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Investment Opportunity in BSE-SENSEX: A study based on asymmetric GARCH model

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Abstract

This article aims to focus on the stylized facts in the financial series of BSE – SENSEX, and the impact of good and bad news on the volatility of BSE-SENSEX. The financial market volatility of an emerging financial market is considered as one of the most interested study of an investor. The volatility ratio in emerging markets are found as higher compared to the developed financial markets. That increases the factorial risks and probatility of higher returns.. We consider daily OBS (observations) 2967 which represents 04:2003-03:2015. The study followed by Generalized Autoregressieve Conditional Heteroskedisticity type model that is GJR-GARCH. We found that the financial series of BSE-SENSEX have dynamic volatility scale. GJR – GARCH model fitted well on financial series of BSE-SENSEX.

Introduction

The financial markets are one of the highest utilized option to invest funds for corporates, banks, instituttional investors and to ordinary investors as well. The financial market creates volatility in the price rates and that allows investors maintain interest for the investment. It provides opportunity both the side, for the down side it is an opportunity for buyers to invest and buy the stocks and for the higher side opportunity for investors to book profit. Today BSE SENSEX is one of the largest stock exchange in Asia and covers more than 15 individual sectors index to work on. There are plenty number of study been made on the financial market volatility. Kanagaraj and Naliniprava Tripathy (2008) have focused on modeling asymmetric volatility in Indian stock market using EGARCH and TGARCH 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 carried out study on GARCH models and the financial crisis, the study prepared on Malaysian stock market and employed GARCH (1, 1) and EGARCH (1, 1). This paper fundamentally follows GJR GARCH model that is found by

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Glosten, Jagannathan and Renkle (1993). This model allows us to find out impact of news on the financial market in degree of magnitude.

Methodology and empirical results

We here work with 2967 daily observations of BSE-SENSEX, that covers first transaction of April, 2003 to last transaction of March, 2015. The concept of first GARCH model was introduced by Engle (1982) further it is extended by Bollerslev (1986) and again by Nelson (1991), and GJR-GARCH proposed by Glosten, Jagannathan and Renkle (1993). GJR-GARCH represents dummy variable using original GARCH model. It targets asymmetric in terms of negative and positive shocks. GJR-GARCH model is similar to TGARCH model or Threshold GARCH model, there is difference in application, and TGARCH deals with conditional standard deviation where GJR-GARCH deals with conditional variances. Following are specimen formula for formulating GJR-GARCH models.

GJR-GARCH

$$h_t = \omega + \alpha_1 u_{t-1}^2 + \beta_1 h_{t-1} + \theta I_{t-1} u_{t-1}^2$$

This model also provides leverage effect. Here if $\theta > 0$, we say that there is a leverage effect or otherwise. Here $I_{t-1} = 1$ if $u_{t-1} < 0$ and $I_{t-1} = 0$ or otherwise and if $\theta > 0$, we say that there is a leverage effect. This model is capable to tell us the effect of news on volatility. It reflects bad news ($u_{t-1} < 0$) has an effect of $(\alpha_1+\theta) u_{t-1}^2$ on the variance. Where as good news (u_{t-1} □ 0) has an effect of $\alpha_1 u_{t-1}^2$ on the variance and if $\theta < 0$ represent effect of bad news. Application of model makes it easy to decide if $\theta = 0$ or $\theta > 0$ or not.

The financial series of BSE-SENSEX converted into log difference and tested with Augmented Dickey Fuller test (ADF test). We consider stationary series at level of 5%. The original series and stationary series prescribed in Fig1.

The financial series of BSE-SENSEX represents the index level about 3000 to approaching upto 30000 in the journey of about twelve years. This indicates the potential of the financial index and the interest of continuous investment. The other figure in Fig1 represents the stationary series of BSE-SENSEX which indicates the maximum number of volatility sketches during the year 2008 and year 2010.

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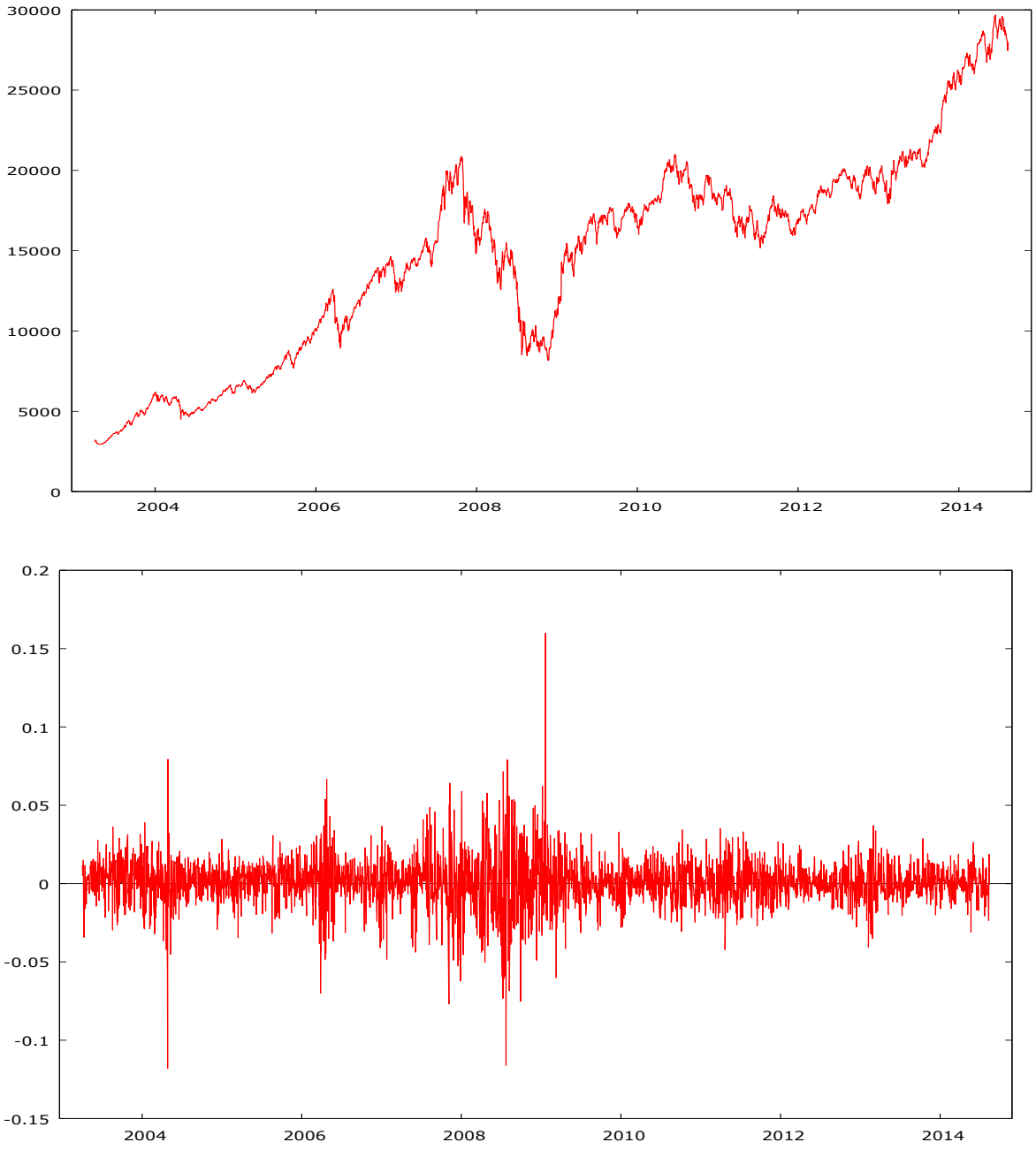
Fig1. Financial series of BSE-SENSEX (Original and stationary series)From 04-2003 to 03-2015



Source: Authors computation using BSE-SENSEX financial data from 04-2003:03-2015

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The following table represents the summary of statistics for BSE-SENSEX using 2967 daily observations. The mean and median level are about to zero, standard deviation represents degree of 0.01549, the negative skewkess and higher degree of kurtosis. Here the degree of kurtosis is much more higher than the normal degree of (03). This represents that the rise in the sensex does not create much impact on the listed stocks to rise with the impact degree in the financial market of BSE-SENSEX.

Table-1 Summary Statistics, using the observations (BSE-SENSEX) 2003-04-01 - 2015-03-31 (2967 valid observations)

Mean	Median	Minimum	Maximum
0.000743326	0.00116527	-0.118092	0.159900
Std. Dev.	C.V.	Skewness	Ex. kurtosis
0.0154939	20.8440	-0.0882675	8.42882
5% Perc.	95% Perc.	IQ range	Missing obs.
-0.0233316	0.0227572	0.0152308	1

Source: Authors computation using BSE-SENSEX financial data from 04-2003:03-2015

We have confirmed the presence of ARCH by using ADF test at level of 5%. And that now allow us to employ the GJR GARCH model.

The following table-2 represents the GJR-GARCH test statistics.

Table-2 GJR-GARCH statistics for BSE-SENSEX from year 04-2003 to 03-2015

Variances	GJR-GARCH
Mean Equ.	0.000866610 (0.0000)
Omega	4.20692e-06 (0.0038)
Alpha	0.0946894 (0.0000)
Gamma	0.281334 (0.0051)

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Beta	0.878317 (0.0000)

Source: Authors computation using BSE-SENSEX financial data from 04-2003:03-2015

* ( ) indicates p-value.

GJR-GARCH model is capable to measure effect of good news and bad news. We measure effect of good news (u_{t-1} □ 0) has an effect of$\alpha_1 u_{t-1}^2$ on the variance and if $\theta < 0$ represent effect of bad news. We apply this to finding out application of GJR-GARCH on BSE-SENSEX stock index as below.

$h_t = 0.000866610 \ (\omega) + 0.0946894 \ (\alpha_1) u_{t-1}^2 + 0.878317 \ (\beta_1) h_{t-1} + 0.281334(\theta) I_{t-1} u_{t-1}^2$

GJR GARCH model suggests that the good news has an impact of 0.09468 magnitudes where as bad news generates an impact of 0.0946894+0.281334= 0.3760 magnitudes. Here it represents the high risk factor and alternatively opportunity for great returns on the investments. The bad news creates stronger and larger impact on financial market of BSE-SENSEX than the good news. The same impact we can see in Fig1 during the year 2008-2010 (at time of global financial crisis) the negative shocks are comparative in larger degrees and for the longer time.

Conclusion

The stock market of emerging country is more volatile than the stock market of developed country. Estimating stock market volatility is subject of interest not only for investors and researchers but it also reserves attention in general. Nowadays an advancement of econometric modeling provides such opportunities. We employed GJR GARCH model to financial series of BSE-SENSEX using 2967 daily observations. We found stylized facts in the financial series and it is observed that the bad news impact much higher than the good news to the financial market. Although this market provides great potential to investors as the index level suggests the same.

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