



Weak-Form Test of Efficient Market Hypothesis (Case Study of Indonesian Stock Market on LQ-45 Index)

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Abstract: A variable value that is affected by other variable value at a same time is called a contemporaneous relationship. However, a variable value could also be affected by the variable value itself as well as other variable at different period of time. The objective of this research is to determine the contemporaneous connection between trading volume and stock return, and to understand whether the trading volume and stock return is consistent with the weak form of the efficient market hypothesis (EMH) in the Indonesian stock data with the LQ-45 index case study. The linear regression outcome showed that stock that owned monthly market average capitalization between 50 trillion rupiah and 90 trillion rupiah (moderate capitalized stock) dominated (at 33.33% or 4 out of 12 stocks) the contemporaneous relationship between trade volume and the significant return stock statistically. It is indicated that the Indonesian stock market does not contradict with the weak form of EMH.

Keywords: Indonesian stock market, stock return, trading volume

1. INTRODUCTION

An efficient capital market is a market where all the price of the stock/convertible bond marketed reflected all available information [4]. Fama (1970) classified the efficient market form into three EMH, i.e. Efficient in *weak form*, efficient in *semi strong form*, and efficient *strong form*. This research focused only to the *weak form* efficient market. With *weak form* efficient market is meant that the past information (historic) will be reflected in the present formed price. Therefore, the historical information such as price, trade volume and the past event could not be used to predict the future price change, because it has been reflected in the present price. The implication is the investor could not predict the future stock market value using the historical data, as done in the technical analysis [4].

Weak form efficient market hypothesis test could be carried out using the *return* predictability test. Return predictability test could be carried out using the past *return* data for short term predictability. One of the methods to carry on the short term predictability test was through a correlation test between to-day's *return* and the day before. The higher the correlation between the past and the present *return* is, the higher the past *return* capability in the prediction of the present *return* [4].

One of the researches that studied the relationship between the trade volume and stock *return* was carried out by Tapa and Hussin (2016). Tapa and Hussin (2016) analyzed the contemporaneous relationship between trade volume and stock *return* and studied whether the relationship between trade volume and the stock *return* is consistent with the weak form of the *efficient market hypothesis* (EMH) in ACE market, Malaysia. Tapa and Hussain (2016) concluded that there was a significant positive contemporaneous relationship between stock *return* and trade volume. ACE Malaysia market was contrary to the *weak form* of the EMH. Tapa and Hussin (2016) was using *structural vector autoregression* model between the trade volume and *return* stock with *ordinary least square* (OLS method). Using OLS, the *structural vector autoregression* model was unpredictable because the

regression and the error term are correlated [1]. As the result, this research used the standard *vector autoregression* model as a modification of Tapa and Hussin (2016) model using the OLS method.

Therefore, this research was aimed to determine the contemporaneous relationship between trade volume and stock *return* and to find out whether the relationship between trade volume approach and the stock *return* is consistent with the *weak form* of the EMH in Indonesian stock data with index LQ-45 case study.

2. DATA AND VARIABLES DESCRIPTION

The stocks being studied were consistently starting February 2013 to February 2016. The stocks have ARCH effect in the residual of the constant average equation model and satisfying GARCH (1,0) or GARCH(1,1). Table 1 provides the list of companies.

Table1. *The list of companies*

No	Stock Code	Stock Name
1	AALI	Astra Agro Lestari Tbk
2	ASRI	Alam Sutera Realty Tbk
3	BMRI	Bank Mandiri (Persero) Tbk
4	CPIN	Charoen Pokphand Indonesia Tbk
5	ICBP	Indofood CBP Sukses Makmur Tbk
6	INDF	Indofood Sukses Makmur Tbk
7	JSMR	Jasa Marga (Persero) Tbk
8	KLBF	Kalbe Farma Tbk
9	LPKR	Lippo Karawaci Tbk
10	MNCN	Media Nusantara Citra Tbk
11	SMGR	Semen Indonesia (Persero) Tbk
12	UNVR	Unilever Indonesia Tbk

Our primary data set consists of the close price, trading volume, and the close bid and ask price using intraday intervals from 3 August 2015 to 29 July 2016 for all stocks. All the data are obtained electronically from www.idx.co.id.

Following [6], trading variables are defined as

- a. Return R_t at time t

$$R_t = \ln \left(\frac{P_t}{P_{t-1}} \right),$$

where P_t represents closed price at time t .

- b. Trading Volume is defined as

$$V_t = \ln(Vol_t),$$

where Vol_t is trading volume at time t .

Average monthly market capitalization for the duration of August 2015 until July 2016 for all stocks is presented in Table 2.

Table2. *Average monthly market capitalization for the duration of August 2015 until July 2016*

Stock code	Average monthly market capitalization*	Stock code	Average monthly market capitalization*
AALI	26.77248762	JSMR	35.3826667
ASRI	7.47496377	KLBF	67.2853315
BMRI	214.10812500	LPKR	25.1642974
CPIN	50.78597250	MNCN	27.1602584
ICBP	85.39918046	SMGR	58.9321227
INDF	55.95692638	UNVR	310.5568960
*In trillion rupiah.			

The results are, that stock with a market capitalization above 90 trillion rupiah is categorized as stock with big capitalization if between 50 trillion rupiah and 90 trillion rupiah it is categorized as stock

with medium capitalization while if it is under 50 trillion rupiah is categorized as stock with small capitalization.

3. MODELS OF RELATIONSHIP BETWEEN TRADING VOLUME AND STOCK RETURN

The contemporaneous model between trading volume and stock return presented in this paper is

$$R_t = \alpha_1 + \beta_1 V_t + u_t, \tag{1}$$

where R_t and V_t are stock return and trading volume respectively at time t .

The models of VAR in Level (Unrestricted VAR) presented in this paper are

$$R_t = c_1 + \gamma_1 R_{t-1} + \gamma_2 V_{t-1} + \eta_{1t} \tag{2}$$

$$V_t = c_2 + \gamma_3 V_{t-1} + \gamma_4 R_{t-1} + \eta_{2t}. \tag{3}$$

where R_t and V_t are stock return and trading volume respectively at time t .

4. IMPLEMENTATION RESULTS

4.1. Cross-Correlation

One of the measures being used in relationship analysis is correlation coefficient. The correlation coefficient used is Pearson correlation coefficient. The results of the correlation coefficients are presented in Table 3.

Table3. *Cross correlation coefficients*

Stock code	Volume ↔ Return	Return ↔ Return(-1)
AAJI	0.101	0.048
ASRI	0.269*	0.024
BMRI	0.042	0.061
CPIN	0.139*	0.147*
ICBP	0.209*	-0.050
INDF	0.183*	0.061
JSMR	0.108	-0.022
KLBF	0.219*	0.018
LPKR	0.502*	0.159*
MNCN	0.203*	0.109
SMGR	0.181*	0.041
UNVR	0.028	-0.189*

**Significant at 10% level (2-tailed).*

According to Table 3, there is a positive relationship between stock return and trading volume which significant statistically at 10% level for ASRI, CPIN, ICBP, INDF, KLBF, LPKR, MNCN, and SMGR stocks. According to Table 3, there is a relationship between the current stock return and the previous stock return which significant statistically at 10% level for CPIN, LPKR, and UNVR stocks. CPIN, LPKR, and UNVR stocks have very low correlation coefficient between the current stock return and the previous stock return. Therefore, none of the stocks has strong correlation coefficient between the current stock return and the previous stock return so that the previous stock return data is less able to predict the current stock return grade.

4.2. Contemporaneous Relationship Model

Contemporaneous relationship model is used after basic classic regression assumption test for simple linear regression, such as autocorrelation and heteroscedasticity conducted. The test being used to detect autocorrelation assumption violation in regression equation is Breusch-Godfrey Test. The test being used to detect heteroscedasticity assumption violation in regression equation is Breusch-Pagan-Godfrey. In this paper, Cochrane-Orcutt is the method being used to overcome assumption violation if autocorrelation assumption violation. White heteroscedasticity-consistent standard error & covariance is the method being used to overcome violation on non-heteroscedasticity assumption.

Model of contemporaneous relationship between trading volume and stock return is given in equation (1). Results of contemporaneous relationship between trading volume and stock return are presented in Table 4. The parameter β_1 measures the contemporaneous relationship between trading volume and stock return. A statistically significant and positive value of β_1 would indicate a positive contemporaneous relationship between trading volume and stock return.

Table 4. Contemporaneous relationship between trading volume and stock return

Stock code	α_1	β_1	R-squared
AALI	-0.066354	0.004588	0.010299
ASRI	-0.189888*	0.010633*	0.072492
BMRI	-0.031356	0.001867	0.001804
CPIN	9.026006*	1.028030	0.005602
ICBP	-0.110630*	0.007693*	0.043715
INDF	-0.141894*	0.009038*	0.033313
JSMR	-0.054051	0.003500	0.011604
KLBF	-0.181643*	0.010329*	0.048079
LPKR	-0.344735*	0.023337*	0.261603
MNCN	-0.138858*	0.008607*	0.041294
SMGR	-0.147989*	0.009462*	0.032908
UNVR	-0.030356	0.001822	0.002321

*Significant at 10% level.

According to Table 4, it is found that ASRI, ICBP, INDF, KLBF, LPKR, MNCN, and SMGR stocks have positive contemporaneous relationship between trading volume and stock return which statistically significant at 10% level. AALI, BMRI, CPIN, JSMR and UNVR stocks do not have contemporaneous relationship between trading volume and stock return which is shown by statistically insignificant of β_1 value. Stocks that have average monthly market capitalization between 50 trillion rupiah and 90 trillion rupiah (stocks with medium capitalization) dominate (at 33.33% or 4 out of 12 stocks) contemporaneous relationship between trading volume and stock return which statistically significant. While none of stocks with big capitalization (stocks that have average monthly market capitalization more than 90 trillion rupiah) that has contemporaneous relationship between trading volume and stock return.

4.3. Stationarity Test

Problems which often occur in time series data are nonstationary data. The data needs special treatment to be applied in time series analysis. This is caused by the potential of spurious regression results [3]. ADF test is a formal test to check whether the data is stationary or not. The results of data stationary test show that the variables are stationary in level at 10% level in all stocks except for the trading volume of MNCN stock. Trading volume variable of MNCN stock is not stationary in level, but stationary in first difference (order 1).

4.4. Model of VAR in Standard Form

The models of VAR in level (unrestricted VAR) by using lag 1 are given in equation (2) and equation (3). The VAR(1) model is used to a relationship between trading volume and stock return for all stocks except for MNCN stock. Based on Johansen cointegration test, the VAR model for MNCN stock is vector error correction model (VECM) using lag 1, using 1 co-integration which significant at 5% level and using the trend deterministic assuming none no intercept no trend.

Further, Portmanteau and ARCH-LM tests are implemented on the VAR or VECM model of each of the stocks. Based on Portmanteau test, there is a serial correlation of residual on the VAR model for MNCN, SMGR and UNVR stocks. Based on ARCH-LM, residual variance of trading volume and stock return is homogenous for AALI, ASRI, CPIN, ICBP, JSMR and LPKR stocks at 1% level. As the result, the VAR(1) model is suitable to be used in the relationship between trading volume and stock return for AALI, ASRI, CPIN, ICBP, JSMR and LPKR stocks.

The VAR(1) model in equation (2) for AALI, ASRI, CPIN, ICBP, JSMR and LPKR stocks is presented in Table 5.

Table5. The VAR(1) model in equation

$$R_t = c_1 + \gamma_1 R_{t-1} + \gamma_2 V_{t-1} + \eta_{1t}$$

Stock code	c_1	γ_1	γ_2	Adjusted R-Squared
AALI	-0.0583	0.0386	0.0040	0.0017
ASRI	0.0615	0.0486	-0.0034	-0.0009
CPIN	-0.1299*	0.1275*	0.0084*	0.0319
ICBP	0.0264	-0.0395	-0.0017	-0.0039
JSMR	-0.0402	-0.0308	0.0026	-0.0015
LPKR	-0.0853	0.1043	0.0048	0.0259

*Significant at 10% level.

According to Table 5, the previous stock return and the previous trading volume significantly affect the current stock return for CPIN stock at 10% level. Therefore, there is a stock that has historical information such as the change of price and trading volume of the previous period has already reflected in the change of price of the current period. Consequently, there is an indication that Indonesia stock market is not contradicted with the weak-form of the EMH.

The VAR(1) model in equation (3) for AALI, ASRI, CPIN, ICBP, JSMR and LPKR stocks is presented in Table 6.

According to Table 6, the previous trading volume significantly affects the current trading volume for all stocks at 10% level. The previous stock return significantly affects the current trading volume for LPKR stock at 10% level.

Table6. The VAR(1) model in equation

$$V_t = c_2 + \gamma_3 V_{t-1} + \gamma_4 R_{t-1} + \eta_{2t}$$

Stock code	c_2	γ_3	γ_4	Adjusted R-Squared
AALI	7.5038*	0.4729*	1.5426	0.2292
ASRI	6.3642*	0.6441*	1.5941	0.4320
CPIN	8.0801*	0.4832*	-0.0913	0.2253
ICBP	9.1584*	0.3708*	-1.5906	0.1238
JSMR	7.6746*	0.5010*	-2.0232	0.2425
LPKR	10.9497*	0.3865*	-3.0868*	0.1092

*Significant at 10% level.

5. CONCLUSION

The linear regression outcome showed that stock that owned monthly market average capitalization between 50 trillion rupiah and 90 trillion rupiah (moderate capitalized stock) dominated (at 33.33% or 4 out of 12 stocks) the contemporaneous relationship between trade volume and the significant return stock statistically. It is indicated that the Indonesian stock market does not contradict with the weak form of EMH.

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