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APPLICATION OF ARCH - GARCH MODELS FOR ANALYSIS OF THE FLUCTUATION OF VN_INDEX

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In the context of Vietnamese stock market, the awareness of the fluctuation of VN_Index index is the awareness of the information of stock market, and it has an important role in stock evaluation and risk management. The risk here is expressed by the fluctuation in the rate of return of the stock index. Therefore, this study focuses on analyzing the fluctuation of rate of return of VN_Index. This analysis is based on the set of daily closing stock price data for the 2007-2017 period with 2670 observations. The analysis has used the ARCH model and GARCH models. The results of the ARCH model (7) show that past shocks have a large and persistent effect on the fluctuation of the rate of return of VN_Index. This study also demonstrates that the GARCH (1,1) model is preeminent to make predictions for the conditional heteroscedastic of the rate of return. At the same time, TGARCH (1.1) provides evidence that negative shocks have a greater effect on the rate of return than positive shocks. The research achievements help securities investors gain important information for risk management, predict the fluctuations of the stock market in the short term, and identify the volatility of the market to make the right investment decision.

Keywords: *VN_Index, stock market, ARCH model, GARCH model.*

1. Introduction

Measuring the fluctuation of VN_Index index has received great attention of many securities investors because a range of financial indicators varies differently in certain normal period of time. This means the variances of the financial indicators change over time.

In classical econometric analysis, it is assumed that the variance of the errors is constant over time. However, any time seriesisaffected more or less by good andbad news and investors in the market are behavingcrowd-like behavior. The assumptionthat the variance does not change over time isoften no longer appropriate. Therefore the idea is to look at the types of data whose variances depend on time, herein a variance depends on past variances.

In recent years, ARCH (Autoregressive conditional heteroscedasticity), GARCH (General ARCH) models have been used to estimate the factors affecting the risk of financial assets in the stock market, gold market,etc. to provide information for business decisions, and especially in risk management. In 1982, Engle built an ARCH model based on the variance of the errors at a time point depending on the squared errors in the previous periods. Thus this model succeeds in explaining the change

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of variance by using only the past information of the errors itself.In the study of VN_Index series, the ARCH model shows the impact of past shocks (squared errors in the previous periods) on the fluctuation of the rate of return (variance of the errors) at a time point. However, higher-level ARCH model uses much latency so this model is not effective in making predictions. To overcome this limitation, in 1986 an expansion of ARCH model named GARCH was proposed by Tim Bollerslev, the GARCH model added the lagged variables of the conditional variance in the form of auto-regression, representative lagged variables for fluctuations in the rate of return in the past. Unlike GARCH, the GARCH-M (GARCH-in-mean) model (1987) allows the average of conditional rate of return to depend on its conditional heteroskedasticity. This is meaningful to evaluate whether the rate of return of VN_Index depends on the risk. ARCH, GARCH, GARCH_M models all have limitations in that they use the assumption that is symmetrical, meaning that these models do not concern to the sign of shocks. The TGARCH (Threshold GARCH) model was developed with the aim of considering the asymmetry between positive and negative shocks by adding to the variance equation a dummy variable.

Thus, the ARCH model and GARCH models are often built to analyze and predict conditional variances that change over time in financial data series. Therefore, this study applies the mentioned models to analyze and forecast fluctuations of VN_Index index.

2. Literature review

In the world, there have been studies discussing the effectiveness of ARCH and GARCH models in explaining the volatility of the stock market, such as the study of Karmakar (2005) on the volatility of the Indian stock market. Research shows that the GARCH (1,1) model provides good market predicting and uses the GARCH (1,1) model to give predictions for 50 stock codes. Research by Sohail Chand, Shahid Kamal and Imran Ali (2012) using ARCH model, GARCH analyzed the volatility of the price of MCB (Muslim Commercial Bank)T the authors built different ARMA models to estimate the average rate of return, basing on the results obtained and the AIC, SIC criteria, they selected the most appropriate model. Besides, the results also proved that the GARCH (1, 1) model is the best prediction model. In 2014 ErginbayUgurlu, Eleftherios Thalassinos and Yusuf Muratoglu studied the volatility of the European stock market with GARCH models with the selected data set of daily closing stock prices in emerging markets including Bulgaria, Czech Republic, Hungary, Poland and Turkey during 2001 - 2012, data collected from Reuters. The results indicate that the past shocks have a persistent effect on the fluctuation of rate of return and the impact of the news is asymmetrical.

In Viet Nam, Tran Manh Cuong and Do Khac Huong (2013) studied "Measuring fluctuations of VN_Index index by GARCH model" with the daily closing stock price data from 2000 to 2011. Usually, the studies estimating coefficients of the GARCH model use the maximum likelihood estimation method with the assumption that the errors has a normal distribution, however the authors used the GARCH (p, q) model in the case of that the errors has the normal distribution, Student distribution, generalized error distribution and student distribution deviatied. The study results show the model GARCH (1,1) with the error follows the normal distribution rule has the most effective prediction. However, the study has not shown whether the risks affect the rate of return of VN_Index and also does not assess the influence of good and bad news on rate of return. In July 2017, Pham Chi Khoa introduced the research results of "Forecasting stock price fluctuations by ARCH - GARCH models". Based on the AIC, SIC criteria, the study selected

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the ARMA (4,1) model to estimate the average value of rate of return and GARCH (1,1) model for estimating conditional heteroskedasticity. The study was conducted on the data collected during 2006 - 2016. The results show that the past rate of returns has a role in determining the present rate of returns. However, like the previous study, the author did not indicate the impact of risks and good and bad news to the rate of return of VN_Index.

3. Research methodology and Research model

To analyze the fluctuation of the VN-Index index, at first, this study develops an ARCH model to estimate the impact of past shocks on the fluctuation of rate of return, and then uses the model GARCH to add an element of the effect of past variancesto the conditional heteroskedasticity of the rate of return. Finally, this study considers the impact of risk by the GARCH_M model and the impact of good and bad information in the market on the fluctuation of the VN_Indexby TGARCH model. Models are built in a two-step process, step 1 determines the degree of the model; step2 estimates the model by the maximum likelihoodestimation method. In order to determine the degree of model, at first we must check the stationary of the rate of return series, and then select the appropriate ARMA model to estimate the average rate of returnof VN_Index, after that test the ARCH effect of the conducted model, thereby determining the degree of the model.

**** Data***

This project uses VN_Index index to represent Vietnamese stock market, and the data series including daily closing stock price in the period of 2007 - 2017. This is time series data including 2670 observations. The analysis is done on Eviews 8.0 software.

(Data source: http://www.bvsc.com.vn/DownloadMSData.aspx.)

**** Research mode***l

The fluctuation of VN_Index is estimated based on the rate of returnrt: $r_t = \log (P_t/P_{t-1})$

Where P_t, P_{t-1} is closing price of VN_Index at times t, t-1.

Mean of rate of return r_t is: $\mu_t = E(r_t/F_{t-1})$.

Risk is conditional heteroskedasticity of rt: $\sigma_t^2 = Var(r_t/F_{t-1})(1)$.

Where F_{t-1} is the set of information at time t-1.

In order to estimate mean, research uses model ARMA (p,q):

$$r_t = \mu_t + u_t \quad (2)$$

$$\mu_t = \phi_0 + \sum_{i=1}^{k} \beta_i X_{it} + \sum_{i=1}^{p} \phi_i \mu_{i-1} + \sum_{i=1}^{q} \theta_i u_{i-1} \quad (3)$$

Where X_{it} is an independent variable, ut presents the shocks of rate of return of one asset at time t. p, q is unsigned integers identified from serial correlation. After identifying p, q we estimate the average model ARMA (p,q) by ordinary least squares method (OLS), then seleting the most suitable estimated model. Bases on the obtained residual et test ARCH effect of the model.

From (1) and (2) we have: $\sigma_t^2 = Var(r_t/F_{t-1}) = Var(u_t/F_{t-1})$.

The ARCH model suggests that the variance of the errors at time t depends on the squared errors in the previous periods.

Model ARCH (p) has the form:

$$r_t = \mu_t + u_t, \quad u_t = \sigma_t \varepsilon_t, \quad \sigma_t^2 = \gamma_0 + \gamma_1 u^2_{t-1} + \gamma_2 u^2_{t-2} + ... + \gamma_p u^2_{t-p} \quad (4)$$

Where σ_t^2 represents the fluctuation of r_t, $\gamma_0 > 0$; $\gamma_j \geq 0$; j=1,…,p;

Assumes that εt~IID (Independent and identical distribution);

$E(\varepsilon_t)=0; Var(\varepsilon_t) = 1$; $u_t \sim N(0; \sigma_t^2)$ or Student distribution.

Befor estimation ARCH model by maximum likelihood estimation, we have to identify the degree of the model ARCH bases on the serial correlation of e_t^2 . The weekness of ARCH(p) model is using many latencies, it causes difficulty on prediction, therefore the GARCH(p,q) models are reasonable alternatives.

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Model GARCH (p,q) has form:

$r_t = \mu_t + u_t, u_t = \sigma_t \varepsilon_t,$

$\sigma_t^2 = \alpha_0 + + \alpha_1 u^2_{t-1} + \alpha_2 u^2_{t-2} + ... + \alpha_p u^2_{t-p} + \beta_1 \sigma^2_{t-1} + \beta_2 \sigma^2_{t-2} + ... + \beta_q \sigma^2_{t-q}$ (5)

Where $\alpha_0 > 0; \alpha_i \geq 0$, $\beta_j \geq 0$; $\sum_{i=1}^{\max(p;q)} (\alpha_i + \beta_i) < 1$. If p>q then $\beta_i = 0$ with i>q. If p<q then $\alpha_i = 0$ with i>p. Assumes that $\varepsilon_t \sim IID$; $E(\varepsilon_t) = 0; Var(\varepsilon_t) = 1$, $u_t \sim N(0; \sigma_t^2)$ or Student distribution.

To assess the impact of risk on the study average rate of return using the GARCH(1,1) _M model.

Model GARCH(1,1)_M has form:

$r_t = \mu_t + c\sigma_t^2 + u_t, u_t = \sigma_t \varepsilon_t, \ \sigma_t^2 = \alpha_0 + \alpha_1 u^2_{t-1} + \beta_1 \sigma^2_{t-1}$ (6)

One other form of GARCH(1,1)_M: $r_t = \mu_t + c\sigma_t + u_t$ (7), c is a constance. If c>0 then when the risk increases the rate of returnencreases also. The study also uses the TGARCH (1,1) model to measure asymmetric fluctuations.

Model GARCH(1,1)_M has form:

$r_t = \mu_t + c\sigma^2_t + u_t, u_t = \sigma_t \varepsilon_t, \ \sigma^2_t = \alpha_0 + \alpha_1 u^2_{t-1} + \beta_1 \sigma^2_{t-1}$ (6)

One other form of GARCH(1,1)_M: $r_t = \mu_t + c\sigma_t + u_t$ (7), c is a constance. If c>0 then when the risk increases the rate of returnencreases also. The study also uses the TGARCH (1,1) model to measure asymmetric fluctuations.

Model TGARCH (1,1) has form:

$\sigma^2_t = \alpha_0 + \alpha_1 u^2_{t-1} + \gamma\, u^2_{t-1}\, d_{t-1} + \beta_1 \sigma^2_{t-1}$(8)

Where, dt is dummy variable, $d_t = 1$ if $u_t < 0$, dt = 0 if $u_t > 0$. In model TGARCH good news ($u_t > 0$), and bad news ($u_t < 0$) have different effects on conditional variance. Good news has an effect α1, while the bad news have an effect ($\alpha_1 + \gamma$). If $\gamma \neq 0$, then the effects of good and bad news are asymmetrical.

Model TGARCH (p,q) has form:

$$\sigma_t^2 = \alpha_0 + \sum_{i=1}^{p} (\alpha_i + \gamma_i d_{t-i}) u_{t-i}^2 + \sum_{j=1}^{q} \beta_j \sigma_{t-j}^2$$

Where, $d_{t-i} = 1$ if $u_{t-i} < 0$, $d_{t-i} = 0$ if $u_{t-i} > 0$, α_i, γ_i, β_j are unsigned parameters satisfy the assumption of the model GARCH.

4. Research result

Statistics describing the rate of return of VN_Index index (its code is RVN_Index) is summarized in the following Table 1:

Table 1: *Descriptive statistics of the rate of return series of daily VN_Index.*

Mean	0.000106
Maximum	0.046468
Minimum	-0.066395
Std. Dev.	0.014577
Skewness	-0.200626
Kurtosis	4.423806
Jarque-Bera	243.3488
Probability	0.000000
Observations	2669

(Source: Results of data analysis of the author)

The mean of the rate of return is positive 0.0106%, which indicates that the price of VN_Index increases during the observed period about mean. The skewness is different from 0 and kurtosis is greater than 3, which implies that the rate of return does not follow to the normal distribution rule. Combine with the Jarque-Bera test that has a very small value of p_value = 0.000000, then at 1% significance level it can be said that the normal distribution hypothesis has been rejected (Figure1).

The graph shows the daily rate of return of VN_Index fluctuates with a large range around the average. Moreover, these fluctuations seem to last over a certain period; the period of high and low volatility tends to follow, that is, there are clustering fluctuations and these fluctuations seem autocorrelation. On the data set, we calculate the variance of the rate of return is 0.0002125. But the variance calculated with this simple calculation does not deal with cluster, it is only a homoscedasticity, not taking into past the rate of return. Therefore, we use the ARCH model, GARCH models to estimate the fluc-

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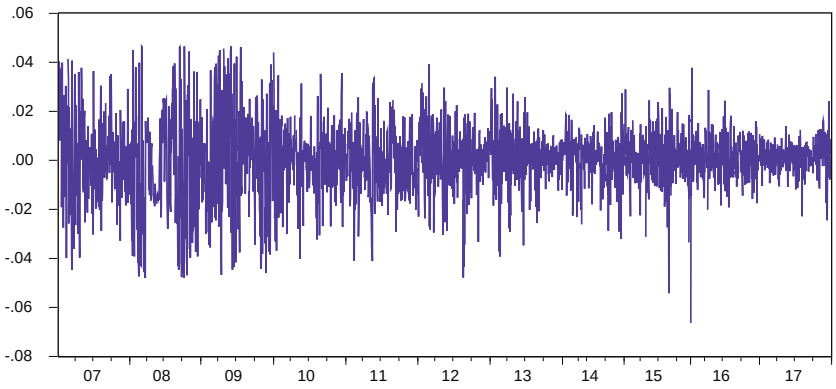

(Source: Results of data analysis of the author)

Figure1: *Graph of rate of return RVN_INDEX in the period 2007 - 2017*

tuation of the rate of return of the VN_Index over time. To apply the ordinary least squares method (OLS) regression to the mean equation of the rate of return sequence, we have to check the stationary of the sequence.

So the RVN_Index sequence is a stationary series with a 1% significance level. Moreover, based on the autocorrelation scheme, once again, the sequence of rate of return of VN_Index is stationary series, because the first-order autocorrelation coefficient of the series is 0.252 and rapidly decreases to 0.

Looking at the schema, we have a correlation coefficient and the partial correlation coefficient rapidly decreases to 0 so p = q = 1. Considering the ARMA (1,0), ARMA (0,1), ARMA (1,1) estimate the average of the rate of return, the estimated results obtained by the ARMA model (0,1) (NOT C) is most suitable because it has the value of the two smallest AIC and SIC criteria.

Testing the ARCH effect of the ARMA (0,1) model obtained results, with the significance at 1% the model has ARCH effect means that the variance of errors

Table2: *The result of stationary test by Augmented Dickey Fuller test (ADF)*

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-39.96170	0.0000

(Source: Results of data analysis of the author)

(Source: Results of data analysis of the author)

Figure 2: *Autocorrelation scheme of RVN_Index series*

Table 3: *Results of estimating ARMA models*

	Models	C	AR(1)	MA(1)	AIC	SIC
1	**ARMA(1,0)**	0.0000962 (p=0.7922)	0.252231 (p=0.0000)	-	-5.683927	-5.679513
2	**ARMA(0,1)**	0.000108 (p=0.7533)	-	0.254470 (p=0.0000)	-5.684158	-5.679745
3	**ARMA(1,1)**	0.0000994 (p=0.7788)	0.115836 (p=0.1201)	0.146234 (p=0.0489)	-5.684418	-5.677796
4	**ARMA(1,0) (NOT C)**	-	0.252266 (p=0.0000)	-	-5.684651	-5.682443
5	**ARMA(0,1) (NOT C)**	-		0.254496 (p=0.0000)	-5.684870	-5.682664
6	**ARMA(1,1) (NOT C)**	-	0.116029 (p=0.1194)	0.146070 (p=0.0491)	-5.685138	-5.680724

(Source: Results of data analysis of the author)

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changes over time, we determine the degree of the ARCH model is 7. Using the maximum likelihood estimation method (ML) we obtain the results that the estimated coefficients are positive and statistically significant.

Equation estimateformean of RVN_Index: = 0,1896et-1. The results show that with the significance at 1% the shock at time t-1 explains 18.96% the change averageof rate of return of VN_Index at time t.

The regression formula of σ^2_t :

$=0.0000348 + 0.166845e^2_{t-1} + 0.167541\ e^2_{t-2} + 0.116710\ e^2_{t-3} + 0.107632\ e^2_{t-4} + 0.127127\ e^2_{t-5} + 0.132828\ e^2_{t-6} + 0.039431\ e^2_{t-7}$ (α^2_t=0,027837<1/3).

The coefficients of the equation show that the variance of rate of return RVN_Index at time t depends on the shocks at the previous 7 points. This proves that past shocks affect the fluctuation of rate of return of VN_Index index. The results are consistent with Vietnam stock market, we can see through some historic milestones of the stock market of Vietnam, such as the start of 2007 VN_Index closed at 741.27 points and VN_Index is increasing rapidly in the early days of that year. On March 12, 2007, VN_Index established a highest record of 1170.67 points. From February to July 2007, VN_Index kept a very high level, almost reached over 1000 points. This result is due to the wave of equitization of state-owned enterprises, typically Vietcombank, Bao Viet, etc. Or just in the first 6 months of 2008 in 118 trading sessions, there were 73 sessions of VN_Index decline. The decline, under the impact of the global financial crisis since the end of 2007, the domestic economy faced many difficulties, greatly affecting the belief of investors. Most recently, the stock market has achieved many impressive figures in 2017. In 2017, the wave of "giants" and banks has helped the market grow strongly in scale. As of December 19, market capitalization and fund certificates reached VND 3.360 trillion, up 73% compared to the end of 2016, equivalent to 74.6% of GDP, exceeding the set target for year 2020.

The ARCH (7) model uses a lot of latencies, making it difficult to use for prediction, so GARCH models are suitable alternatives to the higher - degree ARCH model to measure the fluctuation of rate of return in Vietnamese stock market. The estimated results of model GARCH (1,1), GARCH (1,1)_M are summarized in Table 4.

Regression coefficients such as μ, α_1 and β_1 are statistically significant at 1% level. However, the coefficients C in the equation for estimating the average rate of return in the GARCH(1,1)_M model are not statistically significant, which proves that we can notcome to a conclusion that risks affect the rate of return. At the same time it shows that the GARCH(1,1) model is most suitable to predict the average rate of return of the VN_Index and its variance.

In the equation of conditional variance, the models' results show that the coefficient β_1 is much greater than the coefficient α_1, the shock when occurring has a long-term effect on the rate of return of the VN_Index. The result of the GARCH(1,1) model indicates that with significance at 1% level, the shock at time t-1 explains 18.79% of the change in average rate of return at time t. In addition, we have $\alpha_1 + \beta_1 = 0.983428 < 1$ but very close to 1, meaning that past shocks have a persistent effect on the fluctuation of rate of return of the VN_Index and $\beta_1 = 0.83145$ represents the volatility of the market in the long-term, and the rate of return at time t is

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Table 4: *Results of estimation GARCH(1,1), GARCH(1,1) _M*

Coefficients	GARCH(1,1) (5)	GARCH(1,1) _M (6)	GARCH(1,1) _M (7)
Mean			
μ	0,187988***	0.187344***	0.187858***
	[9.086752]	[8.998498]	[9.014623]
C	-	0.036502	1.869808
	-	[1.579881]	[1.168186]
Variance			
Constant	0,00000396***	0,00000405***	0,00000404***
	[5.243802]	5.287771	
α_1 (ARCH effect)	0.151978***	0.153338***	0.153021***
	[10.42472]	10.39736	10.38999
β_1 (GARCH effect)	0.831450***	0.829699***	0.829953***
	[53.79074]	53.13366	53.17810
* p < 0,05; ** p < 0,01; *** p < 0,001			

(Source: Results of data analysis by the author)

greatly influenced by the fluctuation of the rate of return at time t-1 up to 83.145%.

The estimation of TGARCH(1,1) model shown in Table 5. The results show that the negative shocks (u_t<0) contribute to σ^2_t of an amount of 0.128538 + 0.051249 = 0.179787, while those positive shocks (u_t>0) contribute 0.128538. This implies negative shocks or bad news that affects the fluctuation of rate of return of VN_Indexis more than positive shocks or good news, with thedifference of about 5.12%.

**** Prediction by the result of GARCH (1,1) model***

Basing on the estimation results of the GARCH model (1,1) and the closing price of VN_Index on December 29, 2017, we could predict the VN_Index closing price on January 2, 2018 at 985.37 while the actual price on January 2, 2018 was 995.77, prediction error MAE = 0.0104, RMSE = 0.0141. The result of low predicting error indicates that the

Table 5: *Results of estimation TGARCH(1,1) model*

Coefficients	TGARCH(1,1)
Mean	
μ	0.188865***
	[8.987423]
Variance	
Constant	0,00000439***
	[5.693966]
α_1 (ARCH effect)	0.12853***
	[7.042499]
β_1 (GARCH effect)	0.826461***
	[51.59461]
Γ	0.051249*
	[2.541995]
* p < 0,05; ** p < 0,01; *** p < 0,001	

(Source: Results of data analysis of the author)

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model gives good prediction results. By the static and dynamic predictive methods we predict the conditional heteroskedasticity of the rate of return of VN_Index index on January 2, 2018, respectively, 0.000094 and 0.00023896. Prediction results show that the conditional heteroskedasticity of the rate of returnconverges to homoscedasticity when the forecast length increases. Since the study has a large number of observations, only from the observation No. 656 do the predicted values for the variance by the dynamic predictive methods give the same results and its results are equal to homoscedasticity, so the dynamic predictive values are not significant for future times when the sample size is large.

5. Proposal

The results of this research provide securities investors with meaningful information to identify the volatility of the Vietnamese stock market. The results show that the market fluctuates constantly and the fluctuation has large and persistent dependence on good and bad information, especially bad information. The information affecting the market here may be new policies of the Government, changes in interest rates, exchange rates, business performance of the issuing company, changes of the stock index on the world stock markets, etc. Therefore, in times when the market is affected by shocks, investors need to be cautious when making their decisions. Besides, the results also show that the forecast of stock prices, the fluctuation of VN_Index is not really effective, only forecasting one day after the collected data chain. So when it is necessary to make a forecast for the stock price, investors should combine the results of the ARMA, GARCH models with regular analysis to get the most accurate view of the fluctuation market.

6. Conclusion and future work

**** Conclusion***

The study applies the model ARMA (0,1), ARCH (7), GARCH (1,1), GARCH (1,1) _M, TGARCH (1,1) to analyze the variation of rate of return of the VN_Index index with data set of 2670 observations from January 2, 2007 to December 29, 2017. The research results are:

- The ARCH (7) model shows past shocks have a strong impact on the present rate of return of the VN_Index index and furthermore, and he shocks have a persistent effect on the fluctuation of rate of return. However, higher-degree ARCH models use a lot of latencies, so they are not effective in making predictions; therefore, it is necessary to select the GARCH model instead. The study shows that the GARCH (1,1) model is preeminent to make predictions for the conditional heteroskedasticity of rate of return, which is similar to previous results of Karmakar (2007), Goudarzi (2010), Sohail Chand, Shahid Kamal and Imran Ali (2012), Tran Sy Manh and Do Khac Huong (2013), and Pham Chi Khoa (2017).The GARCH (1,1) model shows that the past rate of return determines the current rate of return and the fluctuation of the current rate of return is affected not only by past shocks but also affected significantly (about 83.14% at 1% significance level) by the fluctuation of rate of return in the past.

- The GARCH (1,1)_M model proves that it is not possible to make a conclusion that the risk affects the rate of return of VN_Index index and the TGARCH (1.1) model shows that there is asym-

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metric information in the data series studied, in particular, negative shocks have greater effects on therate of return (5.12% with 5% significance) than positive shocks. This is also a new contribution of this research compared to previous results. Besides, the study also gives a forecast for the price of VN_Index and the fluctuation of the rate of returnon the next day of the data set, which is day January 2, 2018.

**** Future work***

The ARMA - GARCH model is meant to simulate past behaviors, which is the basis for prediction, so the predicting model becomes insignificant, because the model does not take into account other elements impacts on the stock market. The ARMA model only predicts in the short term, so the study only gives a forecast for VN_Index price within 1 day next to the end of the data. As the VN_Index is irregular, if there is a shock impact on the market, it will make VN_Index strongly adjust. In fact, it is difficult to make a forecast for price of VN_Index in long term, due to the fact that Vietnam stock market is dominated by many factors such as investor psychology, macro factors and government policies... From these limitations, the research opens the next direction to study the construction of regression model to analyze the impact of the factors affecting the fluctuation of the VN_Index index. Construction model with dependent variable is VN_Index index and explanatory variables are interest rate, GDP growth, world stock price volatility, fluctuations in gold price, foreign exchange, etc.◆

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Summary

Thị trường chứng khoán (TTCK) Việt Nam, nắm bắt được sự biến động của chỉ số chứng khoán VN_Index chính là nắm bắt được thông tin của thị trường, nó góp một vai trò quan trọng trong việc định giá chứng khoán và quản trị rủi ro. Rủi ro ở đây được thể hiện qua sự biến động tỷ suất sinh lợi của chỉ số chứng khoán. Vì vậy bài viết tập trung phân tích sự biến động của tỷ suất sinh lợi của VN_Index dựa trên bộ số liệu giá đóng cửa hàng ngày trong giai đoạn 2007-2017 với 2670 quan sát. Việc phân tích được thực hiện bằng cách sử dụng mô hình ARCH và các mô hình GARCH. Kết quả mô hình ARCH (7) chỉ ra các cú sốc trong quá khứ có ảnh hưởng lớn và dai dẳng đến sự biến động của tỷ suất sinh lợi của VN_Index. Nghiên cứu cũng chứng minh rằng mô hình GARCH(1,1) là ưu việt để đưa ra dự báo cho phương sai sai số có điều kiện của tỷ suất sinh lợi. Đồng thời mô hình TGARCH(1,1) cung cấp bằng chứng cho thấy các cú sốc âm có tác động đến sự biến động tỷ suất sinh lợi lớn hơn các cú sốc dương. Các phát hiện qua nghiên cứu giúp cho các nhà đầu tư chứng khoán nắm được những thông tin quan trọng trong việc quản lý rủi ro, dự báo những biến động của TTCK trong thời gian ngắn hạn và nhận định sự biến động của thị trường để đưa ra quyết định đầu tư đúng đắn.

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