CAUSAL AND DYNAMIC RELATIONSHIP AMONG STOCK RETURN, TRADING VOLUME, AND RETURN VOLATILITY IN SOUTH-EAST ASIA MARKET PERIODS OF 2011-2014

Compiled by:
Harun
Student ID Number: 11 12 19348

Supervisor:
Prof., Dr., J. Sukmawati Sukamulja, MM.

ABSTRACT

The purpose of this research is to examine the causal and dynamic relationship among stock market, trading volume, and return volatility in South-East Asia market period of 2011-2014. This research employs Vector Auto-Regression (VAR) and E-GARCH model. The causal and dynamic relationship between stock return and trading volume analyzed using VAR model, whereas dynamic relationship between return volatility and trading volume analyzed using E-GARCH model. Result showed that Thailand market return have no impact to trading volume, and vice versa. There is causal effect in Malaysia and Vietnam market. Stock return does not have impact to trading volume, but trading volume does have impact to return in Philippines and Indonesia. All countries in South-East Asia market indicated that trading volume information being useful in predicting future return volatility, except Philippines.

Keywords: Stock Return, Trading Volume, Return Volatility, VAR, E-GARCH

1. Introduction

According to Karpoff (1987), there are four important reasons of understanding the relationship between stock return and volume. First, it help to predict the relations between trading volume and return that depends on the level information and the extent to which market prices-volume convey this information. Second, the relationship between trading volume and stock return is important for event studies which to draw inferences and will increase the power of these tests by incorporating trading volume and stock return data. Third, this relationship is critical to the debate over the empirical distribution of speculative price. The last reason, the relationship between stock return and trading volume has significant implications research into future market.

Thus, this research will examine the relationship among stock return, trading volume, and return volatility. This research picks evidence in South-East Asia stock market. Kirativanich (2000) concluded that South-East Asian Financial markets were attractive to investors looking for high returns on their investments. Both the financial and economic systems of South-East Asian had grown rapidly. Many investors thus began more favorably on and began investing in the South-East Asian financial market.

Therefore, investors need information about the place that have good prospect in the future. South-East Asian stock markets are one of other interesting stock markets. Investors also need information that can predict future price in order to get high return. Trading volume is a trigger that makes a stock price change. So, this research will investigate "Causal and Dynamic Relationship among Stock Returns, Trading Volume, and Return Volatility in South-East Asia Market Period of 2011-2014".

2. Theoretical Background

The change of stock return is responded by investors. If the stock price decreases, investors are willing to buy the stock in hope will have return when the stock price up. If investors have stock with high price (overvalued), investors will sell the stock in order to get current return. It explained that the change of return have impact to trading volume. There are bidirectional relationship between stock return and trading volume. Trading volume has impact to stock return. On the contrary, the stock markets have impact to trading volume. Thus, there is causal relationship between stock return and trading volume.

Previous researches have done analyzing the causality relationship between stock market returns, trading volume, and volatility. The empirical analysis by Chiang and Doong (2001) and Oral (2012) proved that there is a significant relationship between stock return and volatility. The research by Habib (2011), Choi et al (2012), Kiymaz and Girard (2009), and Asghar (2011) is resulting that trading volume have predictive power to predict or forecast future return volatility. The Granger causality test by Mubarik and Javid (2009) and Darwish (2011) concluded that there is significant interaction between trading volume and stock market return. The Granger causality test indicates a bidirectional causal relation between trading volume and volatility. The trading volume is useful for prediction stock price, and vice versa. From these previous researches, hypothesis can be formulated as the following:

H_1 = There is causal and dynamic relationship among stock market returns, trading volume, and volatility in South-East Asia market period of 2011-2014

2 Research Method

3.1 Type of Methodology

Methodology is the guideline for fulfilling objectives of this research. This research employs Vector Auto-Regression (VAR) Model and Exponential-GARCH (EGARH). The VAR analysis is used to analyze the causality relationship between stock return and trading volume. The E-GARCH model is used to analyze the dynamic relationship between trading volumes and return volatility.

3.2 Sample

The sample of this research will take from composite indices of national stock market at South-East Asian; Indonesia, Singapore, Thailand, Philippine, Malaysia, and Vietnam. The sample used is monthly stock market indices data of those markets with time interval from May 2011 to December 2014. In this period, data of the six countries of South-East Asian are available. All data is taken from Yahoo Finance and Investing.com. These six stock exchanges are selected because the six countries have their stock market and historical data.

Table 3.1
List of Selected Stock Exchange and its Market Index

Country	Name of Stock Exchange	Name of Index
Indonesia	Indonesia Stock Exchange (IDX)	Jakarta Composite Index (JCI)
Malaysia	Bursa Malaysia Stock Exchange	Kuala Lumpur Composite Index (KLCI)
Philippine	Philippine Stock Exchange (PSE)	Philippines Stock Exchange Index (PSEi)
Thailand	Stock Exchange of Thailand (SET)	Bangkok Stock Exchange Index (BSEI)
Vietnam	Hanoi Stock Exchange	Hanoi Stock Exchange Index (HNXI)

3.3 Research Variables

There are two main variables in this research. The variables are market stock return and trading volume. Both of them will use in the same unit to make analysis more fitted. Percentage of change will be as unit number for each variables, market stock return and trading volume.

3.3.1 Measurement of Stock Return

Stock market return is taken from market index in each South-East Asia Country. Market index can represent of overall activity of each country. Market Return can be calculated by stock price in period t minus stock price index in period t-1 divided by stock price period t-1. Market return can be formulated mathematically as (Pisedtasalasai and Gunasekarage, 2008);

$$R_{mt} = \frac{\text{Market Price}_t - \text{Market Price}_{t-1}}{\text{Market Price}_{t-1}} \quad \text{..} (1)$$

where;

R_t : Market Return in period t

$Market\ Price_t$: Market Price in period t

$Market\ Price_{t-1}$: Market Price in periodt-1

3.3.2 Measurement of De-trended Volume

The first variable of this research is return. According Choi et al (2012), trading volume has influence to return, and vice versa. To make regression model, these two variables should be in the same form. If the return is using percentage form, trading volume should be in the percentage form too. Thus, the form of trading volume will be formulated, as following (Pisedtasalasai and Gunasekarage, 2008);

$$DV_t = \frac{\text{Trading Volume}_t - \text{Trading volume}_{t-1}}{\text{Trading volume}_{t-1}} \quad \text{..} (2)$$

where;

DV_t = De-trended Volume in period t

Trading Volume $_t$ = Trading Volume in period t

Trading Volume $_{t-1}$ = Trading Volume in period t-1

3.4 Data Analysis Method

3.4.1 Vector Auto-Regression (VAR) Analysis

Vector Auto-Regression (VAR) analysis was built by Sims (1980). VAR analysis is used to project the system variable time series data and analyze the influence of dynamic disturbance contained in the equation. In this VAR model, it is not necessary to categorize which variable is endogen (dependent) or exogenous (independent). Sims (1980) assumes that all variable in VAR model is endogenous (dependent). There is interdependent between variables. For instance, variable A have influence to variable B. while in the same, variable B also have influence to variable A. It means that there is causality relationship between variable A and variable B.

According Widarjono (2013), there are steps to run VAR analysis; (1) stationary test with the data, (2) Co-integration test, (3) determine maximum lag and optimal lag which will be used, (4) Causality test, (5) estimation VAR, and (6) analyze result of Impulse Response and Variance Decomposition.

1. **Stationary Test**

This research adopts a test for a unit root test to ensure that variable is stationary, and to avoid spurious regression (there is no relationship between dependent variable and dependent variable). Stationary test can detect spurious regression. Stationary test can explain the behavior of the data too. Therefore, it is important to stationary test for time series data.

The testing for a unit root is based on Augmented Dickey-Fuller (1979) (ADF) and Phillip-Perron (1988) (PP). ADF and PP test are used with trend and without trend. The ADF test formulated as follows (Widarjono, 2005);

$$\Delta Y_t = a_0 + \gamma Y_{t-1} + {}_{i=1}^{\rho} \beta_i \Delta_{t-1+1} + \in_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots .... (3)$$

Stationary data is based on statistical comparison from MacKinnon critical value. If statistic value of ADF and PP test absolutely higher that Mackinnon critical value in level α (1%, 5%, and 10%), so data is called stationary. Analyzing using VAR model, data used should be stationary in the same level. If one of data is not stationary, data should be tested in the 1st difference or 2nd difference.

2. **Determining optimal lag**

The most important in VAR analysis is determining the lag length. The optimal lag is needed to catch the influence of each variable to other variable in VAR model. There are five criteria can be used to determine the optimal lag; (1) Akaike Information Criterion (AIC), (2) Schwartz Information Criterion (SIC), (3) Hannan-Quinn Information Criterion, (4) Likelihood Ratio (LR), and (5) Final Prediction Error (FPE).

3. Estimation Vector Auto-Regression (VAR) Model

Estimation VAR model will used determined optimal lag based on five criteria that was mention above. Estimation VAR model can be investigated value of t-statistics in each variable. VAR model will be formulated by Ariefianto (2012) and adjusted with variables of this research. The formulation of the model is as follows;

$$Rt = \alpha_0 + \sum_{i=1}^{k} \alpha_i R_{t-1} + \sum_{i=1}^{k} \beta_i DV_{t-1} + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

$$DVt = \lambda_0 + \sum_{i=1}^{k} \lambda_i R_{t-1} + \sum_{i=1}^{k} \gamma_i DV_{t-1} + \eta_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

VAR model produce several important analysis; (2) Impulse Response, (3) Variance Decomposition, and (4) Granger Causality Test.

a. Impulse Response

It is difficult to interpret based on the coefficient of each variable, so econometricians use impulse response analysis. Impulse response is used to analyze the influence of a variable change to another variable dynamically. Impulse response works by giving shock for one endogen variable. Impulse response figures the path where a variable will be back to balance after shock happened from other variable.

b. Decomposition Variance

Beside impulse response, VAR model provide forecast error decomposition of variance known as variance decomposition. The purpose of decomposition variance is to predict the percentage of contribution variance in each variable because there is change of certain variable in VAR model (Juanda and Juanidi, 2012). Therefore, decomposition variance arranges approximate error variance of certain variable.

c. Granger Causality Test

Granger causality test analyze causal relationship between endogen variable in VAR model. Granger causality test indicate the relationship between variables is bidirectional or unidirectional. To examine causal relationship between trading volume, the following model estimated by Widarjono (2013);

$$R_t = \sum_{i=1}^{m} a_i R_{t-i} + \sum_{j=1}^{n} b_j DV_{t-j} + \mu_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

$$DV_t = \sum_{i=1}^{n} c_i R_{t-i} + \sum_{j=1}^{s} d_j DV_{t-j} + v_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

where R and DV denotes return and detrended volume. The error terms, μ_t and $v_t$was assumed that it is not containing correlation. From the equation (11) and (12) developed Granger Causality test hypothesis the following;

H_{01}: R_t variable does not Granger cause another DV_t
H_{02}: DV_t variable does Granger cause another R_t

3.4.2 E-GARCH Model

The effect of trading volume on return volatilities analysis using first model the dynamic properties of the volatilities without the effect of trading volume. The following formulation leads to the asymmetric GARCH model, *Exponential GARCH*, of Nelson (1991) and adjusted with the research:

$$R_t = \alpha + \beta DV_t \text{ ....} (8)$$

$$ln\ \sigma_t^2 = \omega + \beta \log \sigma_{t-1}^2 + \gamma \frac{\mu_{t-1}}{\sigma_{t-1}^2} + \alpha \frac{\mu_{t-1}}{\sigma_{t-1}^2} - \overline{\frac{2}{\pi}} \text{ ....} (9)$$

The research will use this formula to measure volatility. This formula explains the conditional variance σ_t^2 respectively. The coefficient γ is an asymmetric effect of negative versus positive standardized residuals on conditional variances. A negative value of y means that negative residuals tend to produce higher conditional variances compared to positive one in the immediate future (Pisedtasalasai and Gunasekarage, 2008).

After the E-GARCH model is determined. The next step is diagnostic checking in the residual. The residual is desirable if there is no ARCH effect and the residual is normally distributed. ARCH-LM test will be used to check whether there is ARCH effect or not in the residual, whereas normality test is to check the residual whether the residual is normally distributed or not.

a. ARCH-LM Test

Engle developed a test to examine heteroskedasticity in times series data, known as Auto-Regressive Conditional Heteroskedasticity (ARCH) test. The basic idea of this test is the residual variance (σ_t^2) not only the function of independent variable, but also depends on Residual Square of the previous period (σ^2_{t-1}) or can be written as follows (Widarjono, 2005):

$$\sigma_t^2 = \alpha_0 + \alpha_1 \epsilon_{t-1}^2 + \alpha_2 \varepsilon_{t-2}^2 + \alpha_3 \epsilon_{t-3}^2 \ldots + \alpha_4 \varepsilon_{t-\rho}^2 \text{ ....} (10)$$

If the value chi-squares (x) are greater than critical value chi-square (x^2) and probability value chi-squares (x) are less at the significant level 5%, it means that the model contains ARCH effect.

b. Normality Test

Normality test in residual can be detected using method developed by Jarque-Bera (JB). Jarque-Bera Method is to examine whether the residual is normally distributed or not. Jarque-Bera method measures skewness and kurtosis. The formulation statistically Jarque-Bera test is the following (Widarjono, 2005):

$$JB = n \quad \frac{s^2}{6} + \frac{(K-3)^2}{24} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (11)$$

Where:
S = Skewness
K = Kurtosis
n = number of sample

3 Analysis Data

3.1 Descriptive Statistics

After all data are collected, descriptive statistics can be constructed based on weekly data of stock market returns and trading volume for five countries in South-East Asia; Thailand, Vietnam, Philippines, Malaysia, and Indonesia for period May 2011 to December 2014. The descriptive statistics reports the mean, standard deviation, skewness, kurtosis, and so on. The descriptive statistics will show the following table:

Table 4.1
Descriptive Statistics

Country	Indonesia	Malaysia	Philippines	Vietnam	Thailand
Index	Jakarta Composite Index	Kuala Lumpur Composite Index	Philippines Stock Index	Vietnam Stock Exchange Index	Bangkok Stock Exchange Index
Sample Period	May 2011 - December 2014	May 2011 - December 2014	May 2011 - December 2014	May 2011 - December 2014	May 2011 – December 2014
Observation	192	192	192	192	192
Return					
Mean	0.001992	0.000771221	0.002904	0.000822	0.00181
Std. Deviation	0.02323	0.012665049	0.020767	0.030691	0.025508
Sample	0.00054	0.000160403	0.000431	0.000942	0.000651

Table 4.1 continued

Country	Indonesia	Malaysia	Philippines	Vietnam	Thailand
Variance					
Kurtosis	3.557708	2.194849751	2.611383	1.234372	1.051085
Skewness	-0.49776	-0.130339744	-0.93697	-0.21797	-0.40853
Range	0.181051	0.091211839	0.144651	0.191145	0.154348
Minimum	-0.1066	-0.045418015	-0.09422	-0.10291	-0.08109
Maximum	0.07445	0.045793825	0.050433	0.088231	0.073254
Sum	0.38251	0.148074481	0.557507	0.157733	0.347603
Trading Volume	(in billions shares)	(in million shares)	(in thousand shares)	(in thousand shares)	(in billion shares)
Mean	17.96531	633.2747917	774.9305	237.7092	10.44721
Std. Deviation	5.682027	176.7347162	863.4762	123.8733	3.210851
Sample Variance	32.28543	31235.15993	745591.2	15344.59	10.30956
Kurtosis	1.796163	2.10878464	4.394619	0.339549	-0.34471
Skewness	0.912879	0.819439824	2.28316	0.878565	0.43644
Range	35.88	1189.69	4405.72	630.91	14.6
Minimum	4.13	210.31	54.28	31.98	4.26
Maximum	40.01	1400	4460	662.89	18.86
Sum	3449.34	121588.76	148786.7	45640.16	2005.865

3.2 Stationary Test

Stationary test is important part of time series data analysis. Stationary test is the first step of the research. The method used in unit root test is Augmented Dickey-Fuller (ADF) test. Table 4.2 is stationary test for return and table 4.3 is stationary test for detrended volume.

Table 4.2
Stationary Test – Return

Countries	Test	t-statistics	MacKinnon critical value			Prob.	Meaning
			0.01	0.05	0.1		
Thailand	ADF	-14.35441	-3.464643	-2.876515	-2.574831	0.0000	Stationary
Vietnam	ADF	-11.29448	-3.464643	-2.876515	-2.574831	0.0000	Stationary
Philippines	ADF	-13.58780	-3.464643	-2.876515	-2.574831	0.0000	Stationary
Malaysia	ADF	-14.06695	-3.464643	-2.876515	-2.574831	0.0000	Stationary
Indonesia	ADF	-15.32523	-3.464643	-2.876515	-2.574831	0.0000	Stationary

Table 4.3
Stationary Test – Detrended Volume

Countries	Test	t-statistics	MacKinnon critical value			Prob.	Meaning
			0.01	0.05	0.1		
Thailand	ADF	-20.06712	-3.464643	-2.876515	-2.574831	0.0000	Stationary
Vietnam	ADF	-15.45148	-3.464643	-2.876515	-2.574831	0.0000	Stationary
Philippines	ADF	-14.50982	-3.464643	-2.876515	-2.574831	0.0000	Stationary
Malaysia	ADF	-13.05475	-3.464643	-2.876515	-2.574831	0.0000	Stationary
Indonesia	ADF	-12.85666	-3.464643	-2.876515	-2.574831	0.0000	Stationary

This stationary test for both return and detrended volume data series indicate stationary in Level (0). The first difference level of stationary test is not needed. Return and detrended is not contained unit roots, thus the following process could be conducted which is estimation VAR model.

3.3 VAR Model

4.3.1 Determining Optimal Lag

To employ Vector Auto-Regression (VAR) model, determining the lag length is important. Determining the lag can be done by using Lag Order Selection Criteria VAR test. The optimal lag can be determined based on some indicators such as Akaike Information Criterion (AIC), Schwartz Information Criterion (SIC), Hannan-Quinn Criterion (HQ), Likelihood Ratio (LR), and Final Prediction Error (FPE). The optimal lag order selected based on the lowest number of all criterion.

Table 4.4
VAR Lag Order Selection Criteria

Country	**Optimal Lag**
Thailand	1
Vietnam	3
Philippines	2
Malaysia	5
Indonesia	2

4.3.2 VAR Estimation

This research employs VAR model because the time series data is stationary in Level (0). If the time series data is stationary, there is no need to make co-integration test. The stationary data is co-integrated. It is meaning there is no spurious regression. The estimation result of VAR model shows in the following table;

Table 4.5
Vector Auto-Regression Model

Country	Thailand	Vietnam	Philippines	Malaysia	Indonesia
Panel A: estimation equation 4					
Lag (k)	1	3	2	5	2
α_0	0.001861	-0.000676	0.016390	-0.000646	0.001637
	(0.00187)	(0.00230)	(0.07390)	(0.00109)	(0.00174)
	[0.99735]	[-0.29394]	[0.22178]	[-0.59113]	[0.94209]
α_1	-0.035189	0.167057	0.016390	-0.059217	-0.105592
	(0.07215)	(0.07283)	(0.07390)	(0.07460)	(0.07310)
	[-0.48770]	**[2.29383]***	[0.22178]	[-0.79375]	[-1.44445]
α_2		-0.057354	0.055796	-0.023506	0.056578
		(0.07392)	(0.07338)	(0.07487)	(0.07305)
		[-0.77593]	[0.76033]	[-0.31395]	[0.77448]
α_3		0.115142		-0.016183	
		(0.07304)		(0.07581)	
		[1.57633]		[-0.21347]	
α_4				0.136303	
				(0.07525)	
				[1.81134]	
α_5				-0.073066	
				(0.07664)	
				[-0.95335]	
β_1	0.004429	0.006292	0.001884	-0.002016	0.002928
	(0.00493)	(0.00364)	(0.00314)	(0.00329)	(0.00543)
	[0.89836]	[1.73007]	[0.59970]	[-0.61330]	[0.53890]
β_2		0.006292	-0.001206	0.001653	0.007690
Table 4.5 continued		(0.00364)	(0.00318)	(0.00358)	(0.00546)
		[1.73007]	[-0.37978]	[0.46113]	[1.40766]
β_3		0.005910		0.008311	
		(0.00361)		(0.00367)	
		[1.63832]		**[2.26213]***	
β_4				0.011899	
				(0.00362)	
				[3.28321]**	
β_5				0.008819	
				(0.00334)	
				[2.63934]**	
F-statistics	0.522387	**2.738598****	0.317022	**1.998274***	1.233069
R-squared	0.005527	0.082807	0.006808	0.101962	0.025969
AIC	-4.490101	-4.154604	-4.870744	-5.884901	-4.656191
SIC	-4.439019	-4.034539	-4.785296	-5.694836	-4.570743
Panel B: estimation equation 5					
λ_0	0.075391	0.135773	1.358066	0.097404	0.071432
	(0.02574)	(0.04695)	(1.66880)	(0.02493)	(0.96854)
	[2.92843]**	[2.89182]**	[0.81380]	[3.90701]**	[0.07375]
λ_1	0.458482	3.105734	1.358066	-3.439970	0.071432
	(0.99564)	(1.48662)	(1.66880)	(1.70232)	(0.96854)
	[0.46049]	[2.08913]*	[0.81380]	[-2.02076]*	[0.07375]
λ_2		1.094533	0.167963	-2.908084	0.531907

Table 4.5 continued

Country	Thailand	Vietnam	Philippines	Malaysia	Indonesia
		(1.50884)	(1.65714)	(1.70846)	(0.96790)
		[0.72542]	[0.10136]	[-1.70216]	[0.54955]
λ_3		-2.948696		0.665652	
		(1.49102)		(1.72987)	
		[-1.97764]		[0.38480]	
λ_4				-2.093770	
				(1.71706)	
				[-1.21939]	
λ_5				2.749984	
				(1.74883)	
				[1.57247]	
γ_1	-0.362189	-0.139682	-0.316512	-0.436038	-0.246197
	(0.06802)	(0.07375)	(0.07096)	(0.07499)	(0.07198)
	[-5.32448]**	[-1.89397]	[-4.46041]**	[-5.81430]**	[-3.42059]**
γ_2		-0.046075	-0.309459	-0.285636	-0.189004
		(0.07424)	(0.07172)	(0.08178)	(0.07238)
		[-0.62062]	[-4.31499]**	[-3.49270]**	[-2.61130]*
γ_3		-0.052418		-0.175384	
		(0.07364)		(0.08383)	
		[-0.71186]		[-2.09203]*	
γ_4				-0.146397	
				(0.08270)	
				[-1.77025]	
γ_5				-0.077649	
				(0.07625)	
				[-1.01838]	
F-statistics	0.350927	2.022106*	7.711941**	4.615053**	3.937583**
R-squared	0.131886	0.062497	0.142914	0.207744	0.511680
AIC	0.759105	1.877695	1.363532	0.370216	0.511680
SIC	0.810188	1.997760	1.448980	0.560281	0.597128

Note: Standard errors in ( ) & t-statistics in [ ], An ∗,∗∗ denotes statistical significance at the 5%, 1% level

Table 4.5 presents causality test results obtained through the estimation of VAR models using equation 4 and 5 (see chapter 3). Panel A reports the results from equation 4 when Rt is the dependent variable while panel B reports the results from equation 5 when DVt is the dependent variable.

Estimation Vector Auto-Regression (VAR) model concluded that Thailand market return have no impact to trading volume, and vice versa. It is different with Vietnam market, the stock market return in Vietnam have impact to trading volume, and vice versa. Stock return does not have impact to trading volume, but trading volume does have impact to return in Philippines, Malaysia, and Indonesia.

4.3.3 Causality Test

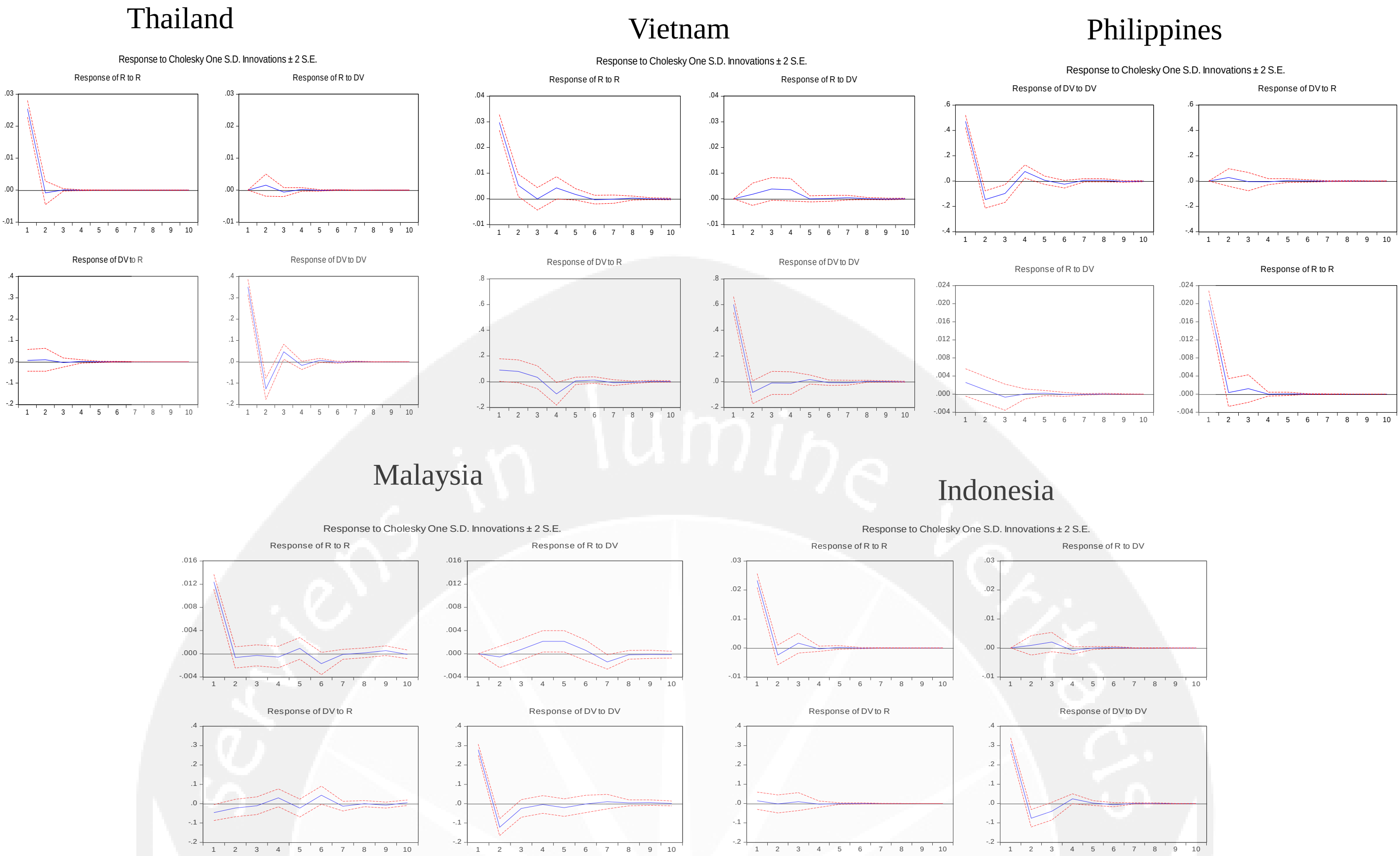
Table 4.6
Granger Causality Tests

Countries	Lags	Null Hypothesis:	Obs	F-Statistic	Prob.	Meaning
Thailand	1	DV does not Granger Cause R	191	0.80706	0.3701	Ho: supported
		R does not Granger Cause DV		0.21205	0.6457	Ho: supported
Vietnam	3	DV does not Granger Cause R	189	1.72684	0.1631	Ho: supported
		R does not Granger Cause DV		3.01908	0.0312	**Ho: not supported**
Philippines	2	R does not Granger Cause DV	190	0.33670	0.7146	Ho: supported
		DV does not Granger Cause R		0.33191	0.7180	Ho: supported
Malaysia	5	DV does not Granger Cause R	187	3.01661	0.0122	**Ho: not supported**
		R does not Granger Cause DV		2.11700	0.0655	**Ho: not supported**
Indonesia	2	DV does not Granger Cause R	190	1.02260	0.3617	Ho: supported
		R does not Granger Cause DV		0.15109	0.8599	Ho: supported

The results of Granger Causality test conclude that Thailand, Philippines, and Indonesia have no causal relationship between trading volume and stock market return. There is unidirectional relationship between trading volume and stock market return in Vietnam. The stock market returns of Vietnam have impact to detrended volume, but it not in reverse. It may indicate that there is causal relationship between stock return and trading in longer period. The causal (bidirectional) relations between trading volume and stock market return in Malaysia. The detrended volume has impact to stock market return, and vice versa.

4.3.3 Impulse Response

Vector Auto-Regression provides impulse response. The impulse response function is used to describe the expectations period k in the future from the prediction error of a variable that can used by innovation of variable.



Graph 1
Impulse Response

In Thailand, stock market returns have move up in the beginning period because of shock from detrended volume, but it is in small number. The value of stock market return will be 0.0015544 if stock market return got a shock from detrended volume. It can be seen in first period. There is no significant change because of shock of stock market return to detrended volume. The value of detrended will be 0.009244 when detrended volume got a shock from stock market return in the second period.

The response of stock market return is increasing in beginning up to period 3. It is back to zero again in the period 5. When stock market return got shock from detrended volume, the value of return will be 0.003829 in third period as the highest change. The change because of shock from detrended volume is high. The fluctuation of detrended volume happens because of shock from the stock market return. Because of shock from return, the value of detrended volume is 0.0090582 in the first period and fall down to -0.095228 in the fourth period.

The decreasing of stock market return happens because of shock from the detrended volume. In the second period, the value of return is 0.000883. It is the highest number because of shock from detrended volume. The detrended volume has response because of shock from stock market return. The value of detrended volume is 0.058268 in the first period.

The interesting part of Malaysia, both variables, return and detrended volume move fluctuated. The response of return is in the fourth and fifth period with the value is 0.002138 and 0.002143. Whereas response of detrended volume, the value of detrended volume is -0.046429 in first period. There are two peak of response of detrended volume which is in fourth and sixth period with the values are 0.030366 and 0.043889

In Indonesia, stock market returns increase up to 0.002052 in the third period. It is the highest response of return. In the beginning of period, because of return shock, the value of detrended volume is 0.308139. In the rest period, there is no highly response of detrended volume.

4.3.5 Variance Decomposition

Impulse response analysis is used to track the shock of variable to other variable, while variance decomposition analysis is to predict the percentage variance distribution in each variable because of the change of certain variable in VAR system.

Table 4.7
Variance Decomposition

Country	Thailand		Vietnam		Philippines		Malaysia		Indonesia	
Variance Decomposition of R:										
Period	R	DV	R	DV	R	DV	R	DV	R	DV
1	100	0	100	0	100	0	100	0	100	0
2	99.62851	0.371488	99.65952	0.340482	99.67594	0.324065	99.79512	0.204882	99.85171	0.148289
3	99.57011	0.429894	98.09067	1.909329	99.67854	0.321464	99.443	0.557001	99.09583	0.904169
4	99.5621	0.437902	96.85568	3.144318	99.67425	0.325748	96.60381	3.396193	98.96288	1.037125
5	99.56101	0.438989	96.86525	3.134752	99.66973	0.330272	93.94076	6.059243	98.96284	1.037158
6	99.56086	0.439137	96.86357	3.136428	99.67035	0.329649	93.85955	6.140446	98.95882	1.041179
7	99.56084	0.439157	96.84445	3.155554	99.66979	0.330205	92.76393	7.236072	98.95878	1.041221
8	99.56084	0.43916	96.84406	3.155937	99.66982	0.330176	92.74531	7.254694	98.95861	1.041393
9	99.56084	0.43916	96.84314	3.156857	99.6698	0.3302	92.75019	7.249815	98.95858	1.04142
10	99.56084	0.43916	96.84318	3.15682	99.66979	0.330209	92.73718	7.262815	98.95858	1.041422
average	99.61	0.39	97.57	2.43	99.7	0.3	95.46	4.54	99.17	0.83
Variance decomposition of DV:										
Period	R	DV	R	DV	R	DV	R	DV	R	DV
1	0.03611	99.96389	2.222617	97.77738	1.522055	98.47794	2.691734	97.30827	0.224558	99.77544
2	0.093216	99.90678	3.808861	96.19114	1.716898	98.2831	2.786284	97.21372	0.215457	99.78454
3	0.101675	99.89833	4.089554	95.91045	1.816002	98.184	2.887062	97.11294	0.308014	99.69199

Table 4.7 continued

Country	Thailand		Vietnam		Philippines		Malaysia		Indonesia	
4	0.102821	99.89718	6.300942	93.69906	1.816226	98.18377	3.808989	96.19101	0.316353	99.68365
5	0.102976	99.89702	6.303300	93.69670	1.827301	98.1727	4.312939	95.68706	0.316376	99.68362
6	0.102997	99.8970	6.336178	93.66382	1.828505	98.1715	6.157007	93.84299	0.316535	99.68347
7	0.103001	99.8970	6.352803	93.6472	1.828932	98.17107	6.307311	93.69269	0.316532	99.68347
8	0.103001	99.8970	6.360071	93.63993	1.82923	98.17077	6.306237	93.69376	0.316546	99.68345
9	0.103001	99.8970	6.361252	93.63875	1.829231	98.17077	6.360762	93.63924	0.316547	99.68345
10	0.103001	99.8970	6.361577	93.63842	1.829262	98.17074	6.382592	93.61741	0.316548	99.68345
average	0.09518	99.90482	5.449716	94.55029	1.784364	98.21564	4.800092	95.19991	0.296347	99.70365

Source: appendix 8

Table 4.7 presents the variance decomposition of return and trading volume in the period 1-10. The average variance decomposition of return is 0.39%, 2.43%, 0.3%, 4.54%, and 0.83% explained by trading volume for Thailand, Vietnam, Philippines, Malaysia, and Indonesia. The average variance decomposition of trading volume can be explained by return 0.095%, 5.45%, 1.78%, 4.8%, and 0.296% for Thailand, Vietnam Philippines, Malaysia, and Indonesia.

4.4 E-GARCH Model

4.4.1 Estimates of E-GARCH Model

Table 4.8 reports the estimated parameters of the EGARCH model with asymmetric effect for each market given by equation 11. There are three points that can be analyzed (1) leverage effect, (2) time varying volatility, and (3) the ability of detrended volume to predict the future dynamics of return volatilities. To examine whether there is asymmetric effect in stock market return showed in coefficient of γ. If the coefficient of γ is negative and statistically significant in the 5% level concluded that there is asymmetric effect in the model of return volatility. To examine whether there is time varying volatility by concerning to coefficient of α. Then, analyzing the predictive power of trading volume to forecast the future dynamic return volatility can be seen in the coefficient of detrended volume.

Table 4.8
Estimates of E-GARCH Model

	Thailand		Vietnam		Philippines		Malaysia		Indonesia	
Variable	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
C	0.002255	0.2088	-0.00164	0.4753	0.002914	0.0466	-0.00024	0.7492	0.001792	0.1349
DV	-0.00046	0.9374	0.011854	0.0493	0.004864	0.0814	-0.00704	0.0009	0.001012	0.8025
variance equation										
C	-9.39996	0.0000	-3.98804	0.0023	-2.83841	0.0123	-0.539520	0.0260	-2.12433	0.0031
β	0.47478	0.0079	0.18418	0.2378	0.340583	0.0709	0.016984	0.8568	0.60938	0.0000
γ	-0.12361	0.1661	0.13585	0.1942	-0.25307	0.0071	-0.280520	0.0004	-0.23688	0.0050
α	-0.21106	0.2523	0.471103	0.0106	0.674462	0.0000	0.945677	0.0000	0.793698	0.0000
DV	0.52486	0.0332	0.770106	0.0003	0.024587	0.9430	1.269540	0.0000	0.948172	0.0013

4.4.2 ARCH LM Test

The heteroskedascity test is to examine the residuals is containing heteroskedascity or not. This test would be performed by ARCH LM test. The result of heteroskedascity showed in the following table:

Table 4.9
ARCH LM Test

Country	Obs*R-squared	Prob. Chi-Square (1)
Thailand	0.170633	0.6795
Vietnam	0.135616	0.7127
Philippines	0.096971	0.7555
Malaysia	0.077431	0.7808
Indonesia	0.001148	0.9730

Table 4.9 showed the probability value of Chi-square of five countries in South East Asia market. The probability value of Chi-square is higher than 0.05. It means there is no residual containing heteroskedascity for each country. There is no ARCH effect in the residual.

4.4.3 Normality Test

Table 4.10
Normality Test

Country	Skewness	Kurtosis	Jarque-Bera	Probability
Thailand	-0.514982	3.980944	16.18460	0.000306
Vietnam	-0.576437	4.093170	20.19314	0.000041
Philippines	-0.665329	4.168115	25.08117	0.000004
Malaysia	-0.046385	3.093756	0.139170	0.932781
Indonesia	-0.330796	3.486723	5.396828	0.067312

The null hypothesis is data normally distributed. The alternative hypothesis is data not normally distributed. The null hypothesis is supported if the p-value is greater than significant level 5%. Look at, table 4.10, there are two residual models are normally distributed that is Malaysia and Indonesia. The residual of others countries is not normally distributed.

4.5 Conclusion

This research analyzed causal and dynamics relationship among stock return, return volatility, and trading volume in South-East Asia Market. The result of this research be concluded that Thailand market return have no impact to trading volume, and vice versa. It is different with Malaysia and Vietnam market, the stock return have impact to trading volume, and vice versa. Stock return does not have impact to trading volume, but trading volume does have impact to return in Philippines and Indonesia. All country in South-East Asia market indicates that trading volume information being useful in predicting future return volatility, except Philippines.

References

Aggarwal, R., Inclan, C., and Leal, R., (1999), Volatility in Emerging Stock Markets, *The Journal of Financial and Quantitative Analysis*, Vol. 34, No. 1, pp. 33-55

Al-Jafari, M.K and Tliti A., (2013), "An Empirical Investigation of the Relationship between Stock Return and Trading Volume: Evidence from the Jordanian Banking", *Journal of Applied Finance & Banking*, vol. 3, no. 3, 45-64

Ariefianto, M.D., (2012). *Ekonometrika: Esensi dan Aplikasi dengan Menggunakan Eviews*, Penerbit Erlangga

Asghar, N., (2011), "The Empirical Relationship between Stock Returns and Trading Volume in Pakistan (2000-2006)", *Interdisciplinary Journal of Contemporary Research in Business*, Academic Journal, June, Vol. 3, p1356

Assan A. and Thomas S., (2013), "Stock returns and trading volume: does the size matter?", *Investment Management and Financial Innovations*, Volume 10, *76-88*

Bodie, Z., Kane A., and Marcus J.A., (2006), *Investment*, 6th Edition, McGraw-Hill

Bodie, Z., Kane, A., and Marcus J.A., (2010), *Essentials of Investment*, Ninth Edition, McGraw-Hill

Brealey, R.A., Myers, S.C., and Marcus, A.J. (2001), *Fundamental of Corporate Finance*, Third Edition, McGraw-Hill

Chiang, T.C., and Doong, SC., (2001), "Empirical Analysis of Stock Returns and Volatility: Evidence from Seven Asian Stock Markets Based on TAR-GARCH Model", *Review of Quantitative Finance and Accounting*, 17: 301–318,

Countries of South-East Asia, Retrieved September 2015, from Northern Illinois University: www.niu.edu

Darwish, M.J., (2012), "Testing the Contemporaneous and Causal Relationship between Trading Volume and Return in the Palestine Exchange". *Interdisciplinary Journal of Contemporary Research in Business*, Vol 3, No 10

Fama, E.F., (2010). "Efficient Capital Markets: A Review of Theory and Empirical Work". Blackwell Publishing for the American Finance Association, Papers and Proceedings of the Twenty-Eighth Annual Meeting of the American Finance Association New York, *Journal of Finance*, Vol. 25, No. 2

Grossman, S.J. and Stiglitz, J.E., (1980), "On the Impossibility of Informationally Efficient Markets", *The American Economic Review*, Vol. 70, No. 3

Habib, N.M., (2011), "Trade Volume and Returns in Emerging Stock Markets An Empirical Study: The Egyptian Market", *International Journal of Humanities and Social Science*, December, Vol. 1, No. 19

Hartono, J., (2010), *Teori Profolio dan Analisis Investasi*, eighth edition, Yogyakarta: Badan Penerbit Fakultas Ekonomi Universitas Gadjah Mada

Jiang, W., (2012), "Using the GARCH model to analyze and predict the different stock markets", *Master Thesis in Statistics*, Department of Statistics, Uppsala University, Sweden

Karpoff, J.M. (1987). The relations between price changes and trading volume: A survey. *Journal of Financial and Quantitative Analysis*, *22*, 109–126

Kirativanich, T., (2000), "The Effects of Macroeconomic Variables on the Southeast Asian Stock Market: Indonesia, Malaysia, the Philippines, and Thailand", *Dissertation Presented to the Graduate Faculty of the College of Business Administration United States International University*

Kiymaz, H., and Girard, E., (2009), "Stock Market Volatility and Trading Volume: An Emerging Market Experience", *the ICFAI Journal of Applied Finance*, Vol. 15, p. 5-32

Lee, M.C.M., and Swaminathan, B., (2000), Price Momentum and Trading Volume, *the Journal of Finance*, Vol. LV, No. 5

Leon, N.K., (2007), "An empirical study of the relation between stock return volatility and trading volume in the BRVM", *Academic Journals; African Journal of Business Management* Vol. 1 (7), pp. 176-184,

Liaw, K.T., (2004), *Capital Market*, Thomson-Learning, South-Western, United States of America

Marusiakova, M., (2006), *Forecasting Financial Market Volatility*, Department of Probability and Mathematical Statistics Charles University, Prague

Mestel, R., Gurgul, H., and Majdosz, P., (2003) "Joint Dynamics of Prices and Trading Volume on the Polish Stock Market", *Managing Global Transitions* 3; Vol. 3, No. 2

Mubarik, F., and Javid, A.Y., (2009), "Relationship between Stock Return, Trading Volume, and Volatility: Evidence from Pakistani Stock Market", *Asia Pacific Journal of Finance and Banking Research*, Vol. 3, No, 3

Murphy, J.J., (1999), *Technical Analysis of the Financial Markets: A Comprehensive to Trading Methods and Applications*, New York Institute of Finance

Odean, T., (1998), Are Investors Reluctant to Realize Their Losses?, *The Journal of Finance*, October, Vol. LIII, No. 5

Odean, T., (1999), Do Investors Trade Too Much, *the American Economic Review*, December, Vol. 89, No. 5

Oral, E., (2012), "An empirical analysis of trading volume and return volatility relationship on Istanbul stock exchange national -100 Index", *Journal of Applied Finance & Banking*, vol.2, no.5, 149-158

Pisedtasalasai, A. and Gunasekarage, A., (2008), "Causal and Dynamic Relationships among Stock Returns, Return Volatility and Trading Volume: Evidence from Emerging markets in South-East Asia", *Springer Science and Business Media*, Asia-Pacific Finance Markets, 14, 277-297

Poon, S.H., and Granger, C.W.J., (2003), "Forecasting Volatility in Financial Markets: A Review", *Journal of Economic Literature*, Vol. XLI, pp. 478–539

Remonov R., (2014), "Stock Price and Trading Volume during Market Crashes", Canadian Center of Science and Education, *International Journal of Marketing Studies*; Vol. 6, No. 1

Ross, S.A., Weterfield, R.W., and Jordan B.D., (2010), *Corporate Finance Fundamentals*, Eighth Edition, McGraw-Hill

Saunders, A. and Cornett, M.M., (2012), *Financial Institution Management: A Risk Management Approach*, Eighth Edition, McGraw-Hill

Van Horne, J.C., and Wachowhicz J.R., (2005), *Fundamentals of Financial Management*, twelfth edition, Prentice Hall

Wennstrom, A., (2014). "Volatility Forecasting Performance: Evaluation of GARCH type volatility models on Nordic equity indices", *Master of Science Thesis*, Department of Mathematics, Royal Institute of Technology (KTH), Stockholm, Sweden

Widarjono, A., (2013). *Ekonometrika: Pengantar dan Aplikasinya, Disertai Panduan Eviews*, Fourth Edition, UPP STIM YKPN

Winarno, W.W., (2009), *Analisis Ekonometrika dan Statistika dengan Eviews*, second edition, Sekolah Tinggi Ilmu Manajemen YKPN