AN ANALYSIS ON FORECASTING AND MODELLING THE VOLATILITY OF NIFTY 50 COMPANIESSTOCK PRICEUSING ARCH MODEL

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ABSTRACT

This study examines the usage of ARCH model for forecasting the volatility of selected NIFTY 50 companies in India using daily adjusted closing price. In India, just 2% of the overall population participates in the stock market. Due to lack of understanding about the securities risk and return, many investors found it difficult to choose their investment. This study is based on analytical research design and a purposive sampling technique, wherein the researcher selected two significant sectors (Financial Services and Automobiles) from the NIFTY 50 index, which was listed from April 1, 2011, to March 31, 2021, based on sector weightage.

Keywords *: GARCH Family Models, Financial Services & Automobiles, Heteroskedasticity Test.*

Introduction

Stock market investments are usually expected to be risky due to their volatility. The price volatility in the stock exchange market is an essentialissue for both investors and practitioners. Volatility in the securities market denotes peaks and troughs that can result in either a loss or a gain. It is a quantitative measure of price fluctuations or the rate of return on percentage price changes.It has been a major concern for financial professionals, market players, institutional investors, regulators, and analysts in recent years (Murari Krishna, 2013). Volatility must be considered while making an investing choice in the stock market. To calculate volatility, many variables such as market rate, trading procedure, dividend distribution, and data arrival have been used(Porwal and Gupta, 2014). Volatility is the fluctuation or unpredictability of asset prices. A change in the volatility of future cash flows or discount rates, in theory, produces a change in the volatility of share values. "Fads" or "bubbles" provide another source of instability(Jakobsen, 2018).Volatility is important to investors not just for asset spot prices, in addition to derivative valuation models, hedging strategies,and portfolio management. (Islam et al. 2012). In a quantitative sense, the current study seeks to apply the GARCH family models to predict the price volatility of the NIFTY 50 companies listed on the Indian stock exchange, utilising the daily adjusted closing price for the period from 1/04/2011 to 31/03/2021.The researcher purposely chose the two sectors, financial services, and automobiles, based on their weightage. The study is based on daily adjusted closing price because to provide investors with a more current and accurate picture of the stock price.

Scope of the Study

The two sectors like financial service and automobile sector were purposefully selected by the researcher based on the sectors weightage. The study is based on the adjusted closing price of the selected 15 companies under the two different sectors.Because to give the investors a more current and accurate idea about the stock price adjusted closing price of each selected companies were taken into consideration.This study will postulate the investor to reform their investment criteria, with the GARCH family model's help for modelling and forecasting the stock price volatility.

Objectives of the Study

1. To quantify and simulate the degree of stock price volatility among the chosen NIFTY 50 Indian companies.

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2. To ascertain the 10-years association between the chosen stocks and the NIFTY 50.
3. To determine the most appropriate GARCH family models for predicting stock price volatility.
4. To make recommendations to the decision makers and stakeholders.

Review of Literature

Dallah (2011) studied the fluctuation of the Nigerian Naira in relation to four main established currencies in the world was investigated. The volatility forecasting results showed that a TGARCH model, an asymmetric GARCH model, surpasses its rivals in the context of the USD.Abdalla and Winker (2012), Babatunde (2013)used GARCH family models to investigate stock market modelling and forecasting. Their research found that the GARCH models were superior and the best suited models for forecasting stock price volatility.Godfrey (2020) examined the stock market volatility modelling for predicting accuracy was investigated utilising symmetric and asymmetric GARCH type models.Dohyunchun (2019) and Huthaifa (2020) the volatility of stock prices was examined using non-linear GARCH type models, and their findings indicated which model is superior for capturing the leverage impact, volatility clustering,leptokurtosis, and skewness. Ibrahim and Aziz (2003), Hussainy and Khanh (2009), Narayan and Reddy (2020) through empirical research, they investigated how macroeconomicvariables impact onstock market performance. Baluja (2019) did afield investigation of share price reactionto demonetization in India.Mazur et.al (2020) conducted an analytical analysis to determine how the COVID-19 pandemic and the March 2020 market crash effect the stock market and provided an empirical conclusion.

Research Methodology

Research is the "acquisition of new understanding or perhaps the inventive utilization of existing experience and understanding to generate fresh concepts, approaches, and conceptions". For the study, the analytical Research Design was employed, and the sample method was "Purposive Sampling." The sample unit for this study includes 14 companies from two key sectors, financial services, and automobiles, that are listed on India's NSEand are indexed under the NIFTY 50 as of March 31, 2021.The companies in each sector were chosen based on their sector weightage. These firms' daily adjusted closing prices were derived from financial data given by the NSE of India (source: Yahoo! Finance). Because the adjusted closing price gives investors a more up-to-date and accurate picture of the stock price.The statistical test like descriptive analysis were used. The series average value is called as mean. The root mean square deviation is called as Standard Deviation.Skewness helps to measure symmetry or the lack of symmetry in distribution. Kurtosis of the given series explains how peaked the graph is. For the standard normal distribution, the kurtosis should be 3. To validate the normality test JB test were used. The JB test statistic is calculated as:

JB = (n)/6 (S^(2 +(1)/4 (K-3)^2))

For modelling the stock price volatility three Non-Linear models like GARCH family models were applied using EViews 12 software for the study.

Analysis of Data

Table 1 shows the statistical summary, of the daily adjusted closingprice of the stock returns and the distributional properties of various descriptive statistics were abridged.

Table 1 Descriptive Statistics

S.No.	Company Name	Mean	S.D.	Skewness	Kurtosis
1	HDFC Bank	0.00062	0.0131	-0.00961	12.312
2	HDFC	0.00054	0.01733	7.63001	212.147
3	ICICI Bank	0.0005	0.02108	0.28433	7.88336
4	KOTAK Bank	0.00072	0.01637	0.0072	7.51225
5	AXIS Bank	0.00064	0.02162	-0.61359	16.5531
6	SBI	0.00055	0.02184	1.63532	20.1435
7	Bajaj Finance	0.00215	0.0223	0.41241	13.0212
8	Bajaj Finserv	0.00136	0.02101	0.08327	16.3581
9	IndusInd Bank	0.00045	0.0232	1.73248	54.7624
10	Maruti Suzuki	0.00056	0.01358	-0.1814	12.3565
11	M&M	0.00036	0.01605	-0.16173	5.37872
12	Bajaj Auto	0.00033	0.0146	-0.34251	9.34177
13	Hero Moto Corp	0.00021	0.01675	0.59671	10.3481
14	Eicher Motors	0.00169	0.02132	0.81506	8.14362

Source: Computed from EViews

The descriptive statistics of the financial services and automobile sector shows that all the selected companies' mean values are positive which indicates the fact that price has increased over the period. The standarddeviation of return series revealed that theselected companies are relatively volatile. If the skewness is normal, it should be zero. If the skewness values are positive or long right tailed it has the higher chance of getting positive returns. Similarly, if the value of skewness is negative or long lefttailed it has the higher chance of getting negative returns.For all theselectedcompanies the kurtosis value is higher than 3. It specifies that the return series are fat tailed and were not distributed normally.Jarque-Bera test were used to see the return series are distributed normally. The test statistic P-value falls between 0 and 1. At 1% significance level, the H0 was rejected, which indicates the fact that the return series were not normally distributed which is leptokurtic distribution with positive peaked curve.

It is mandatory to test ARCH effect before applying ARCH/ GARCH model. Because if ARCH effect is present, we can use GARCH family models. It indicates that the ARCH-LM Statistics and p-value for ARCH Test using Lagrange Multiplier (LM). The p-value of the test is almost 0. The critical value Chi-square (1) at 1% is 6.625. For all the selected companies the H0 is rejected at 1% significance level. This demonstrates that the ARCH effect is present in the returnseries. Therefore, GARCH family models were applied.

Major Findings of GARCH Family Models:

TheGARCH family model for both financial services and automobile sector shows the coefficient estimation for all the selected companies. The (ß1) value clearly shows the maximum information came from the past. The new information has a less impact (a1). The long run average variance is near to zero. Since GARCH (1,1) model does not capture the effect of asymmetric volatility. EGARCH (1,1) model were used for the volatility estimation of stock returns. The condition of stationarity is both the ARCH and GARCH term should be less than 1. Therefore, the stationarity condition was not met for the selected companies using the return series under EGARCH model. Since the Gamma value is non-zero it shows that there is an existence of asymmetry in the volatility, but this model does not provide valuable information whether the good or bad news affects the volatility. Therefore, TGARCH model was used. The TGARCH (1,1) model shows that the negative news significantly increases volatility and return volatility of stock is asymmetric.

Conclusion

The extensive research demonstrates the forecasting capacity, prediction, and assessment of stock market volatility for the return series of the selected NIFTY 50 companies across two sectors, financial services, and automobile, from 1 April 2011 to 31 March 2021. The TGARCH model surpasses and is regarded as the best-fitted model based on an examination of predicting performance using two distinct error statistics, such as RMSE and MAE. As a result, the TGARCH (1,1) model aids in capturing the leverage effect, forecasting accuracy, and distinguishing the asymmetry influence between positive and negative news.Based on the research, every investor ought to have a structured investment plan because it is among the most efficient methods for profiting from volatility. Moreover, before making any investment decisions, investors must evaluate the results of the selected firm.

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