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ASYMMETRIC EFFECT IN INDIAN AND CHINESE STOCK MARKETS

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Abstract

The asymmetric volatility of stock return is a common market dynamic of high market volatility, which occurs when the market is in upward trend than downward. The present study aimed at measuring the asymmetric effect of the daily return of Indian and Chinese stock market indices, for the period between 01/01/1992 and 1/12/2015. By modeling the returns, with extended GARCH family models, the study found that the negative news influenced the volatility than positive news, for the majority of markets, under the study. However, for one of the Chinese market (Shanghai Composite), the impact of good news recorded great impact than the bad shocks.

Key words: *Symmetric Effect, Risk, Volatility, GARCH models, ARCH LM.*

JEL Code: *C32, C53*

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1. Introduction

The asymmetric effect can be described as a negative correlation between the past and future volatility of return. It is a ratio of debt/ equity in which leverage occurs out of negative return, resulting in a low equity price, meaning that the debt equity ratio is high. In asymmetric effect, the positive shocks/news have less impact on conditional variance than negative shocks. The aim of the study was to test the asymmetric effect of financial time series of two emerging countrys' stock markets such as India and China and find out how these markets reacted to the positive and negative news. The various extensions of GARCH models are helpful to capture the nature of any financial

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time series data, mainly in volatility forecasting of the stock return and risk measurement. However, the basic GARCH model cannot account for leverage effect, which led the way to choose extended versions, including EGARCH, and TARCH **(Almeida, D. D., & Hotta, L. K., 2014).**

2. Review of Literature

Many researchers have studied stock market volatility, across the globe, specifically taking developed markets such as US, UK, Germany, and France etc. The studies at the early stage include, **Christie (1982),** who tried to see the relationship between the equity variance and various explanatory variables and the study reported that both financial leverage and the equity variances have a strong positive association, which is contrary to the forecast of the options literature and interest rates. The relation between stock returns and stock market volatility, examined by **French et al., (1987),** reported a positive correlation between market risk premium and volatility of stock returns. The temporal behavior of stock market returns was also analysed by the researchers and found that conditional variances were found to be high accuracy **(Akgiray, 1989).** Heteroskedasticity in Asset returns was examined by researchers such as **Lamoureux et al., (1990), Nelson (1991)** and reported that the ARCH effects disappear if the volume is incorporated in the variance equation. Volatility has been studied differently, by different authors. The relationship between the yield curve and the time-varying conditional volatility, done by **Engle and Ng (1991),** demonstrated different shaped yield curves and various combinations of volatility on future spot rates. Also, researchers made additional insight into the relationship between nature of stock market volatility and the return of industrialized countries, applying GARCH-M model **(Theodossiou and Lee, 1995; Franses and Van Dijk, 1996; Duffee, 2005).** However, the empirical literature, for the Indian and Chinese stock markets, is still limited to only a few comprehensive studies such as **Song, Liu and Romilly (1998),** who studied Chinese aggregate consumption function by applying TVP (time varying parameter) method and found that TVP outperformed other models and it was found to be a good representation of the changes in Chinese consumer behaviour over time. **Robet brooks and Vanitha (2003)** examined the presence of autocorrelation and cross correlation in the four main stock indices. The study found spill-overs from Shenzhen 'A' prices to 'B' share prices also but there was no volatility spill-over from 'B' to 'A' share prices. Indian stock market volatility has been studied by **Harvinder Kaur (2004),** considering Nifty and BSE indices and found volatility to be persistent and the indices responded to the arrival of asymmetric news. Chinese market operation and efficiency had been studied by **Seddighi and Nian (2004)** and it was found that the share prices in the Chinese stock market did not follow a random-walk process, as required by market efficiency. **Niu, H., and Wang, J. (2013)** studied dynamics of nonlinear analysis of Chinese stock market indices such as Shanghai Stock Exchange Composite Index (SSE) and Shenzhen Stock Exchange Component Index (SZSE). **Ning, Xu and Wirjanto (2015)** analysed volatility clustering of asset returns, employing copula-based univariate time series models and found strong nonlinear and asymmetric volatility in the returns.

3. Statement of the Problem

It is evident from the literature that in 2014, there was a 40% rise in Indian market. Also Chinese market was in its heights and market probably found its sensible level. If investments in long term Indian market is better or good idea for any investor, for short period investment, it is not advisable. However, for medium to long term, China and India both are winners. Hence the present study would like to check the seasonal fluctuations in the time series of these

two markets, to find out the leverage effect or to understand how these markets respond to the arrival of negative news.

4. Need of the Study

When you look at a country like India and China, it is good to have long-term and time series approach than cross-sectional. It cannot be compared to USA and Canada at present. It is better to observe as India and China than India Vs China. When we look at these two countries larger length of history, from the late nineties, it recorded tremendous growth. Though there are numerous studies on volatility clustering of stock market return across the world, only a few studies concentrated on the Indian and Chinese economy. Hence the present study aimed at measuring the leverage effect on the daily return of Indian and Chinese stock market indices.

5. Objective of the Study

To study the presence of leverage effect on Indian and Chinese stock market, using asymmetric models.

6. Hypotheses of the Study

Based on the above objectives, the following hypotheses were tested.

NH-1: There is no unit root in the time series return.

NH-2: There is no arch effect in the series.

NH-3: There is no asymmetric impact in the return series.

7. Research Methodology

7.1 Sample Size

The study used data set of stock markets of two emerging countries like India and China, which included S&P BSE Sensex, CNX Nifty, Shanghai Composite Index and Shenzhen Composite Index.

7.2 Source of Data

The data were collected from the Bloomberg database.

7.3 Period of the Study

The study could collect data for all the indices from 1992, (as Shenzhen was started middle of 1991).

7.4 Tools used

The study used GARCH family models such as EGARCH (1, 1) and TARCH models, to capture the asymmetric effect.

8. Data Analysis

To describe the basic features of any time series data, descriptive statistics could be used. It provides simple summaries about sample series and measures. The results of the descriptive statistics revealed **(Table-1)** that Shenzhen Composite Index recorded the highest mean return, during the study period, followed by CNX Nifty, S&P BSE Sensex, and Shanghai composite index. If the mean and variance are low, it reveals that the expected returns and risk are also low. Chinese Stock Markets experienced high volatility than Indian Stock Markets. Shanghai composite return was more volatile, followed by Shenzhen return, as per volatilities measured by standard deviation. Relatively, CNX Nifty was less volatile. High volatility indicated the possibility of high returns as well but carried more risk. S&P BSE recorded the lowest volatility compared to other markets. The negative skewness of Indian markets signified that the distribution had long left tail (lower values), meaning that the stock returns are in negative signs positive. There was greater chance of large decrease in returns than increase. But both Chinese indices showed positive skewness, indicating an asymmetrical distribution, with a long tail to the right (higher values). This indicated prevalence of positive returns than negative return. There was also possibility of a large increase in return. The kurtosis value, expected in any Gaussian distribution, is 3.0 and if the values are more than standard, i.e., > 3, distribution is fat-tailed. The Jarque - Bera (JB) test suggested the return

series distributions to be non-normal. The stationarity of the series was checked by applying the popular unit root tests such as Augmented Dickey–Fuller (ADF), Phillips-Perron test (PP) and Kwiatkowski–Phillips–Schmidt–Shin Test (KPSS). The unit root test statistic rejected the null hypothesis (**NH-1:** There is no unit root in the time series return.) at 1% level of significance, for all return series and confirmed the application of time series stochastic models, to study the dynamic behaviour of volatility and leverage of the returns over the period under study **(Table-2).**

The Arch-LM Test was applied to find out the presence of arch effect in the residuals of the return series. From the **Table-3,** it is inferred that the arch-lm test statistics was highly significant. Since $p < 0.05$, the null hypothesis **(NH-2:** There is no arch effect in the series) is rejected, at 1% level, which confirmed the presence of arch effects in the residuals of time series models in the returns and hence the results warrant the estimation of GARCH family models.

The results of EGARCH Model **(Table-4)** showed a negative and significant parameter for S&P BSE Sensex, CNX Nifty, and Shenzhen Composite Index, indicating the existence of asymmetric shocks on the volatility of the daily return of the indices. The results agreed that negative shocks/bad news had more impact on the volatility than positive shocks/good news.But for Shanghai Composite, the value was positive and significant, showing that volatility was highly influenced by positive events. TARCH model also confirmed the result of EGARCH, as Shanghai Composite Index was proved to be negative and significant, suggesting that there was no asymmetry of leverage effect. But the results showed that leverage effects were positive and significant, for three indices S&P BSE Sensex, CNX Nifty, and Shenzhen Composite Index, attesting that bad news was more influential on volatility than good news. The negative news recorded more impact on the volatility of return than positive news, thereby rejecting the null hypothesis that **NH-3:** There is no asymmetric impact in the return series. Diagnostic checks resulted with no serial correlation and no ARCH effect in the residuals, which were desirable for modelling series with EGARCH and TARCH models.

9. Findings of the study

The study found **(Graph -1 to 4)** that the return series were stationary and found ARCH effect, as per the results obtained from ARCH LM test, which confirmed further scope for modelling return series, with advanced models. The study applied EGARCH and TARCH models and fount asymmetric effect, in almost all the return series (S&P BSE Sensex, CNX Nifty, and Shenzhen Composite Index), except with one of the Chinese Index (Shanghai Market).

10. Conclusion

The present study attempted to findout the asymmetric effect of Indian and Chinese markets, using the daily closing prices of if S&P BSE Sensex, CNX Nifty, Shanghai Composite and Shenzhen Composite Index. EGARCH (1, 1), and TARCH (1, 1) models were employed in the study, after doing the stationary and diagnostic checks. The study applied EGARCH and TARCH models and fount asymmetric effect and concluded that almost all the markets were responding to the asymmetric news. On the other hand, Shanghai market volatility was not confined to negative news but rather there was greater impact of good news than the bad shocks, as evident from the leverage parameter of both the models. The leverage effect conveyed the meaning that negative news influenced the volatility more than positive news/ shocks.

11. Limitation of the Study

The study suffered from all the limitations of secondary data.

12. Scope for Further Research

The study analysed the asymmetric effect of the Indian and Chinese return series, based on daily data. The study may further extend to measure the risk-return trade-off and half-life period of volatility. Also, volatility spillovers can be studied on these markets.

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Table-1: Summary Statistics of the Returns

	S&P BSE	CNX Nifty	SHSE	SZSE
Mean	0.00046	0.000462	0.000646	0.000432
Median	0.000819	0.000818	0.001013	0.000507
Maximum	0.1599	0.163343	0.27221	0.775565
Minimum	-0.136607	-0.130539	-0.205651	-0.179051
Std. Dev.	0.01671	0.0166	0.021809	0.024744
Skewness	-0.12361	-0.13753	0.065955	6.093389
Kurtosis	9.701042	10.28848	13.93703	180.6581
Jarque-Bera	10904.03*	12900.4*	29011.71*	7689896*

Source: Estimated by authors using eviews. *Significance at % level.
SHSE: Shanghai Stock Exchange, SZHE: Shenzhen Stock Exchange. Total numbers of observations for S&P BSE Sensex, CNX Nifty, Shanghai Composite & Shenzhen Composite index were 5820.

Table-2: Result ARCH Heteroskedasticity Test

	S&P BSE	CNX Nifty	Shanghai Composite	Shenzhen Composite
F-statistic	385.4568*	422.5272*	3.267824*	83.1281*
Observed R^2	361.6266*	394.2584*	16.31012*	81.99392*

Source: Estimated by authors using eviews. *Significance at % level.

Table-3: ADF, PP and KPSS Unit Root Test for the Stock Return Series

Indices	ADF	PP	KPSS
S&P BSE Sensex	0.0010	0.0010	0.05801
CNX Nifty	0.0001	0.0001	0.16534
Shanghai Composite Index	0.0000	0.0001	0.18207
Shenzhen Composite Index	0.0000	0.0001	0.14951

Source: Estimated by authors using eviews.

Table - 4: Results of EGARCH (1, 1) and TARCH (1, 1)

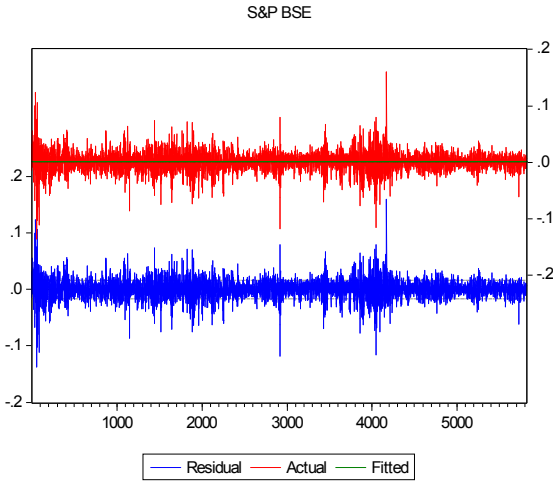
	EGARCH (1,1)				TARCH (1,1)			
Parameter	***S&P BSE***	***CNX Nifty***	***SHSE***	***SZHE***	***S&P BSE***	***CNX Nifty***	***SHSE***	***SZSE***
ω	-0.361953	-0.412579	-0.338545	-0.306139	0.000004	0.000005	0.000005	0.000004
α	0.217338	0.234199	0.289795	0.205597	0.078211	0.084975	0.163527	0.075662
γ	-0.043985*	-0.048007*	0.018528*	-0.016773*	0.061240*	0.062995*	-0.013926*	0.017743*
β	0.977005	0.972429	0.982841	0.980411	0.877451	0.868680	0.862320	0.913030
α + β	1.194343	1.206628	1.272636	1.186008	0.955662	0.953655	1.025847	0.988692
AIC	-5.670787	-5.667957	-5.168089	-5.153055	-5.674114	-5.670904	-5.167734	-5.149153
SIC	-5.665058	-5.662266	-5.162360	-5.147364	-5.668384	-5.665213	-5.162004	-5.143461
ARCH LM								
F-statistic	3.447013	3.007050	0.011985	0.173281	0.227382	0.329985	0.073382	0.155716
Obs* R-squared	3.446156	3.006534	0.011989	0.173335	0.227451	0.330079	0.073406	0.155765
Prob. F(1,5817)	0.063400	0.083000	0.912800	0.677200	0.633500	0.565700	0.786500	0.693100
Prob. Chi-Square(1)	0.063400	0.082900	0.912800	0.677200	0.633400	0.565600	0.786400	0.693100

Source: Estimated by authors using eviews.

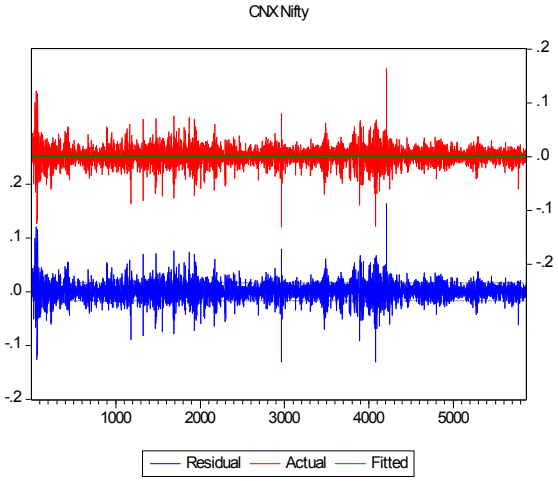
Note: SHSE: Shanghai Stock Exchange, SZHE: Shenzhen Stock Exchange, sig @ 5%

Volatility Clustering of Indices (Residual, Actual and fitted)

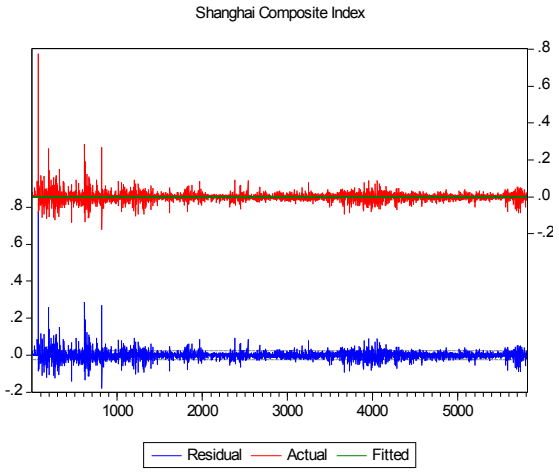
Graph-1



Graph-2



Graph-3



Graph-4