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Demonstrating volatility for NIFTY PSU bank sector using asymmetric heteroscedastic model

KEYWORDS

NIFTY, stock market volatility, EGARCH

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ABSTRACT

The study provides significant evidence for no delay in investment returns based on no leverage effect in the financial series returns of NIFTY PSU bank sector index. Public sector banking in India delivered significant contributions to development of the country. Furthermore, public sector banks also indicated greater returns for investors from past few years for instance, the returns of investments from state bank of India. This study focuses on the aspects of leverage effects in NIFTY PSU bank sector index using exponential generalized autoregressive conditional heteroskedesticity model securing data range from February 2011 to December 2016 considering daily closing index. The result suggests that there is strong evidence of no leverage effect in asset returns of NIFTY PSU bank sector index.

Introduction

Banking system of any country represents the possibility for development and growth of country. Developing countries like India, represents strong banking sector fundamentals. The public sector unit banks (PSUs) still hold large contribution of customer accounts compared with private sector banks. Indian public sector banking system gaining the welfares of robust credit off takes the better risk administration practices. At present, the public sector banks with their present extensive division system have been principally cumulative their information technology connected disbursement. This study objects to explore and model the volatility of NIFTY PSU bank sector and attempt to investigate whether the series returns have leverage effects. The selection of the index established particular criteria such as the companies ranked with top turnover ranges considering daily and average daily full market capitalization. This index considers only public sector banks etc. Traditional investors in India priories their investment to public sector banks instead of private sector banks.

There are scholarly contributions in the area of forecasting and modeling financial market volatility. One of the most famous models is ARCH by Engle (1982) and an extension by Bollerslev (1986) with generalization term and introduced GARCH, generalized autoregressive conditional heteroskedesticity. This symmetric model does not capture the stylized facts of the market such as leverage effects, volatility spillovers etc.

In 1991 Nelson introduced Exponential GARCH also known as EGARCH. Scholars like Chen, S., Hardle, W. K., & Jeong, K. (2010) subsidized research on predicting volatility using unconventional forecasting approaches known as support vector machine (SVM). It is artificial neural network (ANN). The process used submission of support vector machine in volatility predicting under the GARCH framework in comparative style with simple moving average, standard GARCH, nonlinear EGARCH and traditional ANN-GARCH models. GBP exchange rates and NYSE composite index measured as sample data for proportional volatility forecasting using SVM-GARCH models. They found important indication that the models outperform the challenging models. They also renowned throughout the investigation that the standard GARCH also achieves well mainly in case of normality and large sample size. Asymmetric model EGARCH originate respectable at forecasting volatility under high skewed distribution.

Alberg, D., Shalit, H., & Yosef, R. (2008) contributed on a complete experiential analysis of the mean return and restricted variance accepting Tel Aviv Stock Exchange (TASE) indices using various GARCH and GARCH family models. The forecast presentation of these conditional changing variance models is associated to fresher asymmetric GJR and APARCH models. They enumerate the day of the week consequence and the influence effect and test for asymmetric volatility. In their conclusion they found that the asymmetric GARCH model with fat tailed densities advances complete approximation for calculating conditional variance. The EGARCH model using a skewed Student-t distribution is the most successful for forecasting. Whereas Aloui, C. (2007) contributed on price and volatility spillovers between the exchange rate and stock market index using EGARCH model. Al-Zoubi, H., & Kh.Al-Zu'bi, B. (2007) also contributed to measure the market efficiency and time varying volatility considering Amman stock exchange index. They empirically investigate the market efficiency and the asymmetric effect in daily stock returns of ASE. Horng, W. J., Hsu, L. H., & Hsu, H. H. (2010) contributed their research work considering Japan stock market and exchange rates using Exponential GARCH model.

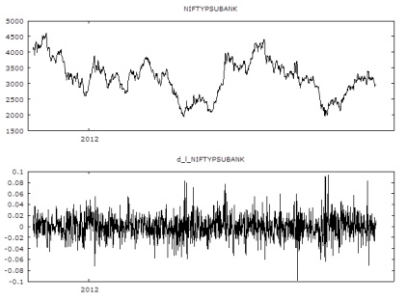
Koutmos, G., & Booth, G. G. (1995) contributed their research work using exponential generalized autoregressive conditionally heteroskedastic EGARCH model to understand transmission mechanism of price and volatility spillovers. They considered New York, Tokyo and London stock markets.

While, Walid, C., Chaker, A., Masood, O., & Fry, J. (2011) contributed comparative research study paper on stock market volatility and exchange rates in developing countries. In their research work they used Markov-Switching EGARCH model. They investigated that the results distinguish among two diverse governments in both the conditional mean and the conditional variance of stock returns.

Methodology and result discussion

The property of summary of statistics describes important contributions of index movement pattern. It suggests that NIFTY PSU bank sector index is no out of risk level in fact it contains high degree of standard deviations recorded at 0.02022 during the computation considering 1465 observations. The return is found positive skewed with significant level of ex kurtosis i.e. (1.7655).

Fig-1 NIFTY PSU Bank sector index property (original) and (stationary) series movements



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Source: Author's computation using NIFTY PSU Bank sector index from Feb 2011 to Dec 2016

The subtraction process started with adaptation of NIFTY PSU Bank sector index into log and considered first log difference. Then after the variable tested for unit root problems and test Augmented Dickey fuller test conducted. The result property computed using following formula. The test were conducted with constant and with constant and trend.

With constant,

$$(1\text{-}L)y = b0 + (a\text{-}1)*y(\text{-}1) + e$$

With constant and trend,

$$(1\text{-}L)y = b0 + b1*t + (a\text{-}1)*y(\text{-}1) + e$$

The result property of ADF test for NIFTY PSU Bank sector index considered at significant level of 1% using maximum lag value 4, and criterion AIC.

EGARCH or exponential GARCH model entity stipulates the practical form and supplies the stricture standards of exponential generalized autoregressive conditional heteroscedastic (EGARCH) model. EGARCH model attempts to discourse volatility clustering in an improvements process. Volatility clustering befalls when an inventions development does not display noteworthy auto correlation, but the alteration of the progression changes with time. EGARCH models are suitable when optimistic and undesirable shocks of equal magnitude power not subsidize similarly to volatility and stock price changes. EGARCH or Exponential GARCH was developed and introduced by Nelson (1991) which is asymmetric GARCH model and capable to capture stylized facts in financial returns. The model takes long term process and ensures the positive variances.

$$\text{Log}\, h_t = w + b_1 \log h_{t^-1} + a^1[qV_{t^-1} + g\{|V_{t^-1}| - E|V_{t^-1}|\}]$$

Where **Ω** indicates the constant, $b_1 \log h_{t^-1}$ takes the long rooted GARCH term process and $a1[qV_{t^-1}$ covers good news about the market ARCH term process and $g\{|V_{t^-1}| - E|V_{t^-1}|\}$ captures the asymmetry in the financial returns of NIFTY PSU bank sector index.

EGARCH (1, 1) conditional mean equation indicates positive results at considerable significant level of 10% and found at magnitude of 0.0012 for the covered period and consisting 1463 daily observations. However, the conditional variance equation indicates positive value for gamma and evidence for presence of no leverage effect in financial returns of NIFTY PSU Bank sector index for the covered period. Furthermore, for the additional analysis purpose the alpha value found at high significant level and indicates 0.8805 magnitude level. This analysis for EGARCH (1,1) indicates presence of no asymmetry in the financial asset returns of NIFTY PSU Bank sector index and increases the probability for early returns on investments. It also suggests that there is less volatility or equal volatility when market trading at down trends. In general, the public investors prefer to invest in public sector bank companies also with reason that there are comparatively less volatility in actual stock prices. Nevertheless, stock market investments either in public sector banking or any particular sector indicates and consists the degree of investment risks for short term investments.

Conclusion

EGARCH (1,1) fitted at significant level of 10% after considering the third difference of log returns of NIFTY PSU Bank sector index returns. The result indicates significant contribution may be useful to investors, researchers and academicians. The outcome of this research is also important that most of the financial asset returns captures the asymmetry and leverage effects whereas the present research outcomes of NIFTY PSU Bank sector index indicates no presence of leverage effect. However, the investment returns is no out of risk factors. The recorded degree of standard deviations is at high magnitudes. Summary of statistics indicates that return is positively skewed at minor level and degree of ex kurtosis does not create leptokurtosis impacts. It indicates that investor community need not to wait for longer than expected time to gain and claim their returns from listed stocks.

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