Print ISSN: 2288-4637 / Online ISSN 2288-4645
doi:10.13106/jafeb.2021.vol8.no3.0731

Econometric Analysis of the Determinants of Real Effective Exchange Rate in the Emerging ASEAN Countries

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Received: November 30, 2020 Revised: February 01, 2021 Accepted: February 16, 2021

Abstract

This research aims to investigate the determinants of real effective exchange rate in emerging ASEAN countries, including Indonesia, Malaysia, Philippines, Thailand, and Vietnam. The research was conducted by using quarterly time series data set from 1980Q1 to 2020Q3. Cointegration and the error correction model (ECM) methods were applied to test the long run and short run relationship of the real effective exchange rate and its determinants. The results indicate that the ratio of foreign direct investment to GDP and the government spending have significantly positive impact on real effective exchange rate in the Emerging ASEAN countries. The trade opening had influencing real effective exchange rate in most the Emerging ASEAN countries, except Vietnam. In addition, the international reserve (INR) had significant long-run impacts variables on real effective exchange rate in Malaysia, Thailand and Vietnam. In the short run equilibrium, the error collection term suggest that Indonesia and Malaysia are the fastest speed adjustment to equilibrium. In addition, the term of trade influence the real effective exchange rate in Indonesia, Malaysia, and the Philippines but it is not in Thailand and Vietnam. However, FDI is a major factor of the real effective exchange rate in Vietnam, but not for other countries.

Keywords: Econometric, Real Effective Exchange, Emerging Economies, ASEAN

JEL Classification Code: C50, C54, E02, E41, E51

1. Introduction

After the Asian Financial Crisis in 1997, most emerging countries in Asia face an unstable economic situation, particularly Indonesia, the Philippines, Malaysia, Thailand, and Vietnam. The crisis caused a temporary collapse in the Southeast Asia economic system, with high unemployment rate and economic downturn in their countries. In addition, many developed countries applied an expansionary monetary policy by reducing an interest rates that cause a massive capital flows into the Southeast Asia. The uncertain economic situation causes unexpected exchange rate fluctuation directly. In respond to the situation, most Asian economies have adopted managed floats exchange rate policy after the crisis, which allow their currency to adjust in value in foreign exchange markets. Therefore, the exchange rate behavior became one of the primary concerns in economic analysis due to the uncertain exchange rate can affect the global investment value and the competitiveness. Moreover, the exchange stability is also related to an international trade, international reserves, and government debt that directly impacts the value of the country's own currency. It can be said that fluctuations in exchange rate affect economic performance and it tend to have negative impact on overall economic activities.

The relationship between real exchange rate and its determinant is certainly an important and ongoing issue, both from the descriptive perspective and the policy prescription perspectives. Recently, many countries performed economic policy by including the real exchange rate stability and correct exchange rate regime as an elements to improve economic growth and stability since the real exchange rate can affect economic activity. Therefore, previous researches that focused on the exchange rates behavior have been performed to analyze the exchange rate fluctuation and their

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volatility. In addition, several models have been created to capture the pattern and forecast the exchange rate, such as portfolio balance models and the monetary exchange rate models. For example, Hallett and Wren-Lewis (1997) explain the exchange rate and its determinant; they claim that inflation is a major factor that has directly positive relationship with the exchange rate. Edwards (2001) analyzed the relationship between exchange rate system and the currency crises in an emerging economy during the 1990s. Taylor (2001) investigates the failure of liberalization and exchange rate policies in Argentina. The research found that Argentina had failed to maintain the liberalization policies due to the fact that Argentina had anti-inflation policy based on fixed exchange rate. Harberger (2004) examined the effect of economic growth on real exchange rate movement. The research indicated there is no relationship between the real exchange rate and economic growth. Husain et al. (2005) found that there is a relationship between inflation rate exchange rate regimes in those countries. Due and Sen (2006) analysed the relationship between the real exchange rate, capital flows, volatility, and economic policy in India during 1993 to 2004.

Since many countries adopt a floating exchange rate system, the exchange rate volatility has also become one of the most important issues among the researchers. Oaikhenan and Aigheyisi (2015) stated that the exchange rate volatility is correlated to fluctuations of the exchange rate, both in short-term and the long-term. Martins (2015) indicate that the foreign exchange transactions profitability can be influenced by the exchange rate movement. Gabaix and Maggiori (2015) analyzed exchange rate dynamics and international liquidity. Hsing (2018) used S-MP-AS model to examine a currency depreciation and its determinants in Thailand. He stated that there are significant relationships among monetary policy, inflation gap, output gap, world real interest rate and the real effective exchange rate. Mc-Grevy et al. (2018) investigated that both factors dominate the random walk bilateral exchange rate and predictive models when they did a case study on Dollar and Euro currencies. Alam et al. (2020) analyzed the effect of crude oil price on the real exchange rate in India. Culiuc (2020) examined the interaction between the overshooting in the depreciation and the real exchange rate. This can be said that the exchange rate stability is important factors that affect foreign investments, economic growth, price stability (Ajao, 2015)). Moreover, changes in these economic activities leads to volatility change by exceeding the long-term and short-term exchange rate equilibrium.

This paper attempts to employ co-integration and an error correction model (ECM) to analyze the determinants of real effective exchange rate in Emerging ASEAN countries, including Indonesia, Malaysia, Philippines, Thailand, and Vietnam, using data set during 1980 to 2020. The rest of this paper is organized as follows: Section II provides the literature reviews related to this paper. Section III presents a research methodology. Section IV outlines an empirical results and discussion this paper, and Section VI presents a conclusion of this paper.

2. Literature Review

The issues of currency exchange rates and factors affecting their changes is one of the most popular issues in international economic studies and have been reviewed by several researchers. The first attempts to analyze exchange rate behavior was developed by Dornbusch (1976) and Rogoff (1983). The model examined the exchange rate adjustments, known as sticky prices and the rational expectations. The research clearly indicated that the sticky prices and the rational expectations remains a significant concept since several evidence in a recent years appeared to be more remarkable for deviations from than observance. After that, the study of exchange rate and the factors affecting nominal exchange rates was clearly investigated by Lane (1999). He used both theoretical and empirical study to analyze long-run exchange rates equilibrium and generated a model for both nominal and real exchange rates by using data set from 107 countries during 1974–1992. The results shown that inflation rate is the most important factor that impact the nominal exchange rate in the long-run. In addition, the country openness, economic growth and the international trade is also resulted to be significant, while the country size was not significant related to the exchange rate. The country openness, country size, and the government debt were significant effect the nominal exchange rate. However, the terms of trade influence the nominal exchange rate via the real exchange rate in the OECD countries.

Due and Sen (2006) investigated an interaction among the real exchange rate and economic indicators, which including a level of capital flows, flows volatility, fiscal policy, and monetary policy, and the current account surplus in Indian during 1993 to 2004. The results indicate that all variables are cointegrated to the real exchange rate and had long run relationship with Indian currency. Kia (2013) applied the monetary theory to develop the model of real exchange rate and its determinants in a small open economy by using Canadian data set from 1972Q1–2010Q3. Similarly, AbuDalu et al. (2014) applied a quarterly time series data between 1991 to 2006 to investigated the relationship between the real effective exchange rate and its determinants. The variables including an inflation rate, money supply, domestic interest rate, foreign interest rate, net foreign assets, and the terms of trade in ASEAN-5 countries. The research applied the panel data from 1998 to 2012. Ahmed, et al. (2016) offered a new approach for predicting the exchange rate. The research focused on unconditional and conditional expectations of

currency risk factors. Bhat and Shah (2017) examined the determinants and movement of real exchange rate in the South Asian Countries. Kim and Park (2020) analyzed a few selected macroeconomic factors from US macro-variable to predict a bilateral exchange rate of 26 currencies.

Lee and Brahmasrene (2019) applied the vector error correction model to estimates a long-term and short-term causality of exchange rate in Korea. Culiuc (2020) analyzed the determinant and consequence of the exchange rate overshooting. He found that the consequences of large depreciations on economy is dependent on contractionary balance sheet immediately and expansionary expenditure. Qamruzzaman et al. (2021) used the data set from 1980–2017 analyzed the impact of foreign direct investment and financial innovation on the volatility of exchange rate in South ASEAN. He suggests that FDI inflow and the financial innovation positively and significantly influence exchange rate volatility in the long run.

3. Research Methodology

3.1. Data Set

This paper focuses on the long run and short run relationship between the real effective exchange rate and its determinants in the Emerging ASEAN countries, including, Indonesia, Malaysia, Philippines, Thailand, and Vietnam. The paper was conducted by using time series secondary data from 1980 to 2020. All data set were extracted from the International Financial Statistics (IFS), which published by the International Monetary Fund (IMF) and the World Development Indicators (WDI) by the World Bank. All the data were transformed to the natural logarithm before using in the estimate model.

3.2. Research Model

In this paper, the determinant of real effective exchange rate in five countries in the Emerging ASEAN countries, including, Indonesia, Malaysia, Philippines, Thailand, and Vietnam, were examine by the following equation:

$$\text{REXC} = \alpha_1 + \beta_1\text{FDI} + \beta_2\text{TOT} + \beta_3\text{GOV} + \beta_4\text{TOE} + \beta_5\text{INR}$$

REXC refers to the real effective exchange rate in each country. In this paper, the REXC is defined as the relative price of tradable products to non-tradable products in domestic country comparing to foreign country. Each real effective exchange rate is based on 2010 (2010 = 100) of each country.

FDI refers to ratio of foreign direct investment to GDP of each country. In this paper the FDI is calculated as follow:

$$\text{FDI} = \frac{\text{Net foreign investment}}{\text{Norminal GDP}}$$

TOT refers to a terms of trade, which calculated from relative price of exports index compared to its imports index.

$$\text{TOT} = \frac{\text{Export Index}}{\text{Import Index}}$$

where

$$\text{Export Index} = \frac{\text{Export Value}}{\text{Export Price Index}}$$

$$\text{Import Index} = \frac{\text{Import Value}}{\text{Import Price Index}}$$

GOV (Government Expenditure) refers to the government spending that includes the all expenditure for employment, buying goods and services, paying for fixed capital, interest, grants, subsidies, and other expenses by the government.

$$\text{GOV} = \frac{\text{Government Spending}}{\text{Norminal GDP}}$$

TOE (Trade Openness) in this paper, the TOE calculated by the value of export plus import divided by the nominal GDP in each country.

$$\text{TOE} = \frac{\text{Export} + \text{Import}}{\text{Norminal GDP}}$$

INR refers to International reserves of the countries

3.3. Research Methods

This paper started by using the Augmented Dickey-Fuller test (ADF test) to test stationary of each variable that included in the model. Then, Johansen (1991) cointegration approach was applied to test a long run relationship of the real effective exchange rate function. After that, this paper examined a short run determinants of the real effective exchange rate and its determinants by using the Vector Error Correction Model (ECM).

3.3.1. Testing for Stationary and Unit Root Test

There are two methods for detecting nonstationary variables of time series data, Firstly, plotting each variable to see any obvious trend in the series. Another method is detecting non-stationary by using formal method, call unit root test. The standard method for detecting the unit roots was created by Dickey and Fuller (1979), called Dickey-Fuller test (DF test). The DF test was valid when the error term (ε_t) is appeared to be a white noise. The DF test assumption is that the error ε_t terms was uncorrelated, and it will be auto correlated in case autocorrelations in the dependent variable in the regression model was detected. After that, Dickey and Fuller (1981) developed an alternative method for detecting the unit root when the error term is more unlikely to be a white noise. This method is well known as the Augmented Dickey-Fuller test (ADF test).

The Augmented Dickey-Fuller test (ADF test) is actually the developed from of the DF test. The ADF test includes an extra ρ-lag value on the dependent variable ΔY_t to eliminate the autocorrelation. Therefore, this paper adopted the ADF approach for detecting nonstationary or unit root of each variables that are included in the research model. The equation that has been used for the unit root testing are following:

$$\Delta y_t = \delta Y_{t-1} + \sum_{i=1}^{P} \phi_i \Delta y_{t-i} + \varepsilon_t \quad \text{(a)}$$

$$\Delta y_t = \alpha + \delta y_{t-1} + \sum_{i=1}^{p} \phi_i \Delta y_{t-i} + \varepsilon_t \quad \text{(b)}$$

$$\Delta y_t = \alpha + \beta_t + \delta y_{t-1} + \sum_{i=1}^{p} \phi_i \Delta y_{t-i} + \varepsilon_t \quad \text{(c)}$$

Where Y_t indicates time series variables at time t,
Y_{t-1} refers to the lag of each time series variable,
ρ presents the lag of the time series a coefficient,
t is time, $t = 1, 2, 3, \ldots$, and
ε_t refers to the disturbance term. It is an identically and independently distributed with 0 mean and variance.

The hypothesis of the ADF test is similar to the original DF test. Therefore, the null hypothesis of the unit root can be written as H0: $\delta = 0$, and the alternative hypothesis is that H1: $\delta < 0$.

Practically, the ADF approach can be detected by comparing the absolute value of ADF statistic (t-statistic) of δ with a MacKinnon critical value. If the absolute value of ADF statistic appeared to be greater than the absolute critical value, the null hypothesis of a unit root can be rejected. It can be said that the series is stationary. However, if the ADF statistic is smaller than the absolute critical value, the series is nonstationary. In case the time series contain unit root or it is nonstationary at level, it can be first differenced or second differenced, or so on. The differencing method on unit root can be continued until the null hypothesis is rejected.

3.3.2. Cointegration Test

After testing unit root, a cointegration test by using Johansen (1991) approach was tested in this paper. There are two likelihood ratio statistics to test the cointegration hypothesis, trace statistic and maximal eigenvalue statistic. The two equations can be presented as:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{n} \text{In}\left(1 - \hat{\lambda}_i\right)$$

$$\lambda_{\max}(r, r+1) = -T \ \text{In}\left(1 - \hat{\lambda}_{r+1}\right)$$

where $\hat{\lambda}_i$ is an estimated value of the characteristic roots, which is obtained from the estimated metric. π refers to the number of usable observations.

The null hypothesis of trace statistic is that the number of cointegrating vectors is smaller or equal to r, against the alternative hypothesis $r > r_0$. The hypothesis of maximal eigenvalue statistic is that at least r cointegrating, against the alternative $r = r_0 + r_1$.

3.3.3. The Vector Error Correction Model

The cointegration approach put more concerns on the long-run equilibrium but it is not considered the short-run relationship between two variables. In order to capture the short-run dynamic relationship between the two variables, Engle and Granger (1987) and Granger (1988) developed an alternative methods to explain the short-run relationship between variables, called the Error Correction Model (ECM). Since Granger introduced the ECM concept, it became more popular among researcher due to the ECM approach using first difference term, which is able to eliminate trend from the equation. Moreover, the ECM also able to capture both short-run and long-run equilibrium relationships of the variables.

Engle and Granger (1987) suggest that if the two time series x_t and y_t become cointegrated in the same order (series x_t and y_t are I (d)), a linear combination of the two series supposed to be the same. In addition, the residual that obtains from the regression y_t on x_t should be I (d). Therefore, the simple method to derive the Error Correction Model, ECM,

is to show whether y_t and x_t are linear functions of the latent integrated progress. The residual of y_t regressed on x_t should be stationary.

To test an equilibrium between the two variables in the short-run, Engle and Granger presents the simple dynamic of short-run adjustment equilibrium as flowing Equation:

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \beta_0 x_t + \beta_1 x_{t-1} + \varepsilon_t$$

Rearrange Equation above by taking first difference

$$\Delta y_t = \alpha_0 + \gamma(y_{t-1} - x_{t-1}) + \lambda_1 \Delta x_t + \lambda_2 \Delta x_{t-1} + \varepsilon_t$$

Where t $\gamma = (\alpha_1 - 1)$, $\lambda_1 = \beta_0$, and $\lambda_2 = \beta_1 + \beta_0 + \alpha_1 - 1$

The γ or $(\alpha_1 - 1)$ indicates a speed that y_t is adjusted to any discrepancy between y_t and x_t in the previous period, while $(y_{1-1} - x_{t-1})$. It is equal to zero when y_t and x_t are in equilibrium. It indicate the extent to the long-run relationship which is not satisfied. The λ_1 indicates the short-run relationship between the two variables. However, instead of explaining the error correction term in $(y_{1-1} - x_{t-1})$ form, De Boef and Keele (2004) explain the convenient method to estimate the error correction model as following:

$$\Delta y_t = \alpha_0 + \gamma y_{t-1} + \eta 1 \Delta x_t + \eta_2 x_{t-1} + \varepsilon_t$$

where $\gamma = (\alpha_1 - 1)$, $\eta_1 = \lambda_1 = \beta_0$, and $\eta_2 = \beta_1 + \beta_0$.

Therefore it can be re-written in the form of an Error Correction Model as following:

$$\Delta y_t = \alpha_0 + \gamma(y_{t-1} + \eta_2 x_{t-1}) + \eta_1 \Delta x_{t-1} + \varepsilon_t$$

4. Empirical Results and Discussion

4.1. Unit Root Test

Since to use stationary data, it is necessary to analyze the time series data, this paper started by detecting stationary of each variables that included in the model. The Augmented Dickey-Fuller (ADF) methods was adopted in this section for testing a stationary of each variable. Table 1 presents the results of unit root test by using the ADF test, both the ADF test at level and at first difference. The numbers in the table indicate the ADF statistic (*t*-statistic). The number in the bracket indicates the optimum lag-length of the ADF.

The results of ADF statistic in Table 1 suggest that at level, all variables in the model, except term of trade (TOT) in Vietnam contains unit root at level. The null hypothesis of unit root cannot be rejected. These can be said that most variables, in this paper appeared to be non-stationary at level. However, the tests of unit root at the first difference of time series in this paper shown that all variables do not contain unit root after their first differentiation, the null hypothesis of unit roots can be rejected at 1% significant level. This can be concluded that all variables in this paper are integrated in order one, or (I (1)). Therefore, all variables in this paper appeared to be stationary and can be used in time series analysis.

4.2. Co-Integration

When the variables are integrated, they might or might not be cointegrated. Therefore, this paper applied Johanson cointegration for analyzing the cointegration among variables that included in the model. Table 2 presents the Johansen cointegration estimation for the real effective exchange rate function in the emerging ASEAN countries.

According to the table, result of Indonesia states that the trace (λ_{trac}) statistic of at most 1 equal 80.89, which is greater than the 5% critical value. This can be said that there is the existence of two integrating vector in real effective exchange rate functions in Indonesia. The estimation of Johansen cointegration for real effective exchange rate function in Malaysia indicates that the trace (λ_{trac}) statistic of at most 2 is 54.508, which is greater than the 5% critical value (47.856). This can be concluded that there are three integrating vectors in real effective exchange rate function. Similar to the estimation of Johansen cointegration for real effective exchange rate function in Philippines that the trace statistic suggest that the null hypothesis of At most 2 is rejected at 5% significance level, as a trace statistic (51.35) is greater than 5% critical value (47.85). This means that at least three stationary linear combinations of variables are cointegrated in real effective exchange rate function in Philippines in the long-run.

The result of Johansen cointegration for real effective exchange rate function in Thailand indicates that the null hypothesis of none is rejected at 5% significance level, since their trace statistic (120.96) are greater than 95% critical value (95.753). This can be concluded that there exists one cointegrating equation in the real effective exchange rate function in Thailand. However, the Johansen cointegration for real effective exchange rate function in Vietnam indicates that the null hypothesis of trace statistic (λ_{trac}) is that at most two cointegrating vectors against the alternative of more than r combination in real effective exchange rate function in Vietnam. The statistic suggest that the null hypothesis of at most two is rejected at 5% significance level, since their trace statistic is 61.142, which is greater than 95% critical value (47.856). This means that there exists three cointegrating vector in real effective exchange rate function in Vietnam. See Table 2.

The results of normalized cointegration vectors of the real effective exchange rate function in the Emerging

Table 1: The Results of ADF Unit Root Test

Variables	Indonesia	Malaysia	Philippine	Thailand	Vietnam
	ADF Unit Root Test at Level				
REXC	−1.59 (0)	−1.81 (0)	−1.52 (2)	−2.03 (0)	−2.20 (0)
FDI	−2.66 (1)	−2.86 (0)	−0.38 (1)	−1.64 (0)*	−2.93 (0)
TOT	−1.25 (1)	−2.93 (0)	−0.68 (1)	− 0.36 (0)	−5.63 (0)*
GOV	0.46 (0)	−2.70 (1)	−2.74 (0)	−1.49 (1)	−0.50 (0)
TOE	0.68 (0)	−2.01 (0)	−1.85 (2)	−1.29 (1)	−0.52 (0)
INR	0.29 (2)	−1.12 (0)	0.59 (0)	0.004 (0)	−2.10 (1)
	ADF Unit Root Test at first difference				
REXC	−7.70* (0)	−6.01* (0)	−6.39*(2)	−4.69* (0)	−4.20* (0)
FDI	−5.10* (0)	−6.58* (0)	−9.07* (1)	−7.696* (1)	−5.93* (0)
TOT	−5.92* (0)	−6.96* (0)	−7.18* (1)	9.22* (0)	−5.63* (0)
GOV	−6.71* (1)	−5.45* (1)	−3.96* (0)	−5.47* (0)	−4.50* (0)
TOE	−8.82* (0)	−6.25* (0)	−4.47*(2)	−5.08* (0)	−5.52* (0)
INR	−5.49* (0)	−4.37* (0)	4.91* (0)	−3.78* (2)	−3.10* (1)

Note * presents the significance level at 5%.
The number in ( ) presents the optimum lag-length of ADF test.

Table 2: Johansen Cointegration for Real Effective Exchange Rate Function in Emerging ASEAN Countries

Hypothesized No of CE (s)	Indonesia		Malaysia		Philippine		Thailand		Vietnam	
	Trace statistic	Prob*	Trace statistic	Prob*	Trace statistic	Prob*	Trace statistic	Prob*	Trace statistic	Prob*
None	155.20	0.00*	130.43	0.00*	147.28	0.00*	120.96	0.00*	193.28	0.00*
At most 1	80.89	0.00*	86.94	0.00*	87.46	0.00*	68.08	0.06	115.41	0.00*
At most 2	47.84	0.06	54.50	0.01*	51.35	0.02*	43.46	0.12	61.142	0.00*
At most 3	22.60	0.26	26.83	0.10	24.34	0.18	22.67	0.26	25.54	0.14
At most 4	8.75	0.38	9.34	0.33	9.70	0.30	10.39	0.25	5.74	0.72
At most 5	0.78	0.37	0.23	0.62	0.39	0.52	0.52	0.46	0.05	0.82

* denotes rejection of the hypothesis at the 0.05 level.

ASEAN countries is presented in table 3. The number in the table shows coefficient of the long run relationship among the variables and the number in brackets represent standard error for each coefficient. The results were performed by setting the estimated coefficient on the real effectiveness exchange equal −1. In addition, this paper divides each cointegrating vectors by negative relevant coefficient. Therefore, the vectors represent real effective exchange rate function and the long run elasticity of real effective exchange rate.

Malaysia: As can be seen in Table 3, the long run movement in all variables in the Malaysian real effective exchange rate model, except trade openness (TOE) had significant effect the real effective exchange rate in Malaysia. The term of trade (TOT) had the highest significant impact on Malaysia's real effective exchange rate. The coefficient of TOT is –23.26, means that 1 percent increase in term of trade leads to 23.26 percent reducing in Malaysia's real effective exchange rate. In addition, a ratio of foreign direct investment to GDP (FDI) and international

Table 3: Normalize Cointegrating Vectors for Real Effective Exchange Rate Function in the Emerging ASEAN Countries

	Malaysia	Indonesia	Philippines	Thailand	Vietnam
	0.177*	0.052*	−0.051*	0.036*	12.578*
FDI	(0.027)	(0.007)	(0.008)	(0.007)	(0.485)
	[6.655]	[7.437]	[−6.368]	[5.029]	[25.95]
	−23.261*	−4.180*	0.009*	−1.124*	−0.153
TOT	(2.584)	(0.557)	(0.004)	(0.465)	(0.123)
	[−9.000]	[−7.505]	[2.500]	[−2.418]	[−1.241]
	−0.103*	−0.098*	−0.074*	0.149*	1.634*
GOV	(0.033)	(0.011)	(0.007)	(0.012)	(0.063)
	[−3.143]	[−9.359]	[−11.20]	[12.27]	[25.828]
	0.367	1.485*	0.382*	−0.137	282.169*
TOE	(0.231)	(0.107)	(0.026)	(0.090)	(11.780)
	[1.590]	[13.85]	[14.77]	[−1.522]	[23.95]
INR	0.013*	0.00032	0.0003	−0.006*	−16.158*
	(0.002)	0.0003	0.0004	0.00033	−0.499
	[8.507]	[0.837]	[−0.501]	[−19.07]	[−32.36]

Standard errors in () & *t*-statistics in [ ].

reserve (INR) had positive effect on the real effective exchange rate in Malaysia while the government spending had negative relationship with Malaysia's real effective exchange rate in the long run.

Indonesia: The statistical results of Table 3 indicate that a ratio of foreign direct investment to GDP (FDI), term of trade (TOT), government spending (GOV), and trade openness (TOE) had significant long-run impact variables on Indonesia's real effective exchange rate, while international reserve (INR) is not. Similarly, to Malaysia, the term of trade (TOT) is the most important factor of those significant impacts on Indonesia's real effective exchange rate with coefficient equal –4.180. This suggest that 1 percent increase in term of trade influences 4.180 percent decline in real effective exchange rate in Indonesia. The trade openness (TOE) is the second important factor influencing the real effective exchange rate.

Philippines: The estimated long-run coefficients of the real effective exchange rate of Philippines in Table 3 indicate that term of trade (TOT) and trade openness (TOE) had positive effects on real effective exchange rate in Philippines, while a ratio of foreign direct investment to GDP (FDI) and government spending (GOV) had negative impacts on effective exchange rate in Philippines. However, international reserve (INR) had no relationship with the effective exchange rate in Philippines in the long run. It is interesting to note that trade openness (TOE) is the most important factor that affect the real effective exchange rate in Philippines, with coefficient equal 0.382. This indicate that the real effective exchange rate in Philippines will be increased by 0.382 percent if the trade openness in increase 1 percent.

Thailand: The statistical results of the long-run coefficients of real effective exchange rate in Thailand in Table 3 presents that ratio of foreign direct investment to GDP (FDI), term of trade (TOT), government spending (GOV), and international reserve (INR) had significant long-run impacts variables on Thailand's real effective exchange rate, while it is not influence by the trade opening (TOE) . The terms of trade (TOT) appeared to be the most important factor affecting Thailand's real effective exchange rate with coefficient equal to 1.12. This can be said that 1 percent increase in term of trade 1.12 percent dropped in Thailand's real effective exchange rate. The ratio of foreign direct investment to GDP (FDI) and government spending (GOV) had positive effect on Thailand's real effective exchange rate.

Vietnam: the statistical results in Table 3 point out the ratio of foreign direct investment to GDP (FDI), government spending (GOV), and trade opening (TOE) had significant positive impact on Vietnam's real effective exchange rate, while international reserve (INR) had significant long-run negative impact variables on Vietnam's real effective exchange rate.

4.3. The Short Run

While the previous section presents the long of real effective exchange rate determinant in the emerging ASEAN countries by using the co integration approach, this section investigates a short run dynamic relationship of variables included in real effective exchange rate determinant by using the Vector Error Correction Model.

The results of short run real effective exchange rate determinant of the Emerging ASEAN countries, Indonesia, Malaysia, Philippine, Thailand and Vietnam were presented in an equation form. The equations were written by eliminating the insignificant lagged variables from the model based on t-statistic. The equations of short run real effective exchange rate determinant in Southeast Asia, estimated by ECM present as following:

Indonesia

$$\Delta REXC = \underset{(2.76)}{-0.96ECT_{t-1}} - \underset{(-1.20)}{0.192\Delta EXCt_{t-1}} - \underset{(-2.64)}{0.242\Delta EXCt_{t-1}} - \underset{(-2.73)}{0.242\Delta TOT_{t-2}}$$

R-square = 0.353	Adjust *R*-square = 0.331
SEE = 11.96	Sum sq resides = 3434.47
Log likelihood = –355.57	*F*-statistic = 55.79

Malaysia

$$\Delta REXC = \underset{(1.97)}{-0.97ECT_{t-1}} - \underset{(-2.11)}{0.52\Delta EXCt_{t-1}} - \underset{(-2.18)}{0.53\Delta EXCt_{t-1}} - \underset{(-2.61)}{0.05\Delta TOT_{t-2}}$$

R-square = 0.695	Adjust *R*-square = 0.515
SEE = 1.185	Sum sq resides = 30.899
Log likelihood = 4.33	*F*-statistic =3.858

Philippines

$$\Delta REXC = \underset{(-3.88)}{-0.101ECT_{t-1}} + \underset{(4.52)}{0.156\Delta REXC_{t-1}} + \underset{(2049)}{0.37\Delta TOT_{t-1}} + \underset{(2.03)}{0.22\Delta TOT_{t-2}} - \underset{(-2.78)}{0.77\Delta GOV_{t-2}} + \underset{(2.79)}{5.24\Delta TOE_{t-2}}$$

R-square = 0712	Adjust *R*-square = 0.542
SEE = 0.616	Sum sq resides = 8.373
Log likelihood = –24.830	*F*-statistic = 4.193

Thailand

$$\Delta REXC = \underset{(-2.76)}{-0.526ECT_{t-1}} + \underset{(2.18)}{0.480\Delta REXC_{t-1}} + \underset{(3.05)}{0.004\Delta INR_{t-1}} - \underset{(-3.42)}{0.006\Delta INR_{t-2}}$$

R-square = 0.640	Adjust *R*-square = 0.428
SEE = 0.069	Sum sq resides = 0.105
Log likelihood = 59.96	*F*-statistic = 3.01

Vietnam

$$\Delta REXC = \underset{(-2.36)}{-8.13ECT_{t-1}} + \underset{(3.60)}{0.1482\Delta REXC_{t-1}} - \underset{(-2.75)}{11.76\Delta REXC_{t-2}} - \underset{(-2.57)}{0.58\Delta FDI_{t-1}} - \underset{(-2.05)}{0.403\Delta FDI_{t-2}} + \underset{(4.70)}{1.987\Delta GOV_{t-1}}$$

R-square = 0.771	Adjust *R*-square = 0.635
SEE = 1.227	Sum sq resides = 33.136
Log likelihood =	*F*-statistic = 5.70

AS can be seen from the short run real effective exchange rate equation, the coefficient of the error collection term (ECT_{t-1}) of the run real effective exchange rate equation in Indonesia and Malaysia are –0.96 and –0.97, which are similar. As error correction terms present the speed of adjustment to the long-run equilibrium, it can be concluded that the disequilibrium of the real effective exchange rate in Indonesia and Malaysia are able to correct approximately in the range of 96 and 97% within a quarter. However, the Philippines has a few the collection term, which is around 0.10. This implies that the disequilibrium of the real effective exchange rate in the Philippines is able to be corrected only by 10% within a quarter.

It is interesting to note that, the real effective exchange rate of previous time has a significant influence on the real effective exchange rate in every country in the emerging ASEAN countries in the short term. The real effective exchange rate of previous time had negative impact on the real effective exchange rate in Indonesia and Malaysia. However, it had negative impact on the real effective exchange rate in Philippines, Thailand, and Vietnam. Term of trade impact the real effective exchange rate in Indonesia, Malaysia, and the Philippines in the short run but it is not affecting the real effective exchange rate in Thailand in Vietnam. However, FDI is a major factor that influence the real effective exchange rate in Vietnam, but not for other countries. The

international reserve is affecting the real effective exchange rate in Thailand significantly in the short run.

5. Conclusions

The exchange rate behavior become one of the most concern in economic analysis since the exchange rate movement and fluctuation is able to affect the global investment portfolio value. In addition, a competitiveness related to imports value and exports value, international reserves, and public debt that is related to the country's own currency value. When there is some change in the exchange rate. This can have an effect in eliminating an imbalance in international trade due to the nations that have trade surpluses will expect an appreciation in their currency. However, the currencies of countries with trade deficits will depreciate. This paper aims to analyze determinants of real effective exchange rate in each country in the Emerging ASEAN countries, including Indonesia, Malaysia, Philippines, Thailand, and Vietnam during 1980 to 2010.

The results indicate that the ratio of foreign direct investment to GDP and government spending have a significant positive impact on real effective exchange rate in Southeast Asia, including, Indonesia, Malaysia, Philippines, Thailand, and Vietnam. The trade opening had influence on real effective exchange rate in the Southeast Asia, except Vietnam. In addition, international reserve (INR) had significant long-run impacts variables on real effective exchange rate in Malaysia, Thailand, and Vietnam. Since the effect of the real effective exchange rate on other economic activity and monetary policy should be considered for the future research as the real effective exchange rate also plays an important role in the in monetary policy.

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