ASYMMETRIC EFFECT OF EGARCH AND TARCH MODELS IN THE SHARE PRICE MOVEMENT OF HDFC BANK

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ABSTRACT

Banking is the acceleration of an economy's progress and it is one of the vital industries and tools to achieve the growth of the economy. After liberalization, the Indian banking system has seen many changes like important decisions of government to reduce it's stake from 51% in public sector banks (PSBs) and the coming up of new generation private sector banks in the post-1991 phase of changes, which further increased competition. The ability of financial system and markets to play these roles hinges on the stability in the system particularly the stock prices. Investors in the stock market are obviously interested in the volatility of stock prices, for high volatility could mean huge losses or gains and hence greater uncertainty. The objective is to measure the share price movement of HDFC bank using EGARCH and TGARCH models. The results of E-Garch model that predicts the negative shocks of the volatility that can tend to have a large impact and TARCH model is to find how far it captures the movements of the negative shocks which can also have bigger effect on the price volatility than the positive shocks. The study is analytical in nature and based on secondary data considering the Stock Price Movement of HDFC Bank in NSE index. Tools used for analyzing the stock price volatility of HDFC bank during the periods from 2011-12 to 2015-16 are TARCH and EGARCH models. Results shows evidence of volatility clustering and leptokurtic and also existence of leverage effect during the study periods in the NSE for HDFC stock prices which may be due to political and economical circumstances in the national and global that may have significantly impact on the GDP also the effects of demonetization may have considerably influence the market price. Therefore, it is recommended that HDFC bank can build a beneficial investment climate which may be a barrier of uncertainty occupied in the minds of investors can be eliminated through enhancing the scale of future expected returns by well improving its performance.

Key Words: Volatility, Stock Price, Private Sector Bank, ARCH, EGARCH, TGARCH…

1. INTRODUCTION

Banking is the acceleration of an economy's progress and it is one of the vital industries and tools to achieve the growth of the economy. Since, the banking sector is the strength of economic development, any transformation in its practice is deemed to have repercussions on the nation's development. Hence, the role of banking system and its financial viability is most important for sustainable growth of the nation.

PRIVATE SECTOR BANKS

During the mid 1980s, the scenario changed both at the political front and in the banking system in India. After liberalization, the Indian banking system has seen many changes like important decisions of government to reduce it's stake from 51% in public sector banks (PSBs) and the coming up of new generation private sector banks in the post-1991 phase of changes, which further increased competition. Thus, by 1995-96, a total of 9 private sector banks were in operation. At present we have 30 private sector banks in India, out of which 21 are old and 9 new private sector banks. These banks brought productivity, profitability, professionalism, technology, competition among private sector banks, new innovation of products and services etc. These new private banks had the advantage of starting afresh with adequate capital resources, well-trained employees, absence of nonperforming loans in their books, computerization, lean organization system, a handful of branches in chosen centers, a new variety of products and services, etc.

The financial system provides a framework within which capital formation takes place and within which the securities of members of the public are made available to other members of the public for productive investment. The Stock Exchange as an integral part of the system plays an important role in the day –to-day capital formation and wealth creation activities in any nation.

The ability of financial system and markets to play these roles hinges on the stability in the system particularly the stock prices. The major component of instability in stock prices is exhibited by the varying conditional variance (volatility) of the stock prices. Hence, to be able to establish and maintain a viable stock market that could enhance the growth of the economy, there must be an in depth and comprehensive understanding of the volatility of stock prices. Gujarati (2004) opined that knowledge of volatility is of crucial importance in many areas.

Investors in the stock market are obviously interested in the volatility of stock prices, for high volatility could mean huge losses or gains and hence greater uncertainty. In volatile markets, it is difficult for companies to raises capital in the capital markets. According to Brooks (2002), financial data exhibit a number of importance features such as leptokurtosis, volatility clustering or volatility pooling, leverage effect among others.

VOLATILITY

Volatility is defined as the conditional standard deviation of the asset returns. Thus, volatility modelling provides a simple approach to calculating value at risk of a financial position in risk management. It also plays an important role in asset allocation under mean-variance frame work. Modelling volatility of a time series can also improve the efficiency in parameter estimation and accuracy of interval forecast. This volatility index of a market has become a very important financial instrument for measuring the risk in the asset return/stock. However, a special feature of stock volatility is that it is not directly observable (Tsay 2005).

REVIEW OF LITERATURE

Dr.Gaurav Agrawal et.al (2010) research empirically examines the dynamics between the volatility of stock returns and movement of Rupee-Dollar exchange rates, in terms of the extent of interdependency and causality. To

begin with, absolute values of data were converted to log normal forms and checked for normality. Application of Jarque-Bera test yielded statistics that affirmed non-normal distribution of both the variables. This posed questions on the stationarity of the two series. Hence subsequently, stationarity of the two series was checked with ADF test and the results showed stationarity at level forms for both the series. Then, the coefficient of correlation between the two variables was computed, which indicated slight negative correlation between them. This made way for determining the direction of influence between the two variables. Hence, Granger Causality test was applied to the two variables, which proved unidirectional causality running from stock returns to exchange rates, that is, an increase in the returns of Nifty caused a decline in the exchange rates but the converse was not found to be true.

Ramanarayanan. C.S (2011) The volatility of BSE500 stock returns have been investigated and modelled using two nonlinear asymmetric models, EGARCH (1, 1) and TGARCH (1, 1) and news impact curve. We found that BSE500 returns series exhibit leverage effects and in addition to leverage effects exhibit other stylized facts such as volatility clustering and leptokurtosis associated with stock returns on developed stock markets. Further, we found that TGARCH(1,1) can be possible representative of the asymmetric conditional volatility process for daily returns series BSE500.Given the expiration of decoupling theory and consequences of global integration of emerging market with developed markets taking the consequences of any possible bad news into account and taking accurate steps before trapping in the financial crisis as it was the case about world financial crisis of 2008 is necessary. In this regards preparing necessary national funds before facing crisis is one alternative. Also, it is recommended that the rules related to common control mechanism i.e. price limits and volume quotas be restructured relative to the status of both the economy and Indian stock market trading cycles. All in all, a growing and increasingly complex market-oriented economy, and its greater integration with global trade and finance, will require deeper, more efficient, and well-regulated financial markets.

The relationship between stock market volatility and macro variables is examined not only for developed markets but also for developing markets. Since these markets are immature and have different characteristics with developed markets, macro information is reflected ineffectively. **Chinzara (2011)** conducted research for South Africa market. He documented that inflation statistically influences stock market volatility. Industrial production does not bear any information about stock market volatility. **Olweny and Omondi (2011)** applied EGARCH and TGARCH model to analyze the linkage between macro factors and stock market in Kenya for 10 years periods from 2001 to 2010 based on monthly data. Their results show that exchange rate, inflation and interest rate statistically affect stock market volatility.

STATEMENT OF THE PROBLEM

Volatility which a conditional standard deviation that can change the underlying assets return overtime which is directly not visible that happens in daily basis is observed through every day stock trading. This study is to predict the results of E-Garch model that measures the negative shocks of the volatility that can tend to have a large impact and TARCH model is to find how far it captures the movements of the negative shocks which can have any bigger effect on the price volatility than the positive shocks have. This study measures stock price movement of HDFC bank to understand how far the results are volatile in the NSE Index.

OBJECTIVES OF THE STUDY

i. To measure the share price movement of HDFC bank using EGARCH and TGARCH models.

METHODOLOGY AND RESULTS

The study is analytical in nature and based on secondary data considering the Stock Price Movement of HDFC Bank in NSE index during the periods from 2012 to 2016. Nelson (1991) proposed the extended version of GARCH which unlike the ARCH and GARCH allows for the symmetry in the responsiveness to shocks, does not impose the non-negative constraints on parameters and reduces the effect of outliers on the estimation results. EGARCH has been commonly used to examine interest rate, inflation rate of future markets, exchange rate and in the analysis of stock returns (Tsay, 2005). The last model is the Threshold GARCH model (TGARCH) created by Glosten, Jagannathan and Runkle in 1993 and Zakoian in 1994. The idea behind TGARCH is that it should be better to capture the movements of the negative shocks, due to the fact that they have a bigger effect on the volatility than the positive shocks have (Tsay 2005, p. 130). Tools used for analyzing the stock price volatility of HDFC bank during the periods from 2011-12 to 2015-16 are TARCH and EGARCH models.

Table-1: Unit Root test

ADF Statistics	HDFC Level Close Series	HDFC Return Series
Critical Value	-0.634444	-23.46697
Prob.*	0.8604	0.0000
Test critical values:		
1% level	-3.435176	-2.566743
5% level	-2.863559	-1.941067
10% level	-2.567894	-1.616535

*MacKinnon (1996) one-sided p-values.

Table 1 shows confirms the stock price movement of HDFC bank is in non stationary level during closing series and achieved stationary in return series which reveals the probability is less than 0.05. Further, the E-GARCH and TGARCH models are applied to determine the model results.

ASYMMETRIC EFFECT OF EGARCH AND TARCH MODELS

EGARCH

The asymmetrical EGARCH (1,1) model estimates the NSE returns of HDFC bank and the results are shown in the Table below.

Table-2: E-Garch Model

Dependent Variable: RETURN
Method: ML - ARCH (Marquardt) - Normal distribution
LOG(GARCH) = C(2) + C(3)*ABS(RESID(-1)/@SQRT(GARCH(-1))) + C(4)
*RESID(-1)/@SQRT(GARCH(-1)) + C(5)*LOG(GARCH(-1))

	Coefficient	Std. Error	z-Statistic	Prob.
C	0.627164	0.034576	18.13890	0.0000
Variance Equation				
C(2)	0.323709	0.025622	12.63424	0.0000
C(3)	0.073182	0.013974	5.236937	0.0000
C(4)	0.520953	0.024543	21.22615	0.0000
C(5)	0.875114	0.007792	112.3083	0.0000

R-squared	-0.008870	Mean dependent var	0.077025
Adjusted R-squared	-0.011977	S.D. dependent var	5.843472
S.E. of regression	5.878361	Akaike info criterion	5.750161
Sum squared resid	44887.11	Schwarz criterion	5.769997
Log likelihood	-3744.105	Hannan-Quinn criter.	5.757603
Durbin-Watson stat	3.191039		

It is understood from the table that the ARCH (α) and GARCH (β) and TAARCH (γ) are more than 0.01, reveals that conditional variance is explosive. the estimated coefficients are statistically significant at 1% level indicating higher leverage effect in HDFC return series during the study period implies positive shocks to the market contribute to higher increase in volatility of HDFC stock in the NSE market also implies to the positive shock magnitude on a daily basis. Hence, it is consistent with the previously established facts.

Table-3: TARCH Model

Dependent Variable: RETURN
Method: ML - ARCH (Marquardt) - Normal distribution
GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*RESID(-1)^2*(RESID(-1)<0) +
C(5)*GARCH(-1)

	Coefficient	Std. Error	z-Statistic	Prob.
C	0.865273	0.164575	5.257630	0.0000
Variance Equation				
C	4.343433	0.258425	16.80733	0.0000
RESID(-1)^2	0.702541	0.060628	11.58777	0.0000
RESID(-1)^2*(RESID(-1)<0)	-0.864051	0.095176	-9.078464	0.0000
GARCH(-1)	0.661541	0.012395	53.37264	0.0000

R-squared	-0.018210	Mean dependent var	0.077025
Adjusted R-squared	-0.021346	S.D. dependent var	5.843472
S.E. of regression	5.905509	Akaike info criterion	5.832303
Sum squared resid	45302.68	Schwarz criterion	5.852139
Log likelihood	-3797.661	Hannan-Quinn criter.	5.839744
Durbin-Watson stat	3.161768		

As expected in the TARCH effect the Gamma (γ) is negative and significant at 1% level which means that shocks including good and bad news may have significant effect on HDFC price volatility based on the NSE and can affect the market share of HDFC bank can also make its market share volatile in future periods.

SUMMARY OF RESULTS AND CONCLUSION

The result shows the asymmetric effect in EGARCH model captured by the parameter (γ) which is positive and also found statistically significant reveals that the negative shocks may have more effect on the conditional variance when compared to positive shocks. The model fitness based on AIC and SIC values (5.750 and 5.769) is low for EGARCH when compared to TARCH. However, the results of TARCH effect for price volatility of HDFC Bank in the NSE index have a negative and significant effect at 1% level means good and bad news can significantly influence price volatility of HDFC bank in the NSE index. Results shows evidence of volatility clustering and leptokurtic and also existence of leverage effect during the study periods in the NSE for HDFC stock prices which may be due to political and economical circumstances in the national and global that may have significantly impact on the GDP also the effects of demonetization may have considerably influence the market price. Therefore, it is recommended that HDFC bank can build a beneficial investment climate which may be a barrier of uncertainty occupied in the minds of investors can be eliminated through enhancing the scale of future expected returns by well improving the present and future performance.

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