging markets. Both increases and decreases in the variance were identified first and then events around the period when volatility shifts occurred were identified. They found the dominance of local events in causing shifts in volatility. Volatility was high in emerging markets and shifts in volatility are related to important country specific political, social, and economic events. According to ***M T Raju and Anirban Ghosh,* (2004),** conclude through their research study, **'Stock Market Volatility – An International Comparison',** that mature markets continue to provide over long period of time high returns with low volatility. Amongst earning markets except India and China, all other countries exhibited low returns. India with long history and China with short history, both as high returns as the US and UK could provide but the volatility in both countries is higher. *Kaur* (2004), in thearticle, **"Time Varying Volatility in the Indian Stock Market"**, study described the extent and pattern of stock return volatility of the Indian stock market during the last decade of the

previous millennium, i.e., from 1990 to 2000. The data was collected from the two most prominent spot price indices Viz., BSE Sensex and S&P CNX Nifty, and tested them for their volatility. It is found that the stock market volatility was the highest during 1992 followed by 1990 and 2000, in that order. It fell sharply after 1992 until 1995, after which it started increasing again. This result is confirmed by findings, based daily as well as monthly returns.

Research Gap and Statement of the problem:
It has been observed that there exists volatility for short durations in the market. So the research was to study the Indian Market volatility for shorter durations through Cross Correlation and Auto Correlation for BSE and NSE.

Objectives:
1. To study the Indian stock market volatility for short durations.
2. To analyse the volatility within the markets through ACF.
3. To compare the behavior and steadiness between BSE and NSE through CCF.

Hypothesis:
- **H1:** The Indian stock market behavior is stable for short durations
- **H2:** Relative correlations of the market indices are stable.

Research Methodology:
To study the market behavior, the stock market Indices was collected through secondary sources. That is BSE – 30 Market Index (Sensex) and NSE – CNX nifty Index (Nifty) were considered. The duration of the study was limited to one and half years, (18 months). The data was collected through the official websites of BSE and NSE. Thus collected data was divided into three time segments of six months each.For each time segment, daily returns were computed using Single period return Model or Holding period return Model, Then these daily returns were reduced into weekly returns based on the trading days of the respective week. Thus the total number of weekly data available for 18 months duration was 78 weeks.

Scope and Limitations:
Behavior of the market was studied through analyzing BSE and NSE only. The behavior of the market was analyzed through BSE Sensex and NSE- Nifty Indices on daily basis. Time duration for the data collection was for one and half years (18 months) in six months intervals i.e. January 2013 to December 2014.

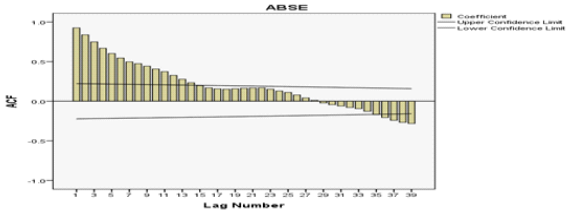
Analysis:
To fulfill the objectives following statistical hypothesis were tested.

H1
H_0: The market index behavior does not follow Random Walk.
H_1: The market index behavior follows Random Walk.

H2
H_0: The BSE index and NSE index were not correlated
H_1: The BSE index and NSE index were correlated

ACF of BSE Index:
To test H1, i.e., to identify the Random walk for BSE index, autocorrelation test was used for 39 lags on average weekly BSE index values for overall period of 78 weeks.

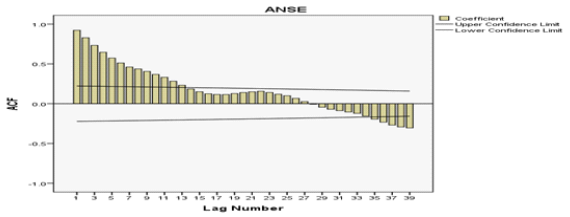
Graph 1: ACF of BSE



From the above graph following inferences were drawn:The first-order autocorrelation was 0.926 with Box-Ljung statistic was significant at 5% levels and the autocorrelation value was above the confidence limit indicating autocorrelation exists for the first time segment. Thereby, rejecting the null hypothesis of H1 that the time series follows Random walk at 5%levels.

ACF of NSE Index:
To test H1, i. e., to identify the Random walk for NSE index, autocorrelation test was used for 39 lags on average weekly NSE index values for overall period of 78 weeks.

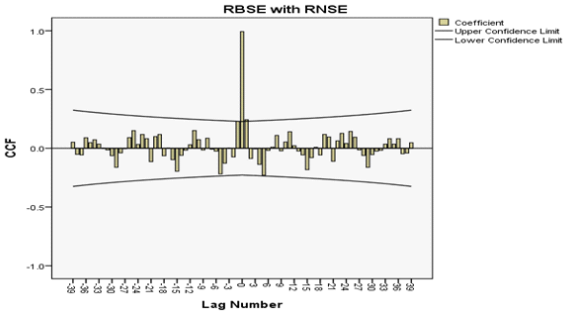
Graph 1: ACF of NSE



From the above graph following inferences were drawn:The first-order autocorrelation was 0.923 with Box-Ljung statistic was significant at 5% levels and the autocorrelation value was above the confidence limit indicating autocorrelation exists for the first time segment. Thereby, rejecting the null hypothesis of H1 that the time series follows Random walk at 5%levels.

Cross-correlation of BSE and NSE
To test H2, the cross-correlation between BSE and NSE was the correlation between the series shifted against one another as a function of lag.

Graph 1: CCF of BSE and NSE



From the above graph following inferences were drawn:

- For lag 0, the cross-correlation equals 1.0 and more than the confidence limit, indicating the test was significant at 5 % levels. I.e. there exists statistically significant relationship exists between BSE index and NSE index.
- The CCF was asymmetrical in nature but shift in the same direction.
- The cross-correlation values were within the confidence limit, no lag in the relationship between BSE index and NSE index.

Individually the three time segments of 6 months each were analyzed using statistical tools like: Descriptive statistics (Mean, Standard Deviation, Skewness , Kurtosis and CV), Trend Analysis, ACF and CCF.

Findings:
Overall time segment: (18 months)
- BSE Index was found to be more variable than NSE Index and BSE Index yield more return than NSE Index. Both BSE index and NSE indices exhibits **Bearish** during first time segment there after exhibits short term **volatility** in the second segment with weak and unpredictable behavior and **Bullish** in the third time segment. There exists positive perfect linear relationship between BSE Index and NSE Index.***Both the stock***

markets exhibit same pattern in their behavior or volatility.

- Autocorrelation exists for both BSE and NSE indices for the first time segment and the time series follows Random walk. This indicates that ***market behavior is volatile for the duration of the study.***
- Autocorrelation does not exist for both BSE return and NSE returns for the time series. This indicates that ***returns does not follow Random walk may be because of the volume of trade in both the markets.***
- There exists statistically significant relationship exists between BSE index and NSE index. ***Both BSE and NSE are moving in same direction (similar Behavior)*** but do not lead each other.

First time segment:

- ABSE was more stable than ANSE and the market indices exhibits bearish nature for this duration. RBSE was more variability than RNSE. For the First segment the average return was found to be negative indicating that the market indices were falling over the given time period. The perfect positive correlation exists between BSE index and NSE index. This implies that ***both the markets are exhibiting bearish nature.***
- Autocorrelation exists for both BSE Index and NSE Index for the first time segment and the time series follows Random Walk. This indicates that the ***both the markets were bearish and shows volatile behavior.***
- There exists statistically significant relationship between BSE index and NSE index. The number of 'lag' was more than 'lead'. I.e. **NSE index leads BSE index**.

Second time segment:

- The time series movement was stable and trend was available. ABSE was more stable than ANSE and the market indices exhibits over all bullish nature for this duration. RBSE was more stable than RNSE and BSE index yields more return than NSE index. The perfect positive correlation exists between BSE index and NSE index. Both the ***markets are volatile.***
- Autocorrelation exists for both BSE Index and NSE Index for the second time segment and the time series follows Random Walk.
- The auto correlation of the weekly return of the market indices indicated that there was no auto correlation exists during this time segment. Also there was ***irregular behavior*** (not persistent) observed, and the number of negative auto correlation was more than the number of positive auto correlations. This implies that the ***market was highly volatile with decreasing trend*** rather than what was assumed to be bullish nature as per the trend analysis.
- The average market indices auto correlation also indicated that with lag increases, the auto correlation becomes negative. This implies that ***market behavior does not encourage the investor to invest rather to watch.***
- There exists statistically significant relationship between BSE index and NSE index. The number of 'lag' was more than 'lead'. I.e. **NSE index leads BSE index.**

Third time segment:

- The time series movement was ***bullish nature*** and trend was available. ABSE was more stable than ANSE.RNSE was more stable than RBSE and NSE index yield more return than BSE index. The perfect positive correlation exists between BSE index and NSE index. Both the ***markets are volatile.*** This implies that ***both the markets are exhibiting bullish nature.***
- Autocorrelation exists for both BSE Index and NSE Index for the third time segment and the time series follows Random Walk.
- There exists statistically significant relationship between BSE index and NSE index. The number of 'lag' was less than 'lead'. I.e. ***BSE index leads NSE index***.

Conclusion and Recommendations:

The purpose of the study was to analyze the Indian stock market volatility for short duration. The study revealed that:The market was persistent, following random walk movement which indicates that it was highly volatile in the short duration during the study period. Both BSE and NSE were exhibiting the same pattern of behavior and hence they were perfectly positively correlated. So the investor can follow any one market to understand the behavior of the market. Further the scope for extended research is: The market behavior can be studied for a long duration (above 5 years). Also, a comparative study of volatility based on volume traded and price volatility of different markets or for the same market can be made.

References:

1. Eugene F. Fama, The Behavior of Stock-Market Prices, The Journal of Business, Vol. 38, No. 1. (Jan., 1965), pp. 34-105.
2. LathaRamchand and Raul Susmell (1998),'Volatility and Cross Correlation across major stock markets' Journal of Empirical Finance, 1998, vol. 5, issue 4, pages 397-416
3. Aggarwal et al. (1999) Volatility in Emerging Stock Markets', Journal of Financial and Quantitative Analysis (Impact Factor: 1.77). 01/1999;34:33-55.
4. M. T. Raju, Anirban Ghosh, (2004), "Stock Market Volatility – An International Comparison", SEBI Working Paper Series, Working Paper No. 8.
5. Kaur, H. 2004. "Time Varying Volatility in the Indian Stock Market", Vikalpa, 29, 4 25–42
6. Hemendra Kumar Porwal and Rohit Gupta 2006. "The Stock Market Volatility", the Journal Accounting and Finance, Vol. 20, No.1, October- March 2006,, pp. 31-44