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IMPLEMENTATION OF VOLATILITY MODEL IN MODELING RELATIONSHIP BETWEEN SHARE TRADE VARIABLES

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ABSTRACT

This study deals with the comparison of Generalized Autoregressive (GARCH) models and square returns in analyzing the relationships between stock trading variables. Stocks that have a statistically significant relationship between volume and volume return squared (volatility) cannot be grouped based on the average monthly market capitalization. Based on causal and contemporary models, it is indicated that intraday trading of LQ-45 stock samples is following the theory of the sequential information arrival hypothesis (SIAH) when using the quadratic return model. When viewed from a contemporary basis, this research uses the quadratic return volatility model following Valentika et.al (2017) research using the GARCH volatility model. If viewed from a causal basis, this research that uses the quadratic return volatility model conflicts with the Valentika et.al (2017) study using the GARCH volatility model.

Keywords: *Stock; Volatility*

1. INTRODUCTION

Securities that are more than one year old are traded on the capital market (Tandelilin, 2010). The stock market is one of the instruments of the capital market. This study takes supporting variables on the stock market, including volume and return volatility. Two hypotheses underlie the contemporary positive relationship between volatility and volume, namely the mixture of distribution hypothesis (MDH) and the sequential information arrival hypothesis (SIAH) (Paital and Sharma, 2016).

In MDH theory, trading volume and return volatility have a contemporary relationship but do not have a causal relationship (Paital and Sharma, 2016). In SIAH theory, volatility and volume have a positive contemporary relationship. The Smirlock and Starks (1988) hypothesis are that volatility and the volume of having a causal relationship may exist in one direction (Paital and Sharma, 2016).

The variables used in this study have previously been examined and

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have conclusions about the relationship between some of these variables. One of the studies on these variables is Valentika, et.al (2017) modeling the relationship between stock trading variables. The return volatility in Valentika. et.al (2017) is modeled by the GARCH model. One of the results of Valentika, et.al (2017) research is that in terms of a causal relationship, it is indicated that the intraday trading of LQ-45 stock samples is in accordance with MDH theory. When viewed from a contemporary basis, Valentika, et.al (2017) suspect that intraday trading of LQ-45 stock samples is in accordance with SIAH theory.

Besides using the GARCH model, volatility can be modeled with quadratic returns as in the research of Paital and Sharma (2016). Thus, the relationship between trading volume and return volatility using the volatility model that is quadratic return and with the GARCH model is interesting to compare. This study takes a case study of the Indonesian stock index, namely the LQ-45 stock index.

2. LITERATURE REVIEW

Return

The purpose of investors in investing is to maximize returns, without forgetting investment risk factors that must be addressed. Return is one of the factors that motivates investors to invest and is also a reward for the courage of investors to bear the risk of their investments (Tandelilin, 2010). Many research is done to illustrate the economic calculations and then policy recommendations are made to maximize the return on investment and development in any field, (Pearce, 2016).

Volatility

Stock volatility is a measure of the uncertainty of return provided by stocks. Stock price volatility is a measure of how certain we are about future stock price movements. As volatility increases, stocks will likely increase very well or very badly. For shareholders, these two results tend to compensate for each other (Hull, 2012).

Trading Volume

Trading volume is the number of units of shares traded in a certain period, usually daily (Bodie et al. 2006). Pursuant to Decision of Board of Directors of PT Bursa Efek Jakarta noKep-306 / BEJ / 07-2004 hence in the framework of conducting Securities trading that is regular, reasonable and efficient, the Listed Company must submit to Exchange periodic reports, incidental reports, and Public Expose, (Irawati, 2019).

Bid-Ask Spread

Bid-ask spread is the difference between ask (the lowest price at which someone is willing to sell an asset or security) and the bid (the highest price at which someone in the market is ready to buy it). Spreads are also often used as a measure of market uncertainty and market liquidity. The average bid-ask spread is also used as a measure of the

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consensus value of an asset (Darity 2008). Bid-askspread (BAS) and also depth of the limit order book are well enough to measure market quality, (Shang et al., 2018).

3. RESEARCH METHOD

Relationships between stock trading variables analyzed in this study are contemporary relationships and causal relationships.

Data Collection Techniques

The data in this study were obtained from secondary data from various references, especially from www.idx.co.id and www.yahoofinance.com.

Sample Collection Techniques

The sampling technique in this study was purposive. This study uses daily data from February 1, 2016, to July 29, 2016. The shares of this study use shares that are consistent and have the effect of Generalized Autoregressive Conditional Heteroscedasticity (GARCH), namely GARCH (1,0) and GARCH (1,1).

Data Analysis Techniques

The method used is Ordinary Least Square (OLS) in a simple linear regression equation to determine contemporary relationships between trade variables and use the Granger Causality Test to test the interrelationships or causal relationships between trade variables. Besides, this study uses the Pearson correlation to see the correlation between trade variables.

4. RESULTS AND DISCUSSION

Research data

This research discusses contemporary relations and causality between trade variables. Shares in the LQ-45 index in this study follow Valentika, et.al (2017). Intraday data in this study had 242 days following Valentika et.al (2017). EViews and Microsoft Excel software used in this study.

Large capitalized stocks are shares that have a market capitalization of above 90 trillion rupiahs. Medium capitalized shares are shares that have a market capitalization of between IDR 50 trillion and IDR 90 trillion. Small capitalized shares are shares that have a market capitalization of under 50 trillion rupiahs. The categorization of monthly market capitalization from August 2015 to July 2016 is presented in Table 1.

Table 1. The Categorization of Shares is Based on Monthly Market Capitalization

Stock Code	Category*	Stock Code	Category*
AALI	Small	JSMR	Small
ASRI	Small	KLBF	Medium
BMRI	Large	LPKR	Small

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CPIN	Medium	MNCN	Small
ICBP	Medium	SMGR	Medium
INDF	Medium	UNVR	Large

*Market capitalization from August 2015 to July 2016.

Research Model

The contemporary model of trading volume and return squared (volatility) in equation (1).

$$Rt2 = \alpha 1 + \beta 1Vt + u1t \quad (1)$$

With the independent variable R_t^2, the independent variable V_t, the regression parameter is β_1, and the intercept value is α_1.

The causal model of stock trading volume and quadratic return (volatility) in equations (2) and (3).

$$R_t^2 = c_1 + \sum^{p} \varphi_{1(i)} R_{t-i}^2 + \sum^{p} \varphi_{2(i)} V_{t-i} + \eta_{1t} \quad (2)$$

$$V_t = c_2 + \sum_{i=1}^{p} \varphi_{3(i)} R_{t-i}^2 + \sum_{i=1}^{p} \varphi_{4(i)} V_{t-i} + \eta_{2t} \quad (3)$$

With R_t^2, and η_{kt}, respectively, are t. c_k is intercept, $_{(i)}$ is the parameter volatility, volume and error term k at time and p is the optimal lag.

Cross Correlation

Pearson coefficient was used in this study. Table 2 presents the results of the Pearson correlation.

Table 2. Correlation Coefficient Return Squares (Volatility) and Volume

Stock Code	$R_t^2 \leftrightarrow V_t$
AALI	0.289142*
ASRI	0.435687*
BMRI	0.386133*
CPIN	0.337531*
ICBP	0.259701*
INDF	0.368386*
JSMR	0.460861*
KLBF	0.425071*
LPKR	0.263803*
MNCN	0.290267*
SMGR	0.288088*
UNVR	0.307431*

*significant at the 5% level.

Table 2 shows the correlation between the return squared (volatility) and the trading volume for all stocks.

Contemporary Model of Volume of Return Squared (Volatility)

The contemporary model between volume and return squared (volatility) is equation (1). Table 3 presents a contemporary model between volume and quadratic return (volatility).

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Table 3. A Contemporary Model of Volume Concerning Quadratic Returns (Volatility)

Stock Code	α_2	t-stat	β_2	t-stat	*R-sq*
AALI	-0.009640*)	-3.659947	0.000892*)	3.861658	0.096245
ASRI	-0.021707*)	-3.726509	0.001263*)	3.806110	0.189823
BMRI	-0.007986*)	-4.910973	0.000695*)	5.041329	0.154209
CPIN	-0.023985*)	-3.192644	0.001614*)	3.296939	0.113927
ICBP	-0.005416*)	-3.150869	0.000398*)	3.305062	0.067445
INDF	-0.011364*)	-3.299353	0.000922*)	3.412965	0.126928
JSMR	-0.010663*)	-4.072993	0.000724*)	4.174768	0.212393
KLBF	-0.013889*)	-3.811741	0.001007*)	3.898733	0.178602
LPKR	-0.006142*)	-4.036092	0.000424*)	4.304903	0.072241
MNCN	-0.011512*)	-4.290831	0.000921*)	4.683146	0.084375
SMGR	-0.012275*)	-3.220794	0.000999*)	3.310514	0.084746
UNVR	-0.005502*)	-4.897911	0.000477*)	5.045057	0.083998

*)Significant at the 10% level.

Table 3 shows the parameter coefficients in the contemporary relationship model between stock trading variables and the significance of the parameter coefficients of the model.

Stationary Testing

The stationary data were checked with the Augmented Dickey-Fuller Test (ADF test). The ADF test results show that all stationary variables are at the level with a real level of 10% except the variable trading volume in MNCN shares. The volume variable on MNCN stock is stationary on the first differentiation.

Granger Causality between Volume and Return Squared (Volatility)

Granger causality test is used to test cause and effect relationships. The optimal lag in this study is Akaike's Information Criterion (AIC). The causal model between volume and return squared (volatility) returns is equation (2) and equation (3). Table 4 presents the results of the Granger causality test between volume and return squared (volatility).

Table 4 Causal Granger Between Volume and Return Squared (Volatility)

Stock Code	H_0: Volume is not the cause of Granger Volatility		H_0: Volatility is not the cause of Granger Volume		Lag
	F-stat	H_0	F-stat	H_0	
AALI	1.66117	Not Rejected	1.64903	Not Rejected	2
ASRI	1.96603	Not Rejected	1.37223	Not Rejected	4
BMRI	0.71655	Not Rejected	0.42709	Not Rejected	1
CPIN	1.72040	Not Rejected	2.10198	Rejected*)	5
ICBP	1.55787	Not Rejected	0.50917	Not Rejected	5

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INDF	0.34021	Not Rejected	3.26863	Rejected*)	1
JSMR	3.96777	Rejected*)	0.46927	Not Rejected	2
KLBF	1.99223	Not Rejected	3.34268	Rejected*)	2
LPKR	2.22014	Not Rejected	0.40994	Not Rejected	1
MNCN**)	0.92492	Not Rejected	1.09665	Not Rejected	6
SMGR	1.99162	Rejected*)	2.42199	Rejected*)	7
UNVR	0.75627	Not Rejected	2.87766	Rejected*)	4

*) significant at the 10% level.

**)Volume and return squared (volatility) at the first differentiation.

Discussion

Discussion of Cross Correlation:

From Table 2, the square of return (volatility) of all shares is positively related to the trading volume of shares at the 10% level.

Discussion of Contemporary Relations:

From Table 3, the volume of quadratic returns (volatility) for all shares is positively related to the significant positive contemporary level of 10%. So, enough evidence to say that the market follows the theory of SIAH if the quadratic return model. So it is following Valentika Research et al. (2017). Contemporary related stocks between volume and return squared (volatility) cannot be grouped based on the average monthly market capitalization.

Discussion of Granger Causal Relations:

From Table 4, SMGR is bidirectional between the return squared (volatility) and volume. Because SMGR shares are bidirectional, there is not enough evidence to say that the market follows the MDH theory. As a result, it is indicated that the LQ-45 stock sample's intraday trading matches the SIAH theory if it uses a quadratic return model. Meanwhile, Research Valentika et.al (2017), the volatility using the GARCH model indicated that the stock market was following MDH theory.

5. CONCLUSION

Stocks that have a statistically significant relationship between volume and volume return squared (volatility) cannot be grouped based on the average monthly market capitalization. Based on causal and contemporary models, it is indicated that intraday trading of LQ-45 stock samples is following the SIAH theory if it uses a quadratic return model. When viewed from a contemporary basis, this research uses the quadratic return volatility model following Valentika et.al (2017) research using the GARCH volatility model. If viewed from a causal basis, this research that uses the quadratic return volatility model conflicts with the Valentika et.al (2017) study using the GARCH volatility model.

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