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Sensitivity of NIFTY Financial Service index returns spreading of volatility and prospects for investment returns

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ABSTRACT

The role of financial intermediaries in any emerging country stands vigorous. The performance of such services provides evidence significant contribution to the country. This study purposes to evaluate the volatility spillovers, volatility sketches, leverage effect and prospects for investment returns by modeling NSE financial service index returns. For this purpose symmetric and asymmetric GARCH model employed considering the time period range from 01:2010 to 12:16 applying daily closing returns. Main results indicate significant evidence for volatile returns and volatility found persistent, evidence for unpredictable volatility shocks and presence of leverage effect. Furthermore, graphical property for actual series returns, volatility sketches and degree of skewness provided with details.

KEYWORDS | Financial risk, GARCH, Financial Services, National Stock Exchange

Introduction

Financial service sectors supports to various enterprises either with manufacturing or service sector or even financial institutions. It strongly contributes directly or indirectly to the development of the economy. Financial services also indicate their reflections in capital market of the country. Listed companies in financial services sector provides various kind of capital requirements to the enterprises, companies or associations which may be in terms of fixed capital or working capital requirements. The same also supports to exporters and importers e-business enterprises with options to short or long term funds. Financial service sector provides various types of financial services such as investment oriented, promotional oriented, performance appraisal etc. by the merchant service providers. After initiative of MAKE-IN-INDIA which motivated several small and medium business to come front. These all became primary clients of financial service sectors for venture capital financing. All these activity leads to higher interest sum for service providers. This concept creates WIN-WIN situation for both of the parties.

Related studies

This research study focused on investment prospects and returns from the financial service sector index and its performance in national stock exchange. This paper follows generalized autoregressive conditional heteroskedesticity modeling process to estimate the volatility in NSE-Financial service sector index. There are premium research contributions by domain area expert scholars. Scholars like Chen, S., Hardle, W. K., & Jeong, K. (2010) contributed research on forecasting volatility using advanced forecasting methods known as support vector machine (SVM). It is artificial neural network (ANN). The process used application of support vector machine in volatility forecasting under the GARCH framework in proportional style with simple moving average, standard GARCH, nonlinear EGARCH and traditional ANN-GARCH models. GBP exchange rates and NYSE composite index considered as sample data for comparative volatility forecasting using SVM- GARCH models. They found significant evidence that the model outperform the competing models. They also noted during the research that the standard GARCH also performs well particularly in case of normality and large sample size. Asymmetric model, EGARCH found good at forecasting volatility under high skewed distribution.

Bildirici, M., & Ersin, O.O. (2009) work with ARCH and GARCH family models and enhanced with artificial neural networks (ANN) to assess the volatility of daily returns from Istanbul Stock Exchange (ISE). They proposed ANN-APGARCH model to upsurge the predicting performance of APGARCH model. They found that the ANN extended versions of the obtained GARCH models improved forecast results. Mohammadi, H., & Su, L. (2010) inspect the practicality of several ARIMA-GARCH models for demonstrating and forecasting the conditional mean and volatility considering weekly crude oil spot prices in eleven global markets using GARCH, EGARCH, APARCH and FIGARCH. While, Lehnert, T., & De Jong, C. (2002) empirically examines a technique to enumerate volatility by the information content of index options. They originate the strictures of a GARCH option pricing model from the term structure of the observed market smile of DAX 30 index. They found the performance of EGARCH estimation fits and performs well to the covered data series.

The comparative study conducted by many scholars between symmetric and asymmetric GARCH models. For instance, Awartani, B. M. A., & Corradi, V. (2005) worked to investigate the relative predictive ability among different GARCH family models focusing on asymmetric GARCH models. The results indicate that asymmetric GARCH models perform better than symmetric GARCH. They add that result also applies to the case for longer forecast horizons. Furthermore, it also found that GARCH (1, 1) performs lower when compared with asymmetric models only, and not in case of other GARCH symmetry models. Bo, W., Shouyang, W., & Lai, K. (2007) contributed research work using hybrid ARCH-M-ANN model comparing ARIMA and GARCH (1,1) and EGARCH (1,1) along with ARIMA – ANN models on root mean square deviation and mean absolute percentage error.

Likewise study done by Ou, P., & Wang, H. (2011) to forecast stock market volatility with Gaussian process considering GARCH, EGARCH and GJR-GARCH models. They concluded their experimental result suggesting that the non-linear hybrid models captures sound symmetric and asymmetric effects of news on stock market volatility which also yields superior predictive performance compared to classic GARCH, EGARCH and GJR-GARCH approaches.

There are research work that provides comparative and detail study outcomes to judge the forecasting performance of GARCH and types of models. Such as Peters, J.P (2001) worked on detail study of comparative GARCH and GARCH family model analysis under various distributions systems. He used normal student-t and skewed student-t distributions considering FTSE100 and DAX30 financial series returns. The research work examines the forecasting performance of GARCH, EGARCH, GJR and APARCH. He concluded result suggesting that developments of the complete estimation are accomplished when asymmetric GARCH are used and when fat-tailed densities are considered into interpretation in the conditional variance.

Methodology and results

With respect to aimed objectives we employ symmetric and asymmetric GARCH models particularly GARCH (1, 1) by Bollerslev (1986) and EGARCH by Nelson (1991) to forecast the volatility and leverage effects respectively. The financial series return of NSE financial index abstracted from official website of NSE and limited data from January 2010 to December 2016.

The research process and analysis follows process mentioned hereunder;

The financial returns are converted to log returns and considered first log difference to come over unit root problems. Further, the converted (stationary) series tested with Augmented Dickey Fuller test using following formula.

$$(1-L)y = b0 + (a-1)*y(-1) + \ldots + e$$

The result property of ADF test computed using maximum 4 lag and with AIC criterion. The sample size (daily closing observations) counts 1735 observations.Whereas, descriptive statistics computed considering 1737 observations that indicates the asset series returns skewed negative at minor level and surprisingly the degree of ex kurtosis indicates better than standard results i.e. 1.5504 with comparatively high degree of standard deviations (see table1)

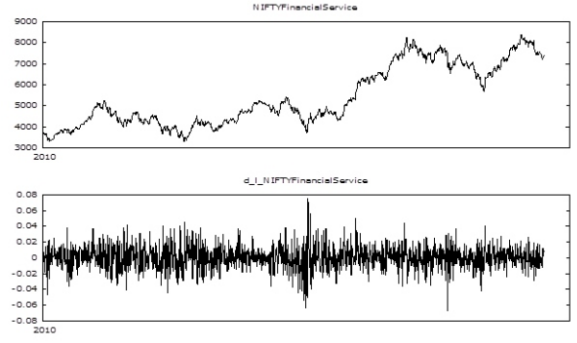
Table1- Summary Statistics, using the observations for the variable NIFTYFinancialService (1737 valid observations)

Mean	Median	Minimum	Maximum
0.000404001	0.000294305	-0.0677093	0.0753110
Std. Dev.	C.V.	Skewness	Ex. kurtosis
0.0141617	35.0537	-0.0123624	1.55045
5% Perc.	95% Perc.	IQ range	Missing obs.
-0.0227422	0.0239100	0.0160318	1

Source: Author's computation using daily returns of NSE-Financial service sector from 01:2010 to 12:2016

The graphical presentation of actual series returns and volatility sketches indicates asset price movements from less than 3500 points up to 8000 index points. NIFTY financial service index movement pattern captures several unexpected shocks and corrections during the study period. The asset of summary of statistics does not confirm the normality of NIFTY financial service index returns.

Fig1 – NIFTY Financial service actual series returns and volatility sketches



Source: Author's computation using daily returns of NSE-Financial service sector from 01:2010 to 12:2016

Presentation of quantiles – quantiles plot captures negatively skewed return which indicates long left tail. Q-Q graph indicates that whether NIFTY financial service sector index normally distributed. It represent strew plot of experiential quantiles against the hypothetical quantiles.

GARCH (1, 1) by Bollerslev modeled with normal distribution for NIFTY financial service sector index the result property fitted and considered at 5% of significance level. The forecast variance from the past period and the volatility are observed in previous period found and recorded in property of Table2. The ARCH and GARCH coefficient are significant and indicates volatility at 0.9751 magnitudes.

Table2 – GARCH(1, 1) and EGARCH results for NIFTY financial service sector index

Variable	GARCH (1, 1)	EGARCH (1, 1)
Constant	0.000696538	0.000522335
Omega	4.92919e-06	-0.302382
Alpha	0.0506660	0.0821392
Beta	0.924501	0.972177
Gamma	-----	-0.0645339

Source: Author's computation using daily returns of NSE-Financial service sector from 01:2010 to 12:2016

EGARCH (1, 1) by Nelson (1991) follows normal distribution and fits at significance of 10%. The model confirms the presence of leverage effect in financial series returns of NIFTY finance service sector. The asymmetry effect is captured by EGARCH (1, 1) model with negative sign suggesting that negative shocks produces higher impact on volatility than the positive shocks.

Conclusion

Modeling and forecasting returns from NIFTY financial service sector index explored the existing volatility from the past period, and presence of leverage effect in series returns. GARCH (1, 1) fitted well to the series returns and accepts the null hypothesis of no heteroskedesticity. Volatility as term in financial market considered as vital importance in the group community of investors, analysts, economist and researchers. For the research objectives purpose two models employed i.e. symmetric and asymmetric model of generalized conditional autoregressive heteroskedesticity and Exponential GARCH or EGARCH. The study finds strong evidence that daily returns from NIFTY financial service sector index could be categorized by GARCH (1, 1) and EGARCH (1, 1). The specimen series returns provides significant evidence of transmitting movement from normality to capture conditional heteroskedesticity in the residuals series.

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