

## The Stock Market and Exchange Rates in Five South Asian Countries

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### Abstract

The composite price index and return of stocks are the important indicators, both as a measure of the company's portfolio performance, as well as an indicator of macroeconomic health and the aggregate investment. In addition, the stock prices are also influenced by macroeconomic variables and one of the most important is the exchange rates. The objective of this study is to determine the behavior of exchange rate affects the stock returns in Southeast Asia, pre and post of the 2008 world financial crisis. By employing the daily stock market return in Indonesia, Malaysia, the Philippines, Thailand, and Singapore more than seventeen years from 1 September 1999 to 31 March 2017, this study utilizes Engle-Granger error correction model and cointegration approach to investigate and compare the long and short run of the structural effect of the exchange rates on stock returns. To differentiate the behavior of variables between pre and post occurrence of 2008 world financial crisis, the estimation of the model is divided into two periods. This study finds that the exchange rate growth influence the stock returns in the long and short run, and proves that the cointegration between the two variables exist in all countries. The study has the implication that the exchange rate, which the one of the fundamental measures of a country's macroeconomic health, is an important determinant of influencing stock return, even its effects are responded by the stock return in one day.

**Keywords:** Stock Market, Exchange rate, Cointegration, Error Correction Model

**JEL Classification:** O16, F31, C22

### 1. Introduction

Stock prices are an important indicator of business. Observation from time to time on stock prices, in which are utilized as a marker of market direction, a measure of profit levels, and a benchmark of portfolio performance. In addition, it becomes one of the important economic indicators to observe the healthy performance of the economy and investment. Therefore, the development and analyzes of models related both the behavior and forecasting of stock prices are getting more attention in the field of business and financial research.

Currently, in modeling of financial time series data, such as stock prices or returns, it very

commonly encounters models which are not based on economic theory or non-structural models. Analysis of phenomenon of volatility clustering of stock returns - which analyze the conditional variance of the volatility - which employ the model of Autoregressive Conditional Heteroscedasticity (ARCH) and Generalize ARCH and its family or other forecasting model such autoregressive moving average (ARMA) and its family, are several examples of models that were originally developed without based on economic theories.

Nevertheless, in its developments, the stock return forecasting models with considering the determinant variables - which can be formed structurally - were gained the attention of stock market researchers in various countries. In

today's global economy, various macroeconomic factors affect the stock changes. Foreign exchange rate is one of the important factors that could affect the market stock return. The growth of exchange rate is one indicator of the health of the macro economy, which also had a direct impact on the field of corporate finance. For decision-makers in a company and market, the exchange rate changes itself may not be bad, but its variability is maybe bad, because it means that the financial planning becomes difficult.

Furthermore, the effects of exchange rate changes toward the conditional stock return have important implications for investors and policy authorities. Several researches that analyze the changes of the exchange rate on stock returns, includes Yang and Chang (2008), Kohler (2010), Mingjie and Tang (2007), Agrawal, Srivastav and Srivastava (2010), Kasman, Vardar, and Tunç (2011), Chkili and Nguyen (2013), Purnomo and Rider (2012), Pan, Fok, and Liu (2007), Rahman and Uddin (2009), Kutty (2010), Zhao (2010), and Sinha and Kohli (2015),

For example, the importance of the effect of exchange rate movements on stock prices can be observed in the Asian crisis of 1997-1998, which explains the dynamic relationship between stock prices and exchange rates. During the crisis period, it was observed that stock markets fell due to the depreciation of the exchange rate in developing countries.

Based on the explanations, this study examines the dynamic influence of the exchange rate toward stock market returns in five South East Asian countries that are Indonesia, Malaysia, the Philippines, Thailand, and Singapore. The selection of these countries based on geographic proximity and similarity of market economic conditions, in addition to these five countries are the member of the ASEAN (Association of South East Asian Nations). Besides that, the stock markets in this region are influenced each other because of the economic unity within ASEAN Free trade.

Some of the research questions which are developed in this study are how the effect of exchange rates on stock returns each country in Southeast Asia market, and how the differences in behavior of the relationship between the two variables, pre and post crisis, and between countries. The world crisis, in this case is the 2008 world financial crisis that has significant effect on the world economy.

With utilizing the two step Engle-Granger error correction procedure on more than seventeen years of daily returns and foreign exchange rate of five South East Asian countries (1 September 1999-31 March 2017), this study examines the effect of exchange rate growth toward stock market returns in short and long run in each country. This model can indicate how quickly the effect of the exchange rate is fully accepted by the stock market in the short term.

The behavior of exchange rate in influencing stock return in each country is examined in two groups, that is 1 September 1999 - 30 September 2008, and 1 October 2008 - 31 March 2017. The division of this period is intended to outline the changes of structural behavior caused by global financial crisis 2008-2009 that faced by each country.

The rest of this paper is composed as follows: In Section 2, the related literatures are discussed. Section 3 explains the method include the model used for long run estimation, cointegration approach, and derivation of the short term or error correction model (ECM). Section 4 contains the empirical results and findings based on estimation models for each country. In Section 5 is a conclusion of study that summarizes the results and provide suggestions for future research.

## **2. Literature Review**

In this section is discussed the researches that examines the effect of exchange rates on stock return empirically in some countries. In general, these studies have similar conclusions.

Yang and Chang (2008) conduct a research on the international integration of financial markets associated with the movement of currencies in affecting the stock prices. The study applies a double-threshold GARCH (DTGARCH) market return model to investigate the empirical effects of daily currency movements on five stock market levels, in Taiwan, Singapore, South Korea, Japan and the United States. Yang and Chang find the interaction between stock information and the foreign exchange market lead to asymmetric reactions of stock returns and related variability. The empirical results show that international fund managers who invest in emerging stock markets need to evaluate the value and stability of the domestic currency as part of their stock market investment decisions.

Kohler (2010) analyzes the relationship of exchange rates and stock prices in two crisis periods in Asia. Kohler states that the exchange rates movement during the 2007-2009 global financial crisis was unusual. Unlike the previous of two episodes of the 1997-1998 Asian crisis and the crisis caused by Russia's debt default in 1998, the 2008 crisis is experienced by many countries where not located in the center of crisis. These countries depreciated their currency sharply. The impact of the crisis has a profound impact on a number of countries. There are two factors considered to contribute to the 2008-2009 crisis, namely the safe-haven effect against the crisis pattern and the existence of interest rate differentiation that explains the exchange rate movements in anticipation of the crisis in 2008-2009.

Agrawal, Srivastav and Srivastava (2010) analyze the relationship between Nifty returns – daily closing index - and Indian rupees-US dollar exchange rates by monthly data from October 2007 to March 2009. This study finds that Nifty's share price and exchange rate were not normally distributed, and the negatively correlation between Nifty returns and the exchange rates. The causality relationship by using Granger test shows a direct relationship between Nifty returns

and exchange rates.

Kasman, Vardar, and Tunç (2011) examine the effect of interest rates and changes in foreign exchange rates on bank stock returns in Turkey using Ordinary Least Squares (OLS) and GARCH models. The results of the study show that interest rates and exchange rate changes affect negatively on stock returns of banks. This study also states that the sensitivity of bank stock returns responds stronger the market returns than interest rates and exchange rates. This implies that the market return plays an important role in determining the dynamics of bank stock returns. The results also observe that the interest rates and exchange rates volatility are the main determinants of the volatility of bank stock returns.

The research which was conducted by Chkili, and Nguyen (2013) employs a regime-switching approach model to investigate the dynamic relationship between exchange rates and stock market return rates for BRICS countries (Brazil, Russia, India, China and South Africa). Univariate analysis shows that stock returns of BRICS countries develop in two different regimes: low volatility regime and high volatility regime. By utilize the Markov switching VAR models, this study indicates that the stock market has a greater influence on exchange rates during periods of calm and turbulence. This empirical insight has important implications for portfolio investment and currency risk hedging.

Purnomo and Rider (2012) examine the short and long run relationships between domestic and foreign source shocks to the Jakarta Composite Stock Price Index (JCI). They states that the stock prices is cointegrated with several domestic macroeconomic variables. This study employs an error correction model to identify long-run equilibrium relationships between IHSG and domestic and overseas macroeconomic shocks and finds that the rupiah exchange rate to US dollar has a two-way effect on JCI. The results also show that JCI is coordinated with stock market prices in some Southeast Asian markets. However, this study also finds that there is no evidence of

cointegration between JCI and U.S. and Japan stock markets, which means that the JCI is influenced by regional stock markets. This study also estimates the impulse response function to simulate the shock effect of domestic and foreign sources on JCI.

Pan, Fok and Liu (2007) outline the relationship between exchange rates and stock prices in seven East Asian countries from January 1988 to October 1998. Their study uses Granger causality test, Variance Decomposition Method (VDM) and Impulse Response Function (IRF). The analysis shows a causal relationship in exchange rates to stock prices in Hong Kong, Japan, Malaysia, and Thailand. There is a causal relationship from stock price to exchange rate in Hong Kong, Korea and Singapore before the Asian financial crisis 1997. This study also finds a causal relationship between exchange rate to stock price for all sample countries except Malaysia during Asian crisis period.

The research conducted by Rahman and Uddin (2009), analyzes the interaction between exchange rates and stock prices in Bangladesh and Pakistan. Using the average exchange rate data of taka (Bangladesh currency) and rupee (Pakistan currency) on the price of DSE (Dhaka stock exchange), BSE (Mumbai Stock Exchange) and KSE (Karachi Stock Exchange), with monthly data throughout January 2003-June 2008, the study finds there is no long-run causal relationship between exchange rates and stock prices in these countries.

Kutty (2010) analyzes the relationship between the exchange rate and the share price in Mexico during 1989-2006 with utilizing the Granger causality test. The study finds that the stock market prices and exchange rates, have no long run causal relationship, but have short-term causal relationships.

By utilizing the monthly data of stock prices and exchange rates along 1991–2009 with VAR and GARCH multivariate model, Zhao(2010) analyzes the dynamics relationship between Renminbi exchange rate (RMB) to US Dollar and

Stock Price Index in China. Zhao's study concludes that exchange rate volatility has a large effect in the future on stock returns.

The last research on the relationship between foreign exchange rates and stock market prices performed by Sinha and Kohli (2015). They examine monthly data from January 2006-March 2012 of the exchange rate effects, the Sensex BSE, BSE Oil index, and the TI BSE sector, gas sector index by using least squares regression model. This study finds a negative and insignificant relationship between the level of foreign exchange and stock returns.

### **3. Methods**

#### **3.1 Data**

The data that are utilized in this study are carried out from Bloomberg (2017a, 2017b, 2017c, 2017d, 2017e, 2017f, 2017g, 2017h, 2017i, 2017j). The following is a list of the original definition of the variable from Bloomberg.

The variables and definition are explained as follows:

1. Indonesian stock price (S\_ID) is the Jakarta Stock Price Index, which is a modified capitalization-weighted index of all stocks listed on the regular board of the Indonesia Stock Exchange.
2. Indonesian exchange rate (IDR), is the Rupiahs (Indonesian currency) exchange rate against the US dollar.
3. Malaysian stock price (S\_MY) is the FTSE Bursa Malaysia Index (KLCI) comprises of the largest 30 companies by full market capitalization on Bursa Malaysia's Main Board.
4. Malaysian exchange rate (MYR) is the Malaysian ringgit exchange rate against the US dollar.
5. The Philippines stock price (S\_PH) is the Philippine Stock Exchange Index (PSEi) which is a capitalization-weighted index composed of stocks representative of the Industrial, Properties, Services, Holding Firms, Financial and Mining & Oil Sectors of the PSE.

6. The Philippines exchange rate (PHP) is the Philippine peso exchange rate against the US dollar.
7. Thailand stock price (S\_TH) is the Bangkok SET Index, which is a capitalization-weighted index of stocks traded on the Stock Exchange of Thailand.
8. Thailand exchange rate (THB) is the Thai baht exchange rate against the US dollar.
9. Singapore stock price (S\_SG) is the Straits Times Index (STI), maintained and calculated by FTSE, is the most globally recognized benchmark index and market barometer for Singapore.
10. Singapore exchange rate (SGD) is the Singapore dollar exchange rate against the US dollar.

The data is the daily stock return and foreign exchange rate of five South East Asian Countries (Indonesia, Malaysia, the Philippines, Thailand, and Singapore) from 1 September 1999 to 31 March 2017, which separates as the need of analysis into two periods: 1 September 1999-30 September 2008 (Period 1) and 1 October 2008-31 March 2017 (Period 2).

### 3.2 Long Run Model and Cointegration Approach

The long run equations developed in this study is linear regression that show the relationship between stock return and exchange rate growth, as follows:

$$Y_t = \beta_0 + \beta_1 X_t + \varepsilon_t \quad (1)$$

$Y$  is stock returns in each country, in percentage, successively, these variables for Indonesia is represented by the GROWTH\_S\_ID, for Malaysia is represented by GROWTH\_S\_MY, for the Philippines is represented by GROWTH\_S\_PH, for Thailand is represented by GROWTH\_S\_TH, for Singapore is represented

by GROWTH\_S\_SG.  $X$  is the growth of exchange rate in each country, in percentage, successively these variables for Indonesia is represented by IDR, for Malaysia is represented by MYR, for the Philippines is represented by PHP, for Thailand is represented by THB, for Singapore is represented by SGD. The  $\beta_0$  and  $\beta_1$  are the regression coefficients in each country model and  $\varepsilon$  is the error terms for equation (1), and subscript  $t$  indicates the period.

Equation (1) can be written as follows:

$$\varepsilon_t = Y_t - \beta_0 - \beta_1 X_t \quad (2)$$

If the unit root of is tested and the result is stationer, then based on the terminology of Engle Granger (1987), it can be stated that the two variables  $Y$  and  $X$  have a linear combination which indicate a long-run equilibrium relationship that may reflect casual, behavioral or simply reduced form relation. The linear relationship is named cointegration.

To test whether the two variables  $Y$  and  $X$  are cointegrated, it can be applied stationarity testing, with Dicky-Fuller stationery test for (Gujarati and Porter, 2009), as follows:

$$\Delta \varepsilon_t = -\theta_0 \varepsilon_{t-1} + u_t \quad (3)$$

$u_t$  s the error terms for equation (3).

### 3.3 Dynamic Model of Stock Return: Error Correction Model

Error correction model (ECM) is one of the best models for modeling variables that have long-term relationships of variables evidenced by the presence of cointegration. The ECM is a model with a useful theoretical derived to estimate the relationship both short-term and long-term effects of one time series on another.

Cointegration between two variables of stock return and exchange rate growth indicates the long run relationship, or an equilibrium between

the two variables. There is the possibility of disequilibrium between the two variables in the short run. Thus, the error of the equation (1) can explain the error equilibrium and can be used to explain how the short run relationship of the dependent variable to its long run value. This method is called an error-correction mechanism, known as the Engle-Granger (EG) two-steps procedure.

The following equations are the brief derivation of ECM model based on equation (1), and to estimate the ECM model, equation (1) need to be reordered. Firstly, by adding the lag of dependent and independent variables, to show the short run disequilibrium relationship. The model is autoregressive distribute lag (ADL) 1,1 model, i.e.:

$$Y_t = \beta_0 + \partial_1 Y_{t-1} + \beta_1 X_t + \beta_2 X_{t-1} + \varepsilon_t \quad (4)$$

Then we reordered the equation with subtract on both sides:

$$Y_t - Y_{t-1} = \beta_0 + \beta_1 X_t + \beta_2 X_{t-1} + \partial_1 Y_{t-1} - Y_{t-1} + \varepsilon_t \quad (5)$$

Then add and subtract from the right hand side.

$$Y_t - Y_{t-1} = \beta_0 + \partial_1 Y_{t-1} - Y_{t-1} + \beta_1 X_t + \beta_1 X_{t-1} - \beta_1 X_{t-1} + \beta_2 X_{t-1} + \varepsilon_t \quad (6)$$

$$\Delta Y_t = \beta_0 - (1 - \partial_1) Y_{t-1} + \beta_1 \Delta X_t + \beta_1 X_{t-1} + \beta_2 X_{t-1} + \varepsilon_t \quad (7)$$

$$\Delta Y_t = + \beta_1 \Delta X_t - (1 - \partial_1) \left( Y_{t-1} - \frac{\beta_0}{1 - \partial_1} - \frac{\beta_1 + \beta_2}{1 - \partial_1} X_{t-1} \right) + \varepsilon_t \quad (8)$$

Equation(8) could be referred to a first order model ECM equation with  $\left( Y_{t-1} - \frac{\beta_0}{1 - \partial_1} - \frac{\beta_1 + \beta_2}{1 - \partial_1} X_{t-1} \right)$  as an *Error Correction Term (ECT)*.

## 4. Result and discussions

### 4.1 Descriptive Statistic of the Variables

Table 1 and Table 2 show the descriptive statistics of market stock returns and the growth of foreign exchange rate of each country in each period of study. Statistically, in Period 1, it exhibit that Indonesia has the highest average value of stock return during the study period, followed by Thailand. The standard deviations of stock return data of Thailand demonstrates the highest value compared to other countries', and then followed

by Indonesia. The comparison of average of stock return and exchange rate growth of Indonesia and Thailand show that volatility of stock market prices in Thailand is more volatile. Singapore has the lowest average stock return compared to other fourth South East Asian countries. Based on exchange rate growth of each country (against the US dollar), it is known that during the observation Period 1, Indonesian exchange rate (Rupiah/US\$) produces the highest average growth compared to other countries.

Table 1. Descriptive Statistic of Period 1: 1 September 1999-30 September 2008

Country	Variable	Average	Standard Deviation
Indonesia	Stock Return	0.042240	1.191059
	Exchange rate growth	0.008589	0.676401
Malaysia	Stock Return	0.012363	0.804281
	Exchange rate growth	-0.002913	-1.257589
Philippines	Stock Return	0.011764	1.140979
	Exchange rate growth	0.005810	0.372939
Thailand	Stock Return	0.016759	1.198136
	Exchange rate growth	-0.003626	0.316220
Singapore	Stock Return	0.007458	1.013215
	Exchange rate growth	-0.004531	0.231032

Source: EViews 9.0 estimation result

In Period 2, the average stock return and exchange rate growth in Indonesia is the highest compare to other countries'. The Philippines' average stock return is still below of Indonesia's, meanwhile in the average exchange rate growth; Malaysia's is placed on number two rank below Indonesia's. In general, the average stock return

of each country has decreased in Period 2, as well as the growth of exchange rates. The similar pattern is also occurred on the figures of standard deviations. This means that the economies of Southeast Asian countries are more stable in post occurrence of the 2008 world financial crisis.

Table 2. Descriptive Statistic of Period 2: 1 October 2008-31 March 2017

Country	Variable	Average	Standard Deviation
Indonesia	Stock Return	0.041668	1.080281
	Exchange rate growth	0.012273	0.528404
Malaysia	Stock Return	0.018705	0.539257
	Exchange rate growth	0.008990	0.408928
Philippines	Stock Return	0.038797	1.006919
	Exchange rate growth	0.002615	0.294654
Thailand	Stock Return	0.036579	1.026386
	Exchange rate growth	0.000623	0.236739
Singapore	Stock Return	0.013723	0.910797
	Exchange rate growth	-0.000380	0.330187

Source: EViews 9.0 estimation result

Figure 1, 2 and 3 show the pattern of stock return changes (in percent). In general, the daily changes in stock return of five Southeast

Asian countries demonstrate the phenomenon of volatility throughout the Period 1 and Period 2.

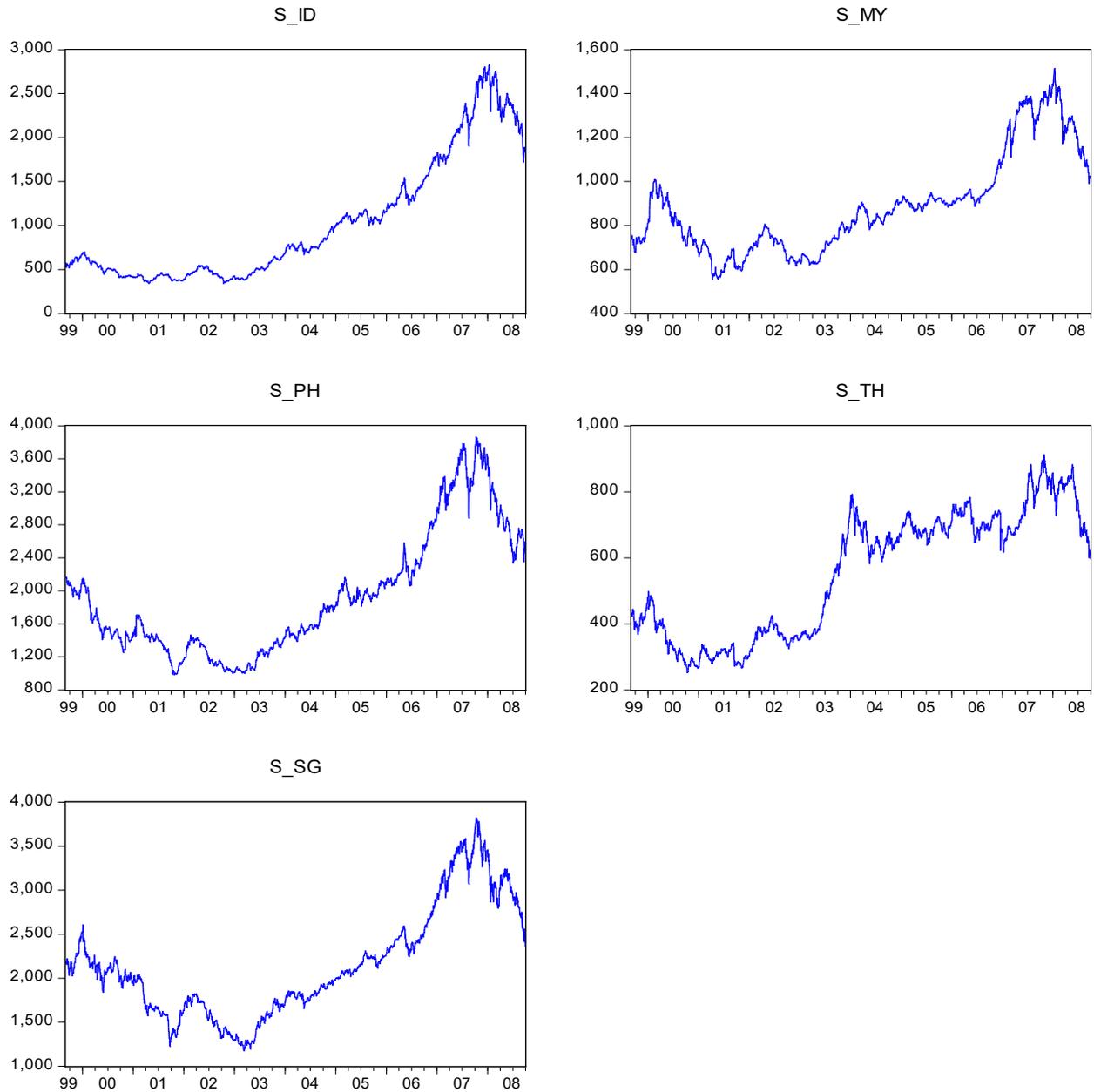


Figure 1. Daily Stock Return Changes: 1 September 1999-30 September 2008  
Source: EViews 9.0 estimation results

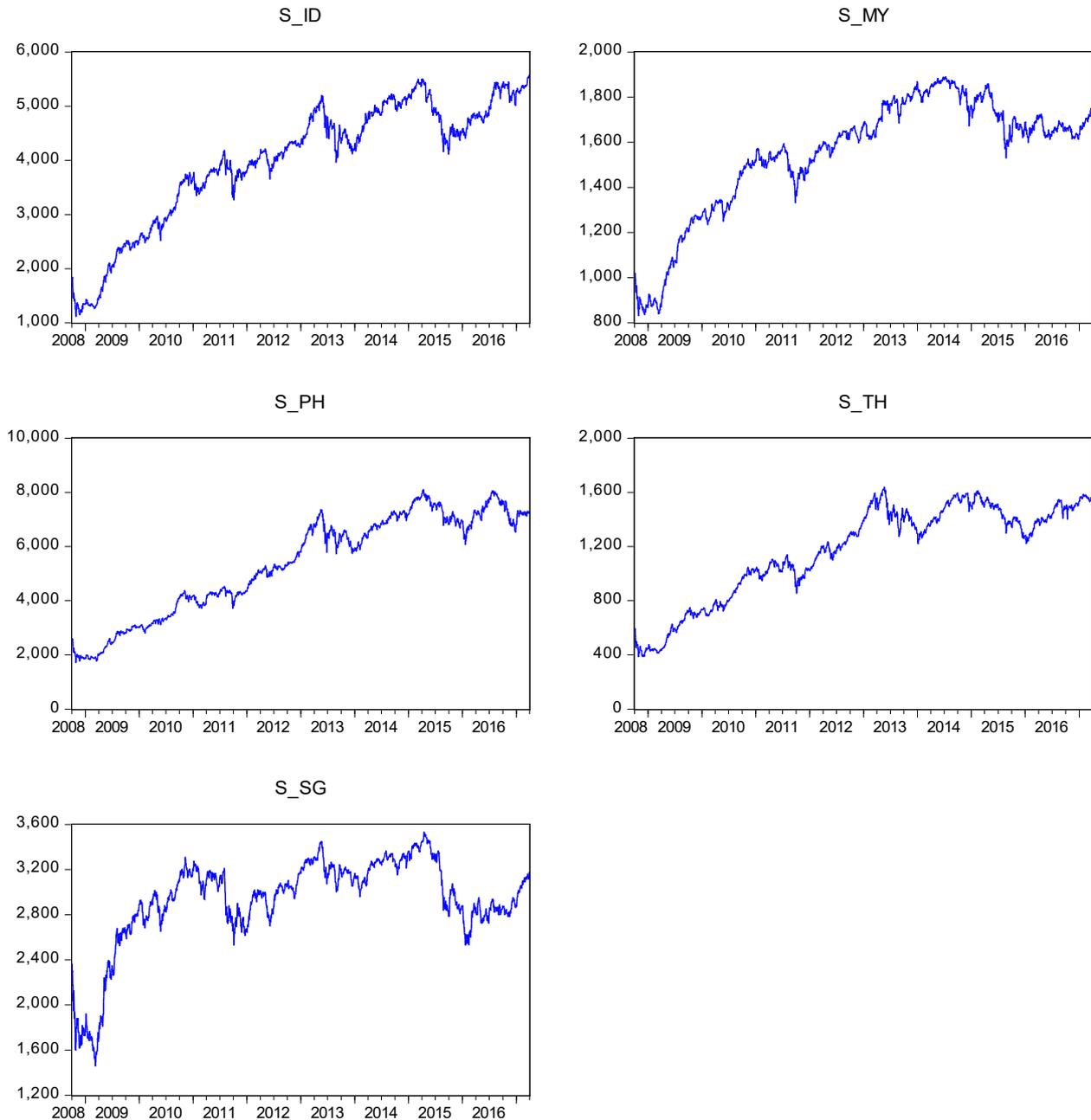


Figure 2. Daily Stock Return Changes: 1 October 2008-31 March 2017  
Source: EViews 9.0 estimation results

#### 4.2 Estimation Results of the Long Run Model and Cointegration of Period 1

Table 3 exhibits the summary of estimation results of the long run model of five Southeast Asian countries along 1 September 1999-30 September 2008 (Period 1). From the Table 3, it can be observed that all of countries show a similar pattern regarding the influence of the

exchange rate growth to the stock returns. The figures of the calculated F is finds greater than the figure of critical F for all of countries' model, which is pointed that the overall independent variables (exchange rates growth) affect stock return in each country. In all countries, exchange rate growth statistically significant affects stock return in a negative direction.

The period of pre world financial crisis 2008 (Period 1), the negative magnitude of stock return and the exchange rate growth indicates that the stock return responds in lower value to the higher of the change of exchange rate depreciation in long run. The increase of the change in depreciation of Indonesian rupiahs by 1 percent, lead the stock return of Indonesian market decrease by 0.514 percent. In this period, the increase of the changes in Malaysian ringgit depreciation by 1 percent leads the decrease of stock return in Malaysian market by 1.046 percent. The increase of the change in depreciation of Philippines' pesos by 1 percent leads the decrease of stock return in Philippines market by 0.703 percent. The increase of the growth of Thailand baht by 1 percent, leads

the increase of stock return in Thailand's market by 0.497 percent. The rise of Singapore's dollar depreciation changes by 1 percent, leads the decrease of stock return Singapore's market by 0.325 percent.

In the long run, in the period of pre-crisis 2008, the depreciation of exchange rate of each country (in term of 1 US dollars) which biggest effect on stock return is occurred in Malaysia's market, compared with four other countries. In other words, pre financial crisis 2008, the stock returns in the Malaysian market were the most vulnerable from the exchange rate changes. While the smallest pressure is occurred in the Singapore's market.

Table 3. Estimation Result of Long Run Model: Period 1

Variable	Coefficient and (t-stat <sup>2</sup> )				
	Indonesia	Malaysia	Philippines	Thailand	Singapore
Constant	0.046651 (2.357783)	0.009316 (0.679073)	0.015850 (0.821881)	0.014955 (0.341117)	0.005987 (0.7330)
X <sup>1</sup>	-0.513546 (-17.55473)	-1.045629 (-11.04964)	-0.703394 (-13.60168)	-0.497441 (-7.625038)	-0.324707 (-4.274609)
R-squared	0.085055	0.035523	0.035523	0.017237	0.005482
Adj. R-squared	0.084779	0.035232	0.035232	0.016940	0.005182
F-stat	308.1687	122.0946	185.0056	58.14120	18.27228

Source: EViews 9.0 estimation results

Note: 1) X for each country= Growth\_IDR (Indonesia); Growth\_MYR (Malaysia); Growth\_PHP (the Philippines); Growth\_THB (Thailand); Growth\_SGD (Singapore), 2) All of t statistics are significant at  $\alpha = 1$  percent

The long run results are supported by cointegration test, as shown in Table 5. From the result, the equilibrium relationship of the growth of exchange rates and the stock return

in each market are proved statistically, which are indicated by the stationery of the long-term residual at level.

Table 4. Estimation results of Engle-Granger Cointegration Test: Period 1

Country and variable	Cointegrated or not	t statistic McKinnon
Indonesia	Cointegrated	-55.33996
Malaysia	Cointegrated	-29.40094
Philippines	Cointegrated	-54.71665
Thailand	Cointegrated	-59.45936
Singapore	Cointegrated	-57.41300

Source: EViews 9.0 estimation results

Note: all of t statistics are significant at  $\alpha = 1$  percent MacKinnon one-sided in EViews estimation.

### 4.3 Estimation Results of the Error Correction Model of Period 1

Summary of the estimation results of error correction model of 1 September 1999-30 September 2008 period (Period 1), are displayed in Table 5. The cointegration test proves that the ECM models of each country can be run. In general, in Period 1, the short run model can be proved by the ECM due to the negative significant of  $u_{t-1}$ . All of results of each country model implies that in short run, the discrepancy between short run and run can be finished in one period. In other words, in pre-crisis 2008, stock return responds fully in the growth of exchange rates almost in one day only.

Dari value  $u_{t-1}$ , it can be demonstrated that stock return adjust the growth of exchange rate with lag. For Thailand, it can be explained that 100 per cent discrepancy the long and short run of stock return in market can be corrected in

one period. For Singapore, 99.666 percent of the discrepancy can be corrected in one period, while for the Indonesia, the discrepancy were corrected 96.020 percent during the period. In the Malaysian market, 91.295 percent of the discrepancy can be corrected in one day, and in the Philippines market 95.036 percent of the discrepancy can be corrected in one day.

In the short run, stock market in Malaysia is very sensitive in response the changes of ringgit, in comparing with other countries' market in region. The changes of depreciation in ringgit by 1 percent decreases the stock return di Malaysia's market by 0.990 percent. In the same period, the stock return in the Singapore market is the most resistant to the shock of exchange rate value. The growth of depreciation of Singapore's dollar by 1 percent decrease the stock return in Singapore by 0,246 percent.

Table 5. Estimation results of ECM: Period 1

Country	$\Delta X^1$		$u_{t-1}$	
	Coefficient	t statistic <sup>2</sup>	Coefficient	t statistic
Indonesia	-0.500009	-23.98772	-0.960196	-55.29560
Malaysia	-0.989359	-14.85562	-0.912951	-52.81995
Philippines	-0.611345	-16.96977	-0.950361	-54.80389
Thailand	-0.394055	-8.612536	-1.029982	-59.28792
Singapore	-0.245984	-4.660752	-0.996656	-57.36721

Source: EViews 9.0 estimation results

Note: 1) X for each country= Growth\_IDR (Indonesia); Growth\_MYR (Malaysia); Growth\_PHP (the Philippines); Growth\_THB (Thailand); Growth\_SGD (Singapore), 2) All of t statistics are significant at  $\alpha = 1$  percent

Based on the diagnostic test results on the long run and the ECM model of Period 1, it can be indicated that the estimator of the long run and short run are normal, homoscedastic and non-autocorrelation.

### 4.4 Estimation Results of the Long Run Model and Cointegration of Period 2

Table 6 displays the summary of estimation results of the long run model for the five Southeast Asian country for 1 October 2008-31 March 2017 (Period 2). As Period 1 model, it can be seen in Table 7 that all of countries show a similar

pattern regarding the influence of the exchange rate growth to the stock returns. The calculated F was found greater than the figure of critical F for all of countries' model, which is pointed that the overall independent variables (exchange rates growth) affect stock return in each country. In all countries, exchange rate growth statistically significant affects stock return in a negative direction.

In the post occurrence of 2008 world crisis (Period 2), the result of estimation of the long run model indicates that the high the change of depreciation of exchange rate the lower the

market stock return, vice versa. The increase of the change in depreciation of rupiahs by 1 percent, lead the stock return of Indonesian market decrease by 0.774 percent. In this period, the increase of the change of Malaysian ringgit by 1 percent lead the stock return decrease in the Malaysia's market by 0.511 percent. The increase of the depreciation of Philippines 'pesos by 1 percent lead the decrease of stock return in Philippines market by 0.971 percent. The increase of the growth of baht by 1 percent, lead

the increase of stock return in Thailand's market by 1.177 percent. The growth of the depreciation of Singapore's dollar by 1 percent, lead the stock return di Singapore's market by 0.583 percent.

In the long run, with the observation post occurrence of world financial crisis 2008, the depreciation of exchange rate in each country (in 1 US dollar) hit the most to Thailand stock return, compared to other countries. Meanwhile, the smallest pressure is experienced in Singapore's market.

Table 6. Estimation Result of Long Run Model: Period 2

Variable	Coefficient and (t-stat <sup>2</sup> )				
	Indonesia	Malaysia	Philippines	Thailand	Singapore
Constant	0.051183 (2.849838)	0.023304 (2.609684)	0.041348 (2.384875)	0.037436 (2.110309)	0.013506 (0.844774)
X <sup>1</sup>	-0.774156 (-22.77905)	-0.510900 (-23.39758)	-0.970925 (-16.49892)	-1.176559 (-15.69893)	-0.582448 (-12.02754)
R-squared	0.143343	0.150049	0.080699	0.073625	0.044571
Adj. R-squared	0.143067	0.149775	0.080402	0.073326	0.044263
F-stat	518.8850	547.4465	272.2144	246.4565	144.6618

Source: EViews 9.0 estimation results

Note: 1) X for each country= Growth\_IDR (Indonesia); Growth\_MYR (Malaysia); Growth\_PHP (the Philippines); Growth\_THB (Thailand); Growth\_SGD (Singapore), 2) All of t statistics are significant at  $\alpha = 1$  percent

For the Period 2 models, the long run results are supported by cointegration test, as shown in Table 8. From the result, the equilibrium relationship of the growth of exchange rates

and the stock return in each market are proved statistically, which are indicated by the stationery of the long-term residual at level 0.

Table 8. Estimation results of Engle-Granger Cointegration Test: Period 2

Country and variable	Cointegrated or not	t statistic McKinnon
Indonesia	Cointegrated	-26.75722
Malaysia	Cointegrated	-53.24538
Philippines	Cointegrated	-52.29585
Thailand	Cointegrated	-58.24979
Singapore	Cointegrated	-55.30948

Source: EViews 9.0 estimation results

Note: all of t statistics are significant at  $\alpha = 1$  percent MacKinnon one-sided in EViews estimation.

#### 4.5 Estimation Results of the Error Correction Model of Period 2

Table 9 points the summary of estimation result of error correction model for the period of 1 October 2008-31March 2017 (Period 2).The

cointegration test result supports that the ECM can be run in each country model. In general, the short run model can be proved by the ECM due to the negative significant of  $u_{t-1}$ . Each country's estimations show that in the short run, the

discrepancy between short run and long run can be completed in one period. That is, in the period of post occurrence of financial crisis 2008, the stock return responds fully the growth of exchange rate depreciation in a day.

Dari value  $u_{t-1}$ , it can be demonstrated that stock return adjust the growth of exchange rate with lag. For Thailand, it can be explained that 100 per cent discrepancy the long run and short run of stock return in market can be corrected in one period. For Singapore, 99.669 percent of the discrepancy can be corrected in one period, while for the Indonesia, the discrepancy were corrected 97.012 percent during the period. In the Malaysian market, 95.524 percent of the discrepancy can be

corrected in a day, and in the Philippines market 94.055 percent of the discrepancy can be corrected in one day.

In this period, Thailand market is very sensitive in response the baht changes, compared with other countries in region by its each exchange rate in short run. The depreciation of baht by 1 percent leads the stock return di Thailand' market by 0.958 percent. In the same period, the stock return Singapore's market is the most resistant to the shock of the exchange rate. The changes of Singapore's exchange rate depreciation by 1 percent leads only to decrease the stock return in Singapore's market by 0.346 percent.

Table 9. Estimation results of ECM: Period 2

Country	$\Delta X^1$		$u_{t-1}$	
	Coefficient	t statistic <sup>2</sup>	Coefficient	t statistic
Indonesia	-0.679594	-29.79491	-0.970121	-54.12692
Malaysia	-0.437280	-28.57154	-0.955237	-53.41993
Philippines	-0.715834	-17.44555	-0.940554	-52.78672
Thailand	-0.958080	-17.63751	-1.045975	-58.43745
Singapore	-0.345942	-10.29440	-0.996587	-55.90744

Source: EViews 9.0 estimation results

Note: 1) X for each country= Growth\_IDR (Indonesia); Growth\_MYR (Malaysia); Growth\_PHP (the Philippines); Growth\_THB (Thailand); Growth\_SGD (Singapore), 2) All of t statistics are significant at  $\alpha = 1$  percent

Based on the diagnostic test results on the long run and the ECM model of Period 2, it can be indicated that the estimator of the long run and short run are normal, homoscedastic and non-autocorrelation.

#### 4.6 The Comparison of Estimation Results of Period 1 and Period 2, and Other Related Researches.

From the two of observation periods estimations, it proves empirically that overall both on long run and short run models, the exchange rate changes affect stock returns negatively. This means that the depreciation of the exchange rate will decrease the stock return. In addition to economic theories, these results are also in line with previous researches with several empirical cases such as Agrawal, Srivastav and

Srivastava (2010), Kasman, Vardar, and Tunç (2011), and Purnomo and Rider (2012). However, the study of Rahman and Uddin (2009), finds a different result, that there is no long-run causal relationship between exchange rates and stock prices in Bangladesh and Pakistan. While the study of Kutty (2010), finds that there is no long run causal relationship, but have short-term causal relationships between the stock market prices and exchange rates I Mexico.

Based on the magnitude of the parameters of the effect of exchange rate growth on stock return, it is observed that there are behavioral differences between countries pre and post the 2008 financial crisis. In the pre-crisis short run model, the stock return in the Malaysia's market is the most vulnerable influenced by the changes in ringgit exchange rate, compared to other

countries' stock market, while on post financial crisis, the stock returns in Thailand's market are the most vulnerable to the change of the baht exchange rate.

The estimation of short run model of all countries indicate that the behavior of exchange rate changes is responded fully by changes in stock prices in one day. This means that the exchange rate variable is an important determinant in stipulation the movement of stock prices in Southeast Asian countries.

## 5. Conclusion

This study has two main significances that are the novelty of the study. The first significance of the study is the employing the long series of daily data (include more than 6000 days) which is divided into two periods, that is the pre and the post-occurrence of the world financial crisis 2008. The second significance of the study is the using strong theoretically approach of error correction model that empirically proves the effects of the change in exchange rates on stock return in Indonesia, Malaysia, the Philippines, Thailand, and Singapore in the long and short run are real.

As it is well known that exchange rate is one of measurement of a country's macroeconomic health, which its real response that being addressed by economic agents in capital markets, the fundamental macroeconomic health problem is a crucial issue. It should be concern by the stakeholders of the stock market and the policy maker of these countries, especially those countries that have high exchange rate influence elasticity on stock in the short term.

Other implications of the study results are the need to strengthen the economic fundamentals and the need to be discreet on the face of foreign policies that can influence the exchange rate of domestic currency, which further depress the domestic stock market. The issues of stock prices and returns are not only as the issue of value rising or falling, but also the concerning of its volatility that can be caused by many problems such as speculative activity, the global and

domestic economic changes, management policies and etc.

To produce a more comprehensive study in the future, by some limitations of method in this study, it can be done some developments. For the improvement of the variables, it can be added other independent variables that are considered affecting the stock returns, include both macroeconomic and microeconomic variables. To investigate the interdependencies among the stock market in the countries, it can be developed the model that capture the effect of transmission between stock markets and even between currencies.

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