A study on Volatility through Cross Correlation and Autocorrelation: Evidence from NASDAQ, BSE and Shanghai Stock Markets

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Abstract

There is a saying on Wall Street that "it takes volume to move stock prices." Change in prices is regarded as stock market behavior or volatility. To many among the general public, the term volatility (the ups and downs) is simply synonymous with risk: in their view high volatility is to be deplored, because it means that security values are not dependable and the capital markets are not functioning as well as they should. In this paper the author is keen on finding the influence of NASDAQ and Shanghai Stock Market on the BSE for shorter duration. For the study data is collected from the secondary source and analyzed using ACF and CCF. The study concludes thatBSE index is volatile than Shanghai stock exchange and NASDAQ. Both Sensex and NASDAQ indicate bullish market and stable at the open ends (April-August 2012, December 2012-March 2013). In the second segment Sensex and NASDAQ move in an opposite direction with NASDAQ repulsive negatively, indicate bearish nature of the NASDAQ.Steady upward is noticed in the third segment (December 2012 – March 2013).

Keywords:

Stock Market, stock Market Behavior, Market Volatility, Cross correlation, Auto Correlation

Introduction

Stock market is an organized market for buying and selling corporate and other securities. Here, securities are purchased and sold out as per certain well-defined rules and regulations. It provides a convenient and secured mechanism or platform for transactions in different securities. Such securities include shares and debentures issued by public companies which are duly listed at the Stock market and bonds and debentures issued by government, public corporations and municipal and port trust bodies. Stock markets are indispensable for the smooth and orderly functioning of corporate sector in a free market economy.

Stock Market Volatility

Unpredictable and vigorous changes in stock prices are referred as volatility. It is necessary for some movement within the market in order to sell commodities, however a volatile market represents the most risk to investors. When the stock market goes up one day, and then goes down for the next five, then up again, and then down again, that's what is called as stock market volatility.Stock market volatility is a measure of how far and fast stock prices move. Several indicators have been developed over the years, such as the S&P

500 Volatility Index (VIX) and Nasdaq Volatility Index (VXN), to track the status of broad market volatility and help investors decide when to buy or sell.Stock market observers have long taken note of the movement patterns of individual stocks, but it was only in the 1970s that an indicator was created to measure the volatility of the market as a whole. Today, almost every professional trader makes sure he is aware of the present volatility situation, as this usually has a large impact on the future price movement of stocks and options.

Stock market volatility is determined by calculating how far a particular stock or index has moved over a set period of time. The more a stock has moved, the more volatile it is. Stock market volatility is an especially critical statistic for options traders because volatility has a huge effect on the price of options. The more volatile a stock is, the more expensive its options are likely to be and vice-versa.

Research Gap: and Statement of the Problem: As per the reviews done most of the studies are conducted on or before 2012 & most of them are restricted to same sector. So the author has found out the gap as Stock Market Behavior of BSE, NASDAQ and Shanghai stock exchange and it also study the influence of NASDAQ and Shanghai stock market on Indian stock market. The study will benefit the investors to understand which market is more volatile and which is stable. This study refers to identify the behavioral Market Indices namely Bombay Stock Exchange (BSE), Shanghai Stock Exchange (SSE), NASDAQ. And Influence of NASDAQ and Shanghai Stock Exchange on the Bombay Stock Exchange. The behavioral pattern is identified by Auto Correlation function and Cross Correlation function.

Objectives:

- To understand the Volatility of selected Stock Markets.

- To study the influence of NASDAQ and Shanghai Stock Market on the BSE.

Scope and Limitations: This is the international stock market study, spread over the three stock exchanges called BSE, NASDAQ and Shanghai. This behavioral study helps to understand the market volatility and influence of foreign market on the Indian Stock Market.This study helps to understand the relationship between the three different stock markets and it also helps to the investors, traders and professionals for their analysis.The study is limited to only BSE, NASDAQ and Shanghai Stock Exchanges.This study is depending on the market indices only. And this study has not considered the other factors like economy of the country, market risk etc.The study is restricted to 1- 4- 2012 to 31- 3- 2013. And the analysis carried out for short duration.

Research Design: The study is intended to find the Stock Market Volatility between BSE, NASDAQ and Shanghai stock market. The study design is explorative in nature.The concerned studies exploratory to the extend, it tries to explore the stock market volatility between the BSE, NASDAQ and Shanghai stock exchanges.*Data collection Method and Procedure:*Secondary data- The secondary data has been collected from the magazines, journals, and websites and also from BSE, NASDAQ and Shanghai Stock Exchanges. *Statistical Techniques used for analysis:*For the analysis Auto Correlation Function and Cross

Correlation Function were used.

Analysis and Discussions:

H1: The market indices were stable.

*H2: Relative correlations of the market indices were stable.*

To test H1 Auto Correlation Function (ACF) was used. The analysis was carried out in three segments- April to January 2012, August to November 2012, December 2012 to March 2013. Each segment was independent to each other.
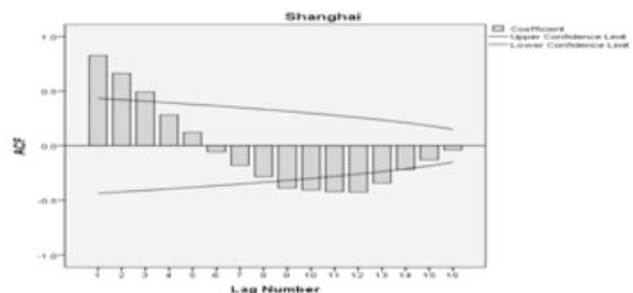
Segment 1: April-July 2012:SENSEX: Graph 1
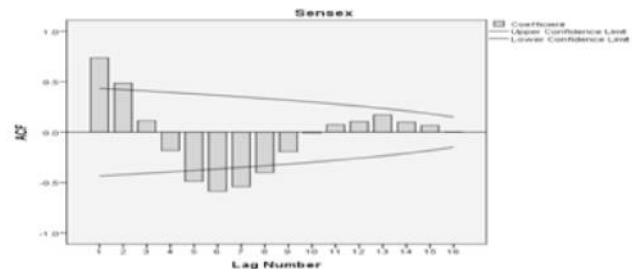
From the above graph infersthat - BSE Index was positively volatile in lag 1 and lag 2, and stable in lag 3 & lag 4 and again negatively volatile in lag 5 to lag 8 and remains stable from lag 9 to lag 16.
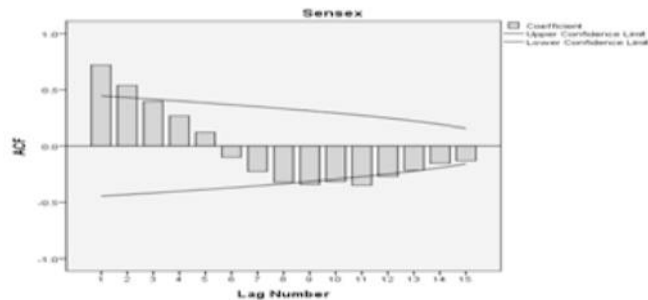
NASDAQ: Graph 2
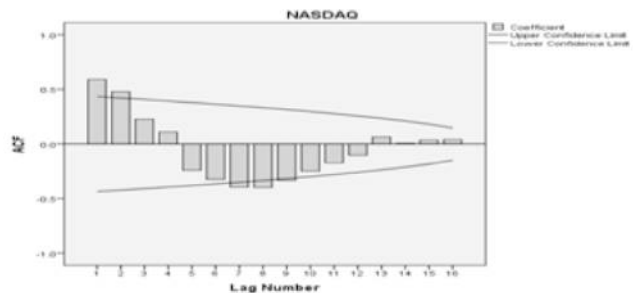
From the above graph infersthat - NASDAQ Index was positively volatile in lag 1 and lag 2, and stable in lag 3 & lag 6 and again negatively volatile in lag 7 to lag 9 and remains stable from lag 10 to lag 16.
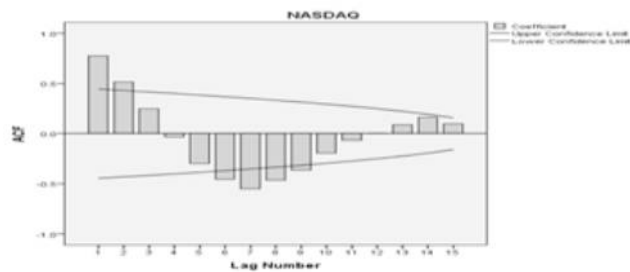
Shanghai Stock Exchange: Graph 3

Shanghai Index was positively volatile in lag 1 and lag 3, and stable in lag 4 & lag 8 and again negatively volatile in lag 9 to lag 13 and remains stable from lag 14 to lag 16.

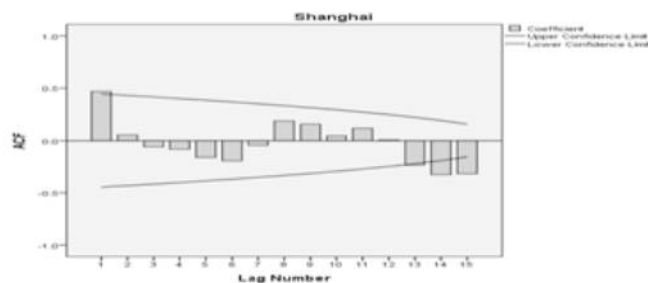**Segment 2: August-November 2012:Sensex: Graph 4**

From the above graph infersthat -Sensex was positively volatile in lag 1 and lag 2, and stable in lag 3 to lag 8 and again negatively volatile in lag 9 to lag 12 and remains stable from lag 13 to lag 15.
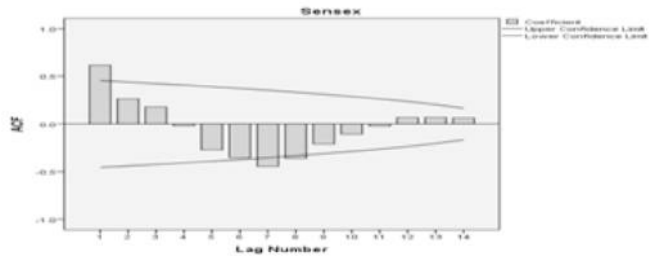
NASDAQ:Graph 5

From the above graph infersthat - NASDAQ was positively volatile in lag 1 and lag 2, and stable in lag 3 & lag 5 and again negatively volatile in lag 6 to lag 9 and remains stable from lag 10 to lag 15.
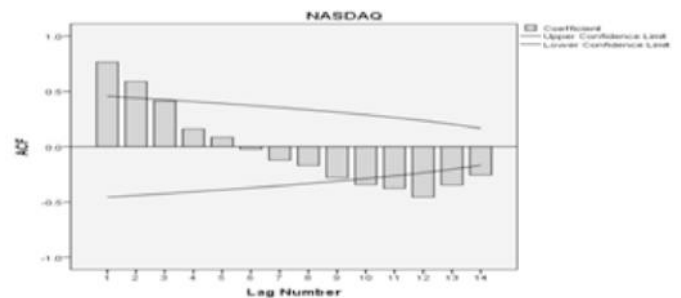
Shanghai Stock Exchange:Graph 6

From the above graph infersthat - Shanghai was positively volatile in lag 1, and stable in lag 2 to lag 13 and again negatively volatile in lag 14 and lag 15.

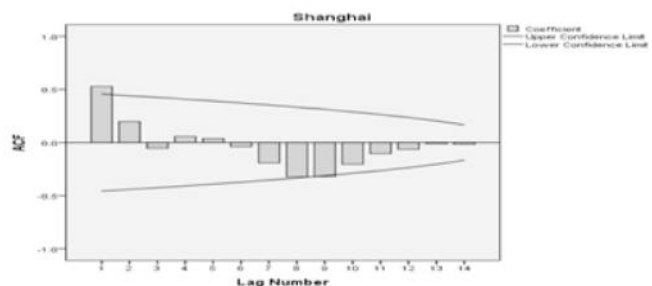**Segment 3: December 2012- March 2013:Sensex:Graph 7**

From the above graph infersthat - Sensex was positively volatile in lag 1, and stable in lag 2 to lag 6 and again negatively volatile in lag 7 and lag 8 and remains stable from lag 9 to lag 14.

NASDAQ: Graph 8

From the above graph infersthat - NASDAQ was positively volatile in lag 1 and lag 2, and stable in lag 3 to lag 9 and again negatively volatile in lag 10 to lag 14.

**Shanghai Stock Exchange:Graph 9**

From the above graph infersthat -Shanghai Stock exchange was positively volatile in lag 1, and stable in lag 2 to lag 14.

To test H2 Cross Correlation Function (CCF) was used. The analysis was carried out in three segments- April to January 2012, August to November 2012, December 2012 to March 2013. Each segment was independent to each other.

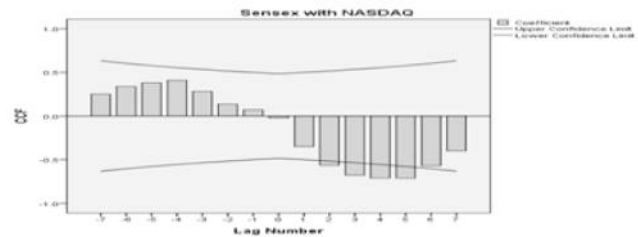**Segment 1: April-July 2012:Sensex with NASDAQ: Graph 10**
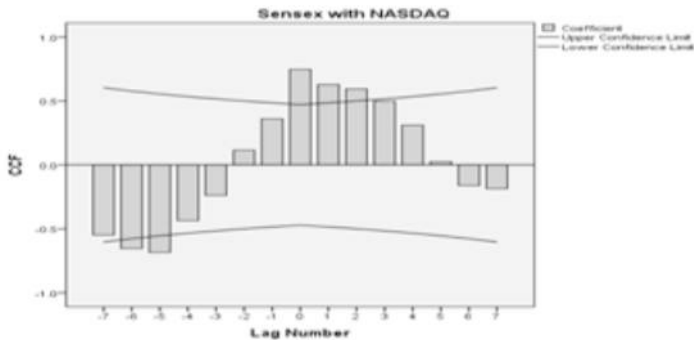
From the above graph infersthat - The market indices- BSE index and NASDAQ was stable in lag -7 and negative repulsiveness in lag -6 to lag -5 and remain stable from lag -4 to -1. At lag 0 to lag 2 the indices displays positive repulsiveness and then shows stable behavior from lag 3 to lag7.
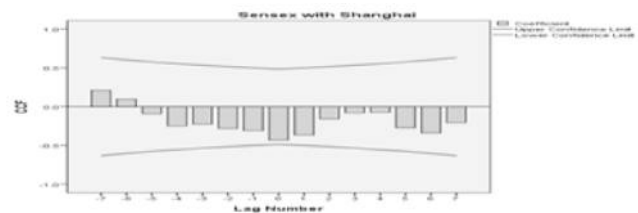
Sensex with Shanghai: Graph 11
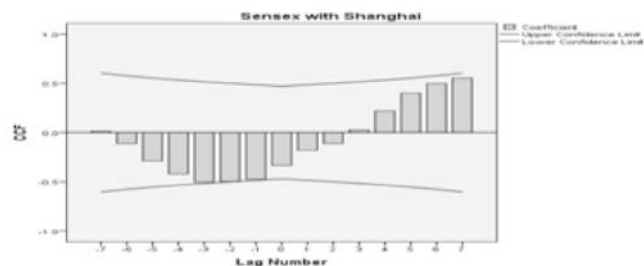
From the above graph infersthat - The market indices- BSE index and Shanghai was stable in lag -7 to lag 7, since $\alpha \leq 2$.

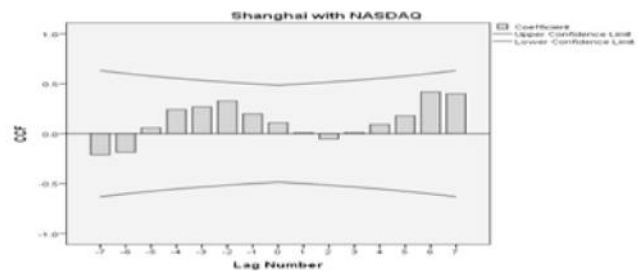**Shanghai with NASDAQ: Graph 12**
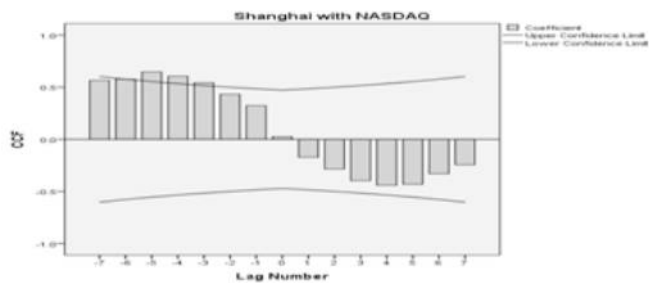
From the above graph infersthat - The market indices- Shanghai and NASDAQ was stable in lag -7 and lag -6 and displays positive repulsiveness in lag -5 to lag -3 and remain stable from lag -2 to 7.

Segment 2: August - November 2012: Sensex with NASDAQ: Graph 13
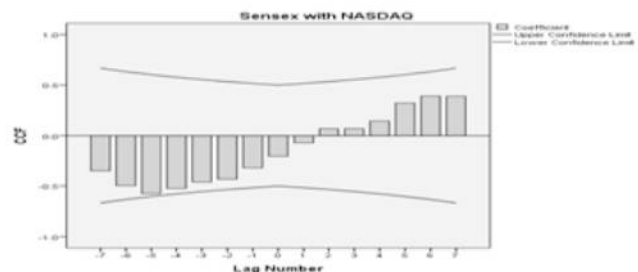

From the above graph infersthat -The market indices- Sensex and NASDAQ was stable in lag -7 and lag 1 and displays negative repulsiveness in lag 2 to lag 6 and remain stable from lag 6 to 7.

Sensex with Shanghai: Graph 14

From the above graph infersthat -The market indices- BSE index and Shanghai was stable in lag -7 to lag 7, since $\alpha \leq 2$.
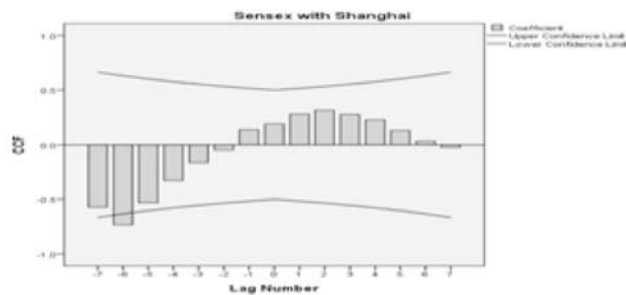
Shanghai with NASDAQ: Graph 15

From the above graph infersthat - The market indices- Shanghai and NASDAQ was stable in lag -7 to lag 7, since $\alpha \leq 2$.

**Segment 2: December 2012 -March 2013:Sensex with NASDAQ:Graph 16**

From the above graph infersthat - The market indices- Sensex and NASDAQ were stable in lag -7 to lag 7, since $\alpha \leq 2$.

Sensex with Shanghai: Graph 17

From the above graph infersthat - The market indices- Sensex and Shanghai was stable in lag -7 and displays negative repulsiveness at lag-6 and remain stable from lag -5 to 7.

Shanghai with NASDAQ: Graph 18
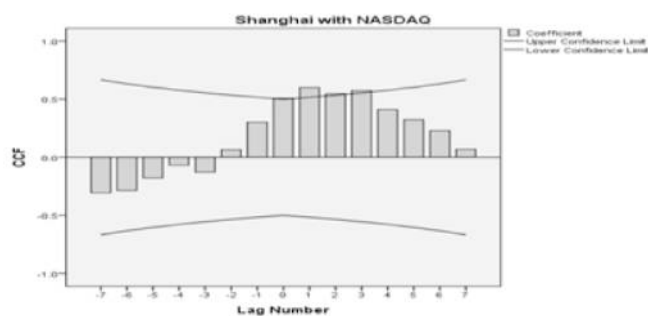
From the above graph infersthat - The market indices- Shanghai and NASDAQ was stable in lag -7 to lag 0 and displays positive repulsiveness in lag 1 to lag 3 and remain stable from lag 4 to lag 7.

Findings:

- The BSE index, NASDAQ index and Shanghai index exhibits sign curve and they are either too volatile nor stable but fluctuates positively according with $\alpha \leq$ (upward trend) in all 3 segments i. e; April – July 2012, August – November 2012 and December 2012 to March 2013. There by BSE index behaves randomly and fails to predict future behavior.

- The relative correlation between SENXES and NASDAQ exhibits sign curve at each peak points, indices becomes repulsive ($\alpha \geq 2$) and at each nodal points the indices exhibits stable ($\alpha \leq 2$) behavior.

- The relative correlation between SENXES and Shanghai exhibits sign curve at each peak points, indices becomes repulsive ($\alpha \geq 2$) and at each nodal points the indices exhibits stable ($\alpha \leq 2$) behavior.

- The relative correlation between Shanghai and NASDAQ exhibits sign curve at each peak points, indices becomes repulsive ($\alpha \geq 2$) and at each nodal points the indices exhibits stable ($\alpha \leq 2$) behavior.

Conclusion: The author concludes from the Auto Correlation

Function (ACF) analysis that, BSE index is volatile than Shanghai stock exchange and NASDAQ. The cross correlation function indicates BSE with NASDAQ shows more repulsive in middle of the segment (August- November 2012) i.e.; both Sensex and NASDAQ indicate bullish market and stable at the open ends (April-August 2012, December 2012-March 2013). In the second segment Sensex and NASDAQ move in an opposite direction with NASDAQ repulsive negatively, indicate bearish nature of the NASDAQ. Risk is less for stable situation and risk is very high in the repulsive reason. Sensex and Shanghai in a opposite direction with $\alpha \leq 2$ with Steady state. Since, α is small for second segment both Shanghai and NASDAQ moving in a similar manner. Shanghai and NASDAQ indices are moving in the same positive direction. Steady upward is noticed in the third segment (December 2012 – March 2013).Further the same study can be extended for other market indices around the world or for different market indices of Indian Stock Market.

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