Impact of Construction Sector Stock Index Market on Volatility : An Application of Garch Model

Commerce

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ABSTRACT

In recent years, the increasing importance of the futures market in the Indian financial markets has received considerable attention from researchers, academicians and financial analysts. This paper is an attempt to examine the time varying properties of volatility of India's stock index futures market. The application of GARCH class models provides the evidence of the persistence of time varying volatility, and its asymmetric effect. It is also inferred that in India's stock index futures market, bad news increases the volatility substantially. This volatility behavior of Indian capital market may be due to recent global financial meltdown that originated from US sub- prime crisis. Such empirical evidence keeps much relevance to policy makers and regulators of India in devising prudential norms and implementing warranted policy reforms.

INTRODUCTION

Introduced in 2000, financial derivatives market in India has shown a remarkable growth both in terms of volumes and numbers of contracts traded. National Stock Exchange (NSE) alone accounts for 99 percent of the derivatives trading in Indian markets. The introduction of derivatives has been well received by stock market players. Trading in derivatives gained popularity soon after its introduction. In due course, the turnover of the NSE derivatives market exceeded the turnover of the NSE cash market. For example, in 2010-11, the value of the NSE derivatives markets was Rs. 2,92,48,221.09 Cr. whereas the value of the NSE cash markets was only Rs. 35,77,412 Cr. Among all the products traded on NSE in construction segment, single stock futures also known as equity futures, are most popular in terms of volumes and number of contract traded, followed by index futures with turnover shares of 52 percent and 31 percent, respectively. Despite the encouraging growth and developments, financial analysts feel that the derivatives market in India has not yet realized its full potential in terms of growth and trading. The reason might be the relatively high level of volatility.

The liberalization and integration of financial markets globally has created new investment opportunities, which in turn require the development of new instruments that are more proficient to deal with the increased risks. Investors who are actively engaged in industrial and emerging markets need to hedge their risks from these internal as well as cross-border transactions. Agents in liberalized market economies who are exposed to volatile stock prices and interest rate changes entail suitable hedging products to pact with them. With the advent of liberalisation and economic expansion in these emerging economies demands that corporations should discover better ways to manage financial and commodity risks. The most wanted instruments that allow market participants to manage risk in the modern securities trading are known as derivatives which are a new advent in developing countries compared to developed countries. The main reason behind the derivatives trading is that derivatives reduce the risk by providing an additional way to invest with lesser trading cost and it facilitates the investors to extend their settlement through the future contracts. It provides extra liquidity in the stock market. They represent contracts whose payoff at expiration is determined by the price of the underlying asset a currency, an interest rate, a commodity, or a stock. Derivatives are traded in organized stock exchanges or over the counter by derivatives dealers. The impact of derivatives trading on stock market volatility has received considerable attention in India, particularly after the stock market crash of 2001. Derivative products like futures and options have become important instruments of price discovery, portfolio diversification and risk hedging. In the last decade, many rising and transition economies have started introducing derivative contracts. Derivatives markets have been in existence by many accounts even longer than that for securities. However, it has been their growth in the past 30 years that has made them a significant segment of the financial markets.

REVIEW OF LITERTURE

Cox (1976) opine that the introduction of futures markets led to increase in informational efficiency, as futures are relatively inexpensive, have low margin requirements and low transaction costs. Figlewski (1978) suggests that the new traders in the GNMA market add noise to GNMA securities trading because of the introduction of futures trading. Chan et al.,1991 conclude that Index futures enable investors to trade large volumes at lower transaction costs, improve risk sharing and reduce volatility.

Figlewski (1981) examines impact of futures trading on Government National Mortgage Association (GNMA) market volatility. He concludes that the volatility of the GNMA security market is related to several factors, including futures trading. The amount of outstanding GNMA lowers cash market volatility and futures trading increases GNMA security volatility. Stein (1987) developed a model to determine prices by the interaction between hedger and informed speculators. His model demonstrates that futures markets reduce volatility and act as essential tool for risk management. Kawaller et al. (1987) conclude that movements in the index futures market led to movements in the spot market. Edwards (1988) examines the volatility effects of the introduction of share futures on percentage daily changes in the level of the S&P 500 index from 1972 to 1987. He concludes that that there is no rise in volatility subsequent to the introduction of index futures. In fact, he reported that volatility in the stock market decreased after futures trading began, although he does not directly attribute the decrease to futures trading.

Chiang and Wang (2002) investigate the impact of Taiwan Index futures trading on spot price volatility using GJR GARCH model and conclude that the trading of TAIEX

futures had a major impact on spot price volatility, while the trading of MSCI Taiwan did not. They conclude that the increase in asymmetric response behaviour following the beginning of the trading of two index futures reflects the fact that a major proportion of the investors in TSE are non-institutional investors who are generally un-informed and are prone to over react to the bad news. The introduction of the TAIEX futures trading improves the efficiency of information transmission from futures to spot markets. Raju and Karande (2003) find a reduction in spot market volatility after the introduction of index futures. Golaka C Nath (2003) investigates behaviour of stock Market volatility after introduction of derivatives by employing GARCH model. Using a sample of 20 stocks taken randomly from the NIFTY, he observes that for most of the stocks, the volatility comes down in the post derivative period while for only few stocks in the sample the volatility in the post derivatives remains same or increases marginally.

Thenmozhi and Thomas (2004) conclude that there is a reduction in volatility in the underlying stock market and increased market efficiency following the launch of NIFTY-linked futures. Pok and Poshakwale (2004) study the impact of the futures trading on spot market volatility. They used data from both the underlying and non-underlying stocks of Malaysian stock market. They used GARCH to test time varying volatility and volatility clustering in data. They conclude that the initiation of futures trading increases spot market volatility and the flow of information to the spot market. The underlying stocks respond more to recent news whereas the non-underlying stocks respond to old news.

OBJECTIVES OF THE STUDY
To examine the stock market volatility of the construction industry in India in general and particular to L&T during the period of January 2006 to December 2016.

DATA BASE AND METHODOLOGY
At the year 2015, L&T company only listed in NSE 50 as construction industry. So, daily closing values of stock index and S&P CNX Nifty have been taken from January, 2006 till December 2015. Returns (Rt) have been calculated as log of ratio of present day's price to previous day's price (i.e. Rt = ln(Pt/Pt-1)). Data relating to the price series have been obtained from website of NSE (www.nseindia.com). Given the nature of the problem and the quantum of data, to quantify and study volatility spillover, the researcher has been used Garch (1,1), T-Garch (1,1) and E-Garch (1,1).

RESULTS AND DISCUSSION
In this section, it has been evaluated if there is any volatility spillover between L&T returns and NSE 50 market for the sample series. Volatility spillover reveals that future trading could intensify volatility in the underlying spot market due to the larger trading program and the speculative nature of the future trading. The volatility spillovers hypothesis involves testing for the lead-lag relations between volatilities in the futures and spot markets. Clearly, reliable tests require common good measure of volatilities. Bollerslev's (1986) Generalize Autoregressive Conditional Heteroscedasticity (GARCH) model cannot be used due to certain regularities where it assumes that positive and error terms have a symmetric effect on the volatility. In other words, good news (market advances) and bad news (market retreats) have the same effect on the volatility in this model. This implies that the leverage effect (price rise and fall) is neutralized in this model. The second regularity is that all coefficients need to be positive to ensure that the conditional variance is never negative (i.e. measures of

risk). To overcome these weaknesses of the GARCH model in handling financial time series, Nelson's (1991) exponential GARCH (E-GARCH) model is used in order to capture the asymmetric impacts of shocks or innovations on volatilities and to avoid imposing non-negativity restrictions on the values of GARCH parameters. There are many studies in which symmetries in stock return are documented.

Analysis of Descriptive Statistics of Daily Returns of Construction Sector

A summary of descriptive statistics of returns series of Construction Sector of Nifty 50 for the entire period of ten years from January 2006 to December 2015 is presented in Table 1. This includes mean, maximum, minimum value, standard deviation, skewness, kurtosis and jarque-bera test.

TABLE NO. 1 : DESCRITIVE STATISTICS FOR L&T

Tools	L&T
Mean	-0.014
Median	0.004
Maximum	21.942
Minimum	-71.797
Std. Dev.	3.24
Skewness	-8.919
Kurtosis	194.765
Jarque-Bera	3829744
'p' Value	0.000*

Note: * - Significant at 1% level

It can be clearly seen from the table 1 depicts the daily return analysis of L&T company. After examining the data, it was found that there is negative mean in L&T as -0.014%. Therefore, it shows that negative return always associated with high volatility. Standard deviation shows the volatility which is more in the case of L&T with 3.24% for the whole study period. The coefficient of the skewness was found to be significant and negative for all the returns. Similarly, the coefficient of kurtosis was found to be positive and significantly higher than 3, indicating highly leptokurtic distribution compared to the normal distribution for all the returns. The investor's preferences for higher moments are important for security valuation and thus such preference take positive values. The Jarque-Bera statistic was indicated lack of normal distribution in the equity returns, suggesting lack of symmetric nature in the equity returns.

Analysis the volatility results with GARCH Models
The following table reports the results of GARCH (1,1), T-GARCH (1,1) and E-GARCH (1,1) models for the return series of Nifty for the period of one year from January 2006 to December 2015. 'ω' represents variance equation coefficients of constant, 'α' represents ARCH coefficient, 'β' represents GARCH (1,1) coefficient, 'γ' represents T-GARCH (1,1) coefficient and 'δ' represents E-GARCH (1,1) coefficient. GARCH class models are popular in capturing the dynamics of capital market volatility. For initial volatility estimation, the GARCH (1, 1) model is used. The model for return series is specified as under :

Variance Equation : $\sigma_t^2 = \omega + \alpha_1\,\varepsilon_{t-1}^2 + \beta_1\,\alpha_{t-1}^2$

TABLE NO. 2 : RESULTS OF GARCH MODELS FOR L&T RETURNS

Variable	GARCH (1,1)	T-GARCH (1,1)	E-GARCH (1,1)
Variance Equation			
ω	0.712143*	0.938706*	-0.503709*

α	-0.838860*	-0.861187*	-0.846297*
β	-0.218583*	-0.244976*	-0.215472*
γ		0.468548*	
δ			0.602598*
R-squared	0.615554	0.624568	0.613348
Adjusted R-squared	0.615399	0.624417	0.613192
Log Likelihood	-4305.525	-4581.056	-4262.881
Akaike info criterion	3.481845	3.704407	3.448208
Schwarz criterion	3.493587	3.716148	3.462298
Durbin-Watson stat	0.581009	0.580200	0.577484

Note : *-Significant at 1% level; ** - Significant at 5% level; NS-Not Significant

The table 2 showed that in the variance equation, the first three coefficients ω (constant), ARCH term (α) was -0.8388 and GARCH term (β) was -0.2185. For the GARCH (1,1) model all three coefficients were statistically significant and exhibited the expected sign. The value of α and β indicated that, news about volatility from the previous periods have not an explanatory power on current volatility. The sum of the two estimated ARCH and GARCH coefficients; $\alpha+\beta$ (persistence coefficients) in the GARCH (1,1) was -1.0573, very close to one which was required to have a mean reverting variance process, indicating that volatility shocks are quite persistent and takes longer time to dissipate. It is an indication of a covariance stationary model with a high degree of persistence. The impact of past volatility on the current volatility in comparison to impact of past shocks on the conditional volatility in equity market in India and even the impact of news has reduced in most recent years.

The result of T-GARCH (1,1) model revealed that asymmetric effect captured by the parameter estimate γ (0.4685) which was greater than zero suggesting the presence of leverage effect, i.e. the volatility to negative innovations is larger than that of positive innovations. In the T-GARCH (1,1) model, the estimate of α (-0.8611) was smaller than that of γ (0.6025), implying that negative shocks do have greater impact on conditional volatility compared to positive shocks of the same magnitude.

The E-GARCH (1,1) model, the dependence of volatility on its past behavior was confirmed, as β and δ coefficients appear to be statistically significant. Besides, the asymmetric coefficient δ (0.6025) showed that the Nifty 50 Index exhibited statistically significant asymmetric effects at one percent level. This indicates that negative shocks have greater impact on this market than the positive shocks.

CONCLUSION

This research, therefore studied the volatility of India's stock index market taking into account the National Stock Exchange as the role model. In this research, also notify the volatility between the Nifty 50 index and construction industry during the study period of January 2006 to December 2015. The study by employing GARCH, E-GARCH and T-GARCH models, provides the evidence of high persistence of time varying volatility, and its asymmetric effects. This volatility behaviour of Indian capital market may be due to recent global financial slowdown that originated from US sub-prime crisis. The results indicate that the trading volume growth of nearby-month index is the most influential factor for volatility in the stock market in India. Therefore, the investors are advised to predict volatility in the cash market by observing the stock volume growth as well as volatility in the index futures since volatility in the cash market is a measure of market risk.

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