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A Study on Sensex Aftermath Global Recession

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Abstract: *This article aims at focussing on the facts in the financial series of SENSEX, the Sensitivity Index of the Bombay Stock Exchange (BSE) and the good and bad news on the volatility of SENSEX. In the field of financial market, the stock market volatility is the most interesting topic for the investors as well as for the researchers. The volatile market gives the opportunity to the investors to reap higher returns for their investments. In the volatile market factorial risks are more and probability of higher returns are possible. The BSE SENSEX data for the period from January 2010 to December 2015 are used for the study. To impart evidence on the existence of volatility TARCH(1,1) model and Descriptive statistics tests are used. In ARCH / GARCH models both positive and negative shocks of same magnitude have exactly same effect in the volatility of the series. TARCH model obviates this restriction. The study found that there volatility exists and the bad news impact is more in the market for the period after global recession and also observed that August and Sep months have higher Volatility.*

Keywords: *BSE SENSEX, Jarque-Bera test, TARCH(1,1) model, Volatility.*

I. Introduction

The financial markets are the major contributors to invest funds for all sorts of people right from corporate to ordinary investors. The volatility in the market makes the investors to participate.The BOMBAY STOCK EXCHANGE is the oldest exchange in Asia. Its history dates back to 1855. The **Bombay Stock Exchange** (**BSE**) is an Indian stock exchange located at Dalal Street, kala ghoda, Mumbai, Maharahtra, India. Established in 1875, the BSE is Asia's first stock exchange and the world's fastest stock exchange with a median trade speed of 6 microseconds.[1] The BSE stood 10th among the world's stock exchanges as measured by market value at the end of October with the market capitalization of $1.58 US trillion , according to data from the World Federation of Exchanges. It is followed closely by India's National Stock Exchange, which is ranked 11th with the capitalization of $1.55 US trillion.[2] The leading US bourse NYSE is on the top with a total market cap of $19.1 trillion, as per the data from World Federation of Exchange (WFE) as on October 31, 2014.
It is followed by Nasdaq OMX, Japan Exchange Group of Tokyo, Euronext and Hong Kong Exchanges in the top five. Others ranked higher than BSE include Shanghai Stock Exchange of China, TMX Group of Canada, Shenzhen Stock Exchange of China and Deutsche Boerse of Germany at 6th, 7th, 8th and 9th positions, respectively.[3]

The BSE is the world's 11th with an overall market capitalization of $1.7 trillion as of January 23rd, 2015.[4] More than 5500 companies are publicly listed on the BSE. There are many studies have been made on the financial market volatility.This paper fundamentally follows TARCH model.This model allows us to find out impact of news on the financial market in degree of magnitude.

II. Review of Literature

A number of previous studies made attempt to analyse the volatility of the Stock Index. Numerous foreign and Indian studies examined the volatile nature of stock returns and the macro-economic variables. Starting with the pioneering work of Mandelbrot (1963) and Fama (1965), various features of stock returns have been extensively documented in the literature which are important in modeling stock market volatility. Akgiray(1989) found that GARCH (1,1) had better explanatory power to predict future volatility in the US stock market. Baillie and Bollerslev (1991) observed that the volatility is predictable in the sense that it is typically higher at the beginning and at the close of trading period. Poshakwale and Murinde (2001) modeled volatility in stock markets of Hungary and Poland using daily indexes.They observed that GARCH(1,1) accounted for nonlinearity and volatility clustering. Poon and Granger (2003) contributed comprehensive review on volatility forecasting. They examined the methodologies and empirical findings of 93 research papers and provided syneptic view of the volatility literature on forecasting. They observed that ARCH and GARCH classes of time series models are very useful in measuring and forecasting volatility. Kanagaraj and Nalinprava Tripathy(2008) have focused on modeling asymmetric volatility in Indian Stock market using TGARCH AND EGARCH Models.They conclude that volatility of BSE 500 stock returns have been investigated and molded by using two nonlinear asymmetric models. Angabini, A. and S. Wasiuzzaman have conducted a study on GARCH models

and the financial crisis, the study prepared on Malaysian stock market and employed GARCH (1, 1) and EGARCH (1,1).Mishra et al. (2007) empirically investigated the volatility dynamic effects between the two markets with reference to India. Their analyses show clear evidence of bidirectional flow of shocks between the currency and equity market. Pandey and Kumar (2008) found co movement of Indian markets with eight other key stock exchanges in Asia for the period from 2000 to 2008.They found that the period was marked with high volatility among all markets under study.

Choi et al. (2010) empirically investigated the New Zealand currency and equity market for volatility transmission mechanism. They concluded bidirectional mechanism of volatility for the two financial markets. Verma, and Mahajan (2012) applied an augmented E-GARCH model to figure the demeanor of Indian stock prices for the global financial crisis. The study implied that the impact of U.S. financial dissolving on the stock return volatility of Indian stock market has been significant. Abidin (2012) investigated the asymmetric volatility in New Zealand stock exchange for the time period 2007-2008 by employing two models, E-GARCH and T-GARCH, to capture the asymmetric effects on New Zealand stock exchanges The results provided evidences of the presence of asymmetric volatility in the New Zealand stock market for the entire time period of study. Andreou et al. (2013) analyzed 12 emerging markets including six from Asia and six from Latin America. The analyses reveal bidirectional volatility spillover between equity and currency market. Market volatility can be closely linked to expected returns and business cycles, as proposed Market volatility can be closely linked to expected returns and business cycles, as proposed Market volatility can be closely linked to expected returns and business cycles, as proposed in a paper written by Kim and Nelson (2013). Recently, Xiong and Han (2015) reported bidirectional volatility spillover between the two markets for China.The present study makes use of TARCH model which is more effective and obviates the limitations of GARCH (1,1) model that gives same effect on volatility.This paper also analyses the causes of volatility over the periods.

III. Objectives of this study

- To investigate and analyse the volatility of BSE stock price indices with respect to its characteristics measured by fat tail and volatility clustering.
- To find out whether good or bad news impact is more on volatilile market of BSE stock indices using TARCH(1,1) model.

IV. Hypotheses of the study

H_0: Series is normally distributed
H_1: Series is not normally distributed

V. Sources of data and the data

The study is based on secondary data obtained from Bombay Stock Exchange website. The International Monetary Fund defines a global recession as "a decline in annual per-capita real World GDP (purchasing power parity weighted), backed up by a decline or worsening for one or more of the seven other global macroeconomic indicators: Industrial production, trade, capital flows, oil consumption, unemployment rate, per-capita investment, and per-capita consumption"According to this definition, since World War there were only four global recessions ie. in 1975, 1982, 1991 and 2009. [5]

In the year 2009, Per capita global output shrunk by 1.8 percent in 2009 and this is by far the deepest fall compared to the average of -0.7 percent decline of the four episodes. In addition, global trade collapsed, capital flows and industrial production registered significant declines, and 23 million people lost their jobs. [6] Considering the above definition we have collected the data for the period from Jan 2010 to Dec 2015 which is aftermath Global Recession.

VI. Research design

We have measured daily data encompassing the closing indexes of Bombay Stock Exchange (SENSEX) index using the sample period extents from January 2010 to Dec 2015.There are 1492 observations for SENSEX. Gretl package programme has been utilized for coordinating the data and carrying out of econometric analyses.

VII. Tools used

In the course of analysis in the present study, descriptive statistics, Jarque-Bera unit root test and TARCH(1,1) model have been used. The uses of all these tools at different places have been made in the light of requirement of analysis.

In financial stock markets it is often observed that positive and negative shocks have different effects on the volatility, in the sense that negative shocks are followed by higher volatilities than positive shocks of the same magnitude (Engle and Ng, 1993). To deal with this phenomenon, Glosten, Jagannathan and Runkle (1993)

and Zakoian (1994) introduced independently the Threshold ARCH, or TARCH model 3, which allows for asymmetric shocks to volatility. The conditional variance for the simple TARCH(1,1) model is defined by

$$\sigma^2_t = \omega + \beta\sigma^2_{t-1} + \alpha\varepsilon^2_{t-1} + \gamma\varepsilon^2_{t-1} d_{t-1}, \quad (1)$$

Where $d_{t-1} = 1$ if ε_τ is negative, and 0 otherwise. In this model, volatility tends to rise with the *bad news* ($\varepsilon_{\tau-1} < 0$) and to fall with the *good news* ($\varepsilon_{\tau-1} > 0$). Good news has an impact of α while bad news has an impact of $\alpha + \gamma$ .This model is concerned with the leverage effect sometimes observed in stock returns. If $\gamma > 0$ then the leverage effect exists. If $\gamma \neq 0$, the shock is asymmetric, and if $\gamma = 0$, the shock is symmetric. The persistence of shocks to volatility is given by

$$\alpha + \beta + \gamma/2 . \quad (2)$$

VIII. Market Volatility

Market Volatility is the degree to which the asset prices tend to fluctuate.It is often described as the rate and magnitude of changes in prices and in finance often referred to as risk.Volatility is a positive feature for short – term stock traders and they can exploit this for booking their profit.

IX. Descriptive Statistics of Return Series

The Daily log returns of Index are caculated by collecting the daily Index of BOMBAY STOCK EXCHANGE from the BSE website and the data are processed in the Gretl software for the results. The descriptve statistics pertinent to the return series so defined for BSE are summaized in Table1.

Table 1: Log Returns Summary Statistics

Mean	Median	Minimum	Maximum	Jarque-Bera test
0.000266302	0.000491954	-0.0611971	0.0370342	143.073,with p-value 8.55095e-032
Std. Dev.	C.V.	Skewness	Ex. kurtosis	---
0.0104061	39.0765	-0.179182	1.47464	---
5% Perc.	95% Perc.	IQ range	Missing obs.	---
-0.0173859	0.0176574	0.0120895	1	---

Note: (1491 valid observations, with 1492 data points)
Source: Computed based on secondary data.

The measure of Ex.kurosis suggests that the daily stock return series in BSE have fatter tail and sharper peak than the normal distribution over the sample period. This means, the probability of extreme returns that has been observed empirically is higher compared to the normal distribution. The above table shows that the sample is Lepto-kurtosis, or simply 'fat tails' that leads lesser risk of extreme outcomes. The hypotheses are:

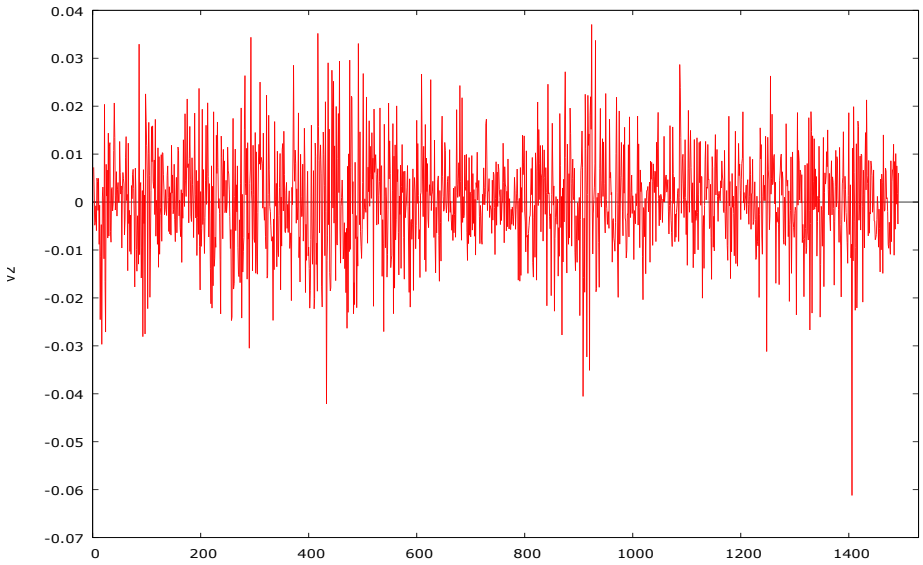
H_0: Series is normally distributed

H_1: Series is not normally distributed

The daily stock return series are not normally distributed and the null hypothesis is rejected which is confirmed by the Jarque Bera test(Jb). Regarding the skewness it is negatively skewed, meaning frequent small gains and a few extreme losses.

Now to test the volatility clustering in BSE, the daily closing stock of index returns over the sample period have been plotted as shown in figure 1. It is obvious from the figure that the amplitude of daily stock returns is changing in BSE SENSEX. The magnitude of this change is sometimes large and sometimes small and this sort of effect is called volatility clustering. The volatilty is higher when stock prices are falling than when prices are raising which means the negative returns are more associated greater volatlity than the possitve returns. This effect is known as asymmetric volatility effect.The greater degree of volatity is observed in Sep 2011, Aug 2013, and Aug, Sep 2015.

Figure 1. Daily Stock Return based on Closing SENSEX.



Computed by Authors: Daily Stock Return based on Closing SENSEX. (from Jan 2010 to December 2015)

The Indian Rupee fall is one of the reasons for market volatility in Sep 2011 and Aug 2013. The Reason for greater degree of volatility may be due to withdrawal of FIIs investments in India. After a record outflow in August 2015 of Rs 17,248 crore, FIIs have sold Rs 2,205 crore of shares in the first two days.

The BSE SENSEX opened on a negative note on 4th Sep 2015, Friday following global cues amid sustained capital outflows by foreign funds. The BSE SENSEX closed 562.88 points lower at 25,201.90. The Global market Trends, fears of poor agriculture output as monsoon deficit widened triggered selling in stocks,Profit-booking by speculators and sustained capital outflows by foreign funds,Indian rupee was down 26 paise at 66.38 against the dollar on fresh bouts of dollar demand amid volatile equities.The FIIs were net sellers in the cash market segment on 03 September 2015, Wednesday sold shares worth Rs 1525.14 crore.[7]

From the above reasons, bad news affect market volatility more and the same is confirmed by TARCH (1,1) model. The Results are as follows in the Table 2.

Table 2.TARCH(1,1) Model for BSE-SENSEX from Jan 2010 to Dec 2015

Model: TARCH(1,1) [Zakoian] (Normal),Gretl Software

Sample: 5-January-2010-31-December-2015 (T = 1491), VCV method: Robust

Conditional mean equation

	Coefficient	std. error	z	p-value
omega	4.00437e-06	1.15533e-06	3.466	0.0005
Alpha	0.0472674	0.0102073	4.631	3.64e-06
Gamma	1.11019	0.270135	4.110	3.96e-05
beta	0.925727	0.0147917	62.58	0.0000

The result shows that the good news has an impact of 0.0472674 magnitudes and the bad news has an impact of 0.0472674 + 1.11019 = 1.1574574 magnitudes in the Stock exchange,Mumbai. From this it is inferred that in the BSE market, the bad news increases the volatility substantially. This time varying stock return volatility is asymmetric. This study shows that FIIs withdrawal and the fall in rupee value have created high level of volatility. The persistence of shocks to volatility is 1.528086.

X. Findings

The daily stock return series are not normally distributed and the volatility is asymmetric over the periods. It is inferred that the good news has less impact compared to bad news. The withdrawal of foreign investments by the investors has significant impact for the volatile market. Also the rupee fall has its impact on volatility. It is observed that high fluctuations happen approximately in every two years and especially in the months of August and September.

XI. Suggestions

Investors can choose August and September months as a guideline for buying the stocks and selling the same when the market price hikes in future. They can sell stocks which they bought in earlier periods before these months. The Government can take measure to control the fall in the rupee value. The withdrawal of foreign investments by the investors can be controlled by special announcements that attract them.

XII. Conclusion

After global recession the BSE SENSEX, continuously facing market volatilty and the volatility is asymmetric. The SENSEX crashed after withdrawals by foreign investors and also fall in rupee but this time it has been least affected. This Study provides the evidence of market volatility and bad news impact is high.

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