

INTERNATIONAL CONFERENCE PROCEEDING

**BUSINESS MANAGEMENT:
DIRECTIONS AND STRATEGIES
IN RESPONSE TO
ASEAN ECONOMIC COMMUNITY 2015**



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FACULTY OF ECONOMICS
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Jember, 2 November 2013

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ASEAN ECONOMIC AND MONETARY INTEGRATION: The Feasibility of The Optimum Currency Area

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ABSTRACT

Economic integration in recent years has become a trend in many parts of the world, including ASEAN. The process of economic integration in ASEAN has begun with economic cooperations that leads to the establishment of the ASEAN Economic Community (AEC). Follow-up of the ASEAN economic community is area with the establishment of a regional currency. The purposes of this study are to analyze the opportunity of establishment of the currency area in ASEAN and to analyze the relationship between the exchange rate variability and the forming OCA-index variables in the short and long term. This study focused on two analyses; the descriptive analysis and quantitative analysis using the Error Correction Model (ECM). The results of descriptive and quantitative analysis showed that the ASEAN countries have diverging economies. It is an obstacle to the establishment for the currency area because the divergence of economies in those countries will make the regional policy ineffective. However, the opportunity of the establishment of the currency area in ASEAN is still open, especially in the long run. This is supported by the increasingly smaller economic divergence between the ASEAN countries and the OCA index that is not too high.

Keywords: Optimum currency area, OCA index, ECM, ASEAN

Background

Opportunities formation of a currency area in the region was first disclosed by Mundel in 1961. Ramayandi and Tjahjawardita (2010) define the currency area as a region where there is only one currency in circulation in the region. Meanwhile, Saichu (2007) define the optimum currency area as a group of countries in the region whose economies are closely linked, mainly because of trade and mobility of factors of production.

The formation of the currency area in ASEAN is still experiencing a lot of debate considering a lot of things, such as fairly high economic, social, and political heterogeneity among ASEAN countries. In addition, the formation of the currency area in ASEAN has some problems. One of the problems is that the pattern of economic development of ASEAN countries which still tends to be divergent. According to Saichu in Resti (2011), the current economic divergence in ASEAN can be divided into four groups of countries: the first group of countries with fairly high economic growth rates, that is, Singapore; the second group of countries such as Thailand and Malaysia; the third group of countries such as Indonesia, Philippines and Brunei Darussalam; and the fourth group of countries including Cambodia, Myanmar, Laos, and Vietnam.

The formation of Optimum Currency Areas (OCA) requires coordination of macro-economic inter-regional countries in order to expand trade in the region and to reduce the risk in the event of shocks (Mundel, 1961). The intense macro-economic coordination will reduce the scope for macroeconomic variability brought by factors such as exchange rate variability (Frankel and Wei, 1993). Therefore, ASEAN needs to make efforts to stabilize the exchange rate since the exchange

rate stability is important in order to create a conducive business environment and the potential to increase the rate of economic growth.

Based on these problems, the formulation of the problem of this study is as follows:

- 1 . How are the currency area formation opportunities in ASEAN?
- 2 . What are the links between exchange rate variability and forming OCA index variable in the formation of the currency area in ASEAN, in both the short and long term?

LITERATURE REVIEW

Achsani and Prastiwi (2010) in her study examines the chances of the formation of the currency area in ASEAN+3. Prastiwi and Achsani conclude that not all countries are ready to form a currency area (mainly Indonesia) and the currency that can be used as a currency peg is the Singapore dollar. Meanwhile, Ayuningtyas (2009) also studied the formation of the currency area in ASEAN+3 but with a different approach. Ayuningtyas used analysis of economic growth and convergence rate to analyze the probability of the formation of the currency area. Research results show that the currency that can be used is the Singapore dollar peg because Singapore's economy is more influential toward the ASEAN+3 economies other than Japan. Meanwhile, from the results of the G-PPP test, it is concluded that Indonesia is more suitable to base the exchange rate of the Singapore dollar than the U.S. Dollar.

Islami (2010) examined the prospects for the formation of the currency area in ASEAN by using the method of data analysis panel. Research results show that there are good prospects for forming a common currency in ASEAN for the calculation of economic indicators support the feasibility of the establishment of the currency area. Darussalam (2010) examined the opportunities of applying currency using the VAR method. Research results show that the proper states to implement a common currency are China, Singapore, and Brunei Darussalam. Meanwhile, the ASEAN+3 other countries more appropriately make use of domestic currencies rather than a common currency. Falianty (2010) examined the chances of the formation of the currency area in ASEAN-5 with endogenous wage approach, OCA index, and asymmetric shocks. Research results show that the formation of the currency area can only be executed by the state of Thailand, Malaysia, and Singapore, while Indonesia and the Philippines are not yet ready when they come to form an economic and financial integration.

METHODS

3.1 Types and Sources of Data

Data used in this study were secondary time series data in years 1980-2009 obtained from the World Bank. The data used were annual data from ASEAN-5 consisting of Indonesia, Malaysia, Philippines, Singapore, and Thailand. In addition, the United States data were used as a country peg or a basis for analyzing the formation of the currency area in ASEAN-5. The variables used in this study were the exchange rate, economic growth, Gross Domestic Product (GDP), Consumer Price Index (CPI) , and Broad Money (M2).

3.2 Specifications Model Research

The model used in this study was a model of exchange rate variability. The model was first introduced by Vaubel (1977) which was used to evaluate the probability of the formation of Optimum Currency Area (OCA) in nine member countries of European Economic Community (EEC). Then, Bayoumi and Eichengreen (1997) constructed an OCA index or exchange rate variability in the countries of the European Economic Community which is the predicted value of the exchange rate

variability. Exchange rate variability is measured by using the standard deviation of the change in the logarithm of the exchange rate between country *i* and country *j*.

The smaller the value of the OCA index means the greater the benefits derived from the creation of the currency area as compared with the cost to be borne. Vice versa, the greater the OCA index value means the smaller the benefits derived from the creation of the currency area as compared with the cost to be borne. This is because countries with symmetric shock linkage and a high trade will tend to have a stable exchange rate variability and find it easier to form a currency area (Hovart, 2002). The model equation used in this study is a model adapted from the Bayoumi and Eichengreen (1997) model equation which was later developed by Hovart (2003). The model equation can be written as follows :

$$L_{ijt} = a_0 + a_1 BSC_{ijt} + a_2 SIZE_{ijt} + a_3 FIN_{ijt} + a_4 INF_{ijt} + e$$

where:

L_{ij} = exchange rate variability / OCA index

= SD (log e_{ij})

BSC_{ijt} = business cycle synchronization between countries *i* and *j*

$SIZE_{ijt}$ = economic size between country *i* and *j*

FIN_{ijt} = relative growth rate finance between country *i* and *j*

INF_{ijt} = differentiation of inflation between countries *i* and *j*

i = ASEAN countries

j = the comparing countries

e = error

with the details :

a. Synchronization of business cycles (Business Cycles Synchronization)

where :

BSC_{ij} = business cycle synchronization between countries *i* and *j*

SD = standard deviation

= Growth in real GDP of country *i* at time *t*

= Real GDP growth in country *j* at time *t*

b . The size of the economy (Economic Size)

where :

$SIZE_{ij}$ = economic size between country *i* and *j*

y_{it} = GDP over the prices prevailing in country *i* at time *t*

Y_{jt} = GDP over the price prevailing in the state *j* at time *t*

c . Financial Growth (Financial Development)

where :

FIN_{ij} = relative growth rates between countries finance *i* and *j*

$M2_{it}$ = M2 money supply of country *i* at time *t*

$M2_{jt}$ = M2 money supply state *j* at time *t*

y_{it} = GDP over the prices prevailing in country *i* at time *t*

Y_{jt} = GDP over the price prevailing in the state *j* at time *t*

d . Differentiation of inflation (Inflation Differential)

where :

INF_{ij} = differentiation of inflation between countries i and j

π_{it} = CPI state i at time t

π_{jt} = CPI state j at time t

Based on the calculation of the OCA index, the stage of formation would be grouped into currency area that would later be realized through the establishment of a common currency (Bayoumi and Eichgreen, 1997). The stages of the formation of currency areas, among others :

- 1 . Phase I is the country with the OCA index values below 0.14326
- 2 . Phase II is the country with the OCA index values range between 0.14326 to 0,23833.
- 3 . Phase III is the country with the OCA index values ranging from 0.23833 to 0.494173.

Previous study estimasted only model parameter of the exchange rate variability. Meanwhile, this study not only carried out the parameter estimation but also viewed the relationship of short-term and long-term between the variable rate and the OCA index. This is important because the economic balance rarely achieved in the long term; the balance usually occurs in the short term.

3.3 Method of Data Analysis

There were two methods of data analysis used in this study: the method of descriptive analysis and quantitative analysis. Descriptive analysis is a problem-solving procedure by describing the state of the object of study of theoretical research and empirical facts. The quantitative analysis in this study was used to analyze the formation of the currency area in ASEAN-5 by using analytical approaches to Error Correction Model (ECM). This method would be used to estimate the model parameters of exchange rate variability and to determine the dynamic inter-relationship between the variable rate and variable-forming OCA index.

4 . DISCUSSION

4.1 Currency Area Formation Opportunities in ASEAN-5 Based on OCA Value Index

OCA index is the predicted value of the exchange rate variability (Bayoumi and Eichgreen, 1997). OCA index in this study is formed of several variables, among others: business synchronization variables (BSC), the size of the economy (SIZE) , financial growth (FIN) and differentiation inflation (IFN) with the United States as the comparing countries. Average OCA index variables forming each ASEAN-5 countries will be presented in tabular form as follows:

Table 4.1: Average of Variable BSC, SIZE, FIN, and IFN ASEAN-5 Countries

No.	Country	BSC	SIZE	FIN	IFN
1.	Indonesia	4.797639	24.04029	2117.806	124.3034
2.	Malaysia	4.272252	23.66836	4.296752	154.9
3.	Phillipines	4.402616	23.63583	16.76977	134.3668
4.	Singapore	4.047184	23.57632	2.377676	165.2899
5.	Thailand	4.803103	23.84090	29.07814	149.3776
	Minimum	4.047184	23.57632	2.377676	124.3034
	Maximum	4.803103	24.04029	2117.806	165.2899

The smaller the value of the OCA index means the greater the benefits derived from the creation of the currency area than the cost to be borne. According Hovart (2002), it is because the states with symmetric shock linkage and a high trade will tend to have a stable exchange rate

variability and find it easier to form a currency area. Based on table 4.1 the average variable BSC, SIZE, FIN, and IFN ASEAN-5, it can be concluded that:

- 1 . Singapore state is benefited mostly from the creation of the currency area compared to other ASEAN-5 countries, in terms of business cycle synchronization, the size of the economy, and the level of financial growth. This is because Singapore has a minimum value on the three variables forming the OCA index.
- 2 . Indonesian state is benefited mostly from the creation of the currency area compared to other ASEAN-5 countries, in terms of differentiation inflation. This is because Indonesia has a minimum value on the differentiation variable inflation.

Exchange rate variability (OCA index) was measured by using the standard deviation of the change in the logarithm of the exchange rate between country i and country j. The results of the calculation of OCA index of each country of ASEAN-5 with comparing countries United States (U.S.) will be presented in tabular form as follows:

Table 4.2: OCA Index of ASEAN-5 Countries

No.	Countries	Comparing Countries	OCA Index
1.	Indonesia	USA	0.432
2.	Malaysia	USA	0.08755
3.	Philippines	USA	0.256096
4.	Singapore	USA	0.063707
5.	Thailand	USA	0.103776
Average			0.188626
Minimum			0.063707
Maximum			0.432

Table 4.3: OCA Index of European Economic Communities

Pairs of Countries		OCA index	Pairs Countries		OCA Index
France	Germany	0.074	Netherlands	Germany	0.007
Italy	Germany	0.059	Norway	Germany	0.077
England	Germany	0.089	Portugal	Germany	0.062
Austria	Germany	0.008	Spain	Germany	0.073
Belgium	Germany	0.013	Swedia	Germany	0.056
Denmark	Germany	0.074	Swiss	Germany	0.023
Finlandia	Germany	0.087	Average		0.052
Greece	Germany	0.054	Minimum		0.007
Irlandia	Germany	0.021	Maximum		0.089

Source : Bayoumi and Eichngreen (1997)

From Table 4.2, it can be seen the minimum value of the OCA index ASEAN-5 is a state of Singapore with the OCA index value of 0.063707, while the maximum value is achieved by the Indonesian state with OCA index value of 0.432. Countries that have a minimum value of OCA index will become the next benchmark in the formation of currency areas in the region. Thus, the state of Singapore will be the comparing countries in the formation of the currency area in ASEAN-5.

Table 4.3 presents the OCA index value of the European Economic Community (EEC) based on the results of the study by Bayoumi and Eicghreen in 1997. Data used in the study were annual data (1983-1992). From Table 4.10, it can be seen that the minimum value of the OCA index of European Economic Community was that achieved by the Netherlands with the OCA index value of

0.007. While the maximum value of the European Economic Community was achieved by the UK with the OCA index value of 0.089.

Based on the comparison of the OCA index values between ASEAN-5 and the European Economic Community, it can be concluded that in general the average value of the OCA index ASEAN-5 countries (the vulnerable period of 1980-2009 is greater than the average value of the index OCA European Economic Community countries (in the vulnerable period of 1983-1992). This indicates that a net benefit of currency area formation in the ASEAN-5 is not as big as benefits in the formation of the European currency area.

Differences in OCA index values between ASEAN-5 and the European Economic Community in Europe is reasonable considering the fundamental differences between the two regions. The fundamental differences include the motivation of early integration, the availability of state leaders, institutional arrangement, convergence criteria, and the initial idea of integration (Plummer, 2005; Sholihah and Siachu, 2007; Falianty, 2006).

Countries that belong to the currency area will be grouped into stages based on the value of the OCA index. Stages of the formation of the currency area will be described as follows:



Source: Bayoumi and Eichengreen (1997)

Figure 4.2: Value of the OCA index ASEAN-5 countries

Based on Figure 4.2 and the results of calculation of the value of the OCA index ASEAN-5 countries (Table 4.9), the formation of the currency area in ASEAN-5 can be divided into several stages, among others:

1. The formation of the currency area in ASEAN-5 countries beginning with the OCA index values below 0.14326 (phase I) includes the countries of Singapore, Malaysia, and Thailand.
2. No ASEAN country is classified in stage II, so the formation of the currency area was resumed at a later stage.
3. The formation of the currency area in ASEAN countries was followed by the merger of the Philippines and Indonesia that belonged to the third phase with OCA index values of respectively 0.256096 and 0.0432.

In conclusion, the ASEAN-5 countries can be said to be ready to form a currency area for ASEAN-5 all go into the formation stage of the currency area by Bayoumi and Eichengreen (1997). This can be seen from the value of the exchange rate variability ASEAN-5 countries are not so high that indicated by the OCA index values of each country that is not too high .

4.2 Dynamic Causal Analysis

Sub-section 4.2 will explain the results of quantitative analysis to answer questions about the empirical relationship dynamic relationship between exchange rate variability and forming OCA index variable, both in the short term and in the long run by using the approach of Error Correction Model (ECM).

4.2.1 Estimation Results of ECM in the Short Run

Estimation methods ECM (Error Correction Model) is a method used to determine the relationship of short-term and long-term between the independent variables and the dependent variable. In reading the results of the estimation by the ECM method the values of t-statistic and t-table would be compared and be linked to the value of the coefficient of each independent variable on the dependent variable. By reading the results of these estimates, it would be known how much the relationship and the level of significance of each independent variable in influencing the dependent variable. In addition, the estimation results would be read by looking at the adjustment of R-square, F- statistic probability, and the value of ET (error correction term)

The variables that significantly influenced the exchange rate variability Indonesian state was a variable size of the economy, financial growth, and differentiation inflation. This is shown by the t-statistic value of the variable size of the economy and financial growth that is greater than t-table value at 5% significance level (1725), which was $|-4.529565|$ and 2.886395. Meanwhile, the inflation differentiation was significant at 10% significance level. This is shown by the value of t-statistic differentiation inflation (1.530953) which is greater than t-table at 10 % significance level (1.325). The significant variables were also supported by the significant value of t-statistic probability value which was less than the degree of significance used. As for the other variables in the model did not significantly affect the variable of exchange rate variability. This is shown by the t-statistic values of variables which were smaller than the value of t-table and probability value of t-statistic which was greater than the degree of significance used.

The negative coefficient of economic measure of 0.65 indicated that if there was an increase of 1% of the size of the economy, then the variability of the exchange rate would be decreased by 0.65%. While financial growth had positive value of the positive coefficient of 4.74E-05, which showed the differentiation if inflation increased by 1%, then the variability of the exchange rate would also increase by 4.74E-05% . Differentiation of inflation also had a positive value of the coefficient of 0.0027%, which means if differentiation inflation increased by 1% , the variability of the exchange rate would also increase by 0.0027%.

Moreover, in general the independent variable significantly affected the variable of rate variability indicated by F-statistic probability value which was smaller than the degree of significance α 5% ($0.000000 < 0.5$). This is supported by the adjusted R-squared of 0.957276 which indicated that the variable of exchange rate variability was explained by the independent variables in the model of 95.7276%, 4.2724% while the rest was explained by other variables outside the model. It can also be concluded that Indonesian equation model can be said true or valid because the value of the ET coefficient is positive and not more than one.

For Malaysia, the variable of exchange rate variability was significantly influenced by the variable size of the economy, inflation differentiation, the size of the economy of the previous year, the previous year's financial growth, and differentiation of inflation of the previous year, with details of each variable coefficient of -0.399567, 0.183276, 0.013445, and -0.002844. This is shown by the value of t-statistic the variable which was higher than degree of confidence used, either 5% or 10%. In addition, generally speaking, the independent variables significantly affected variable of rate variability indicated by F-statistic probability value which was smaller than 5% of significance level ($0.000001 < 0.5$). This is supported by the adjusted R-squared value of the Malaysian state of 0.805248 which indicated that the variable of exchange rate variability was explained by the independent variables in the model of 80.5248%, while the rest was explained by other variables outside the model. In addition, it can be concluded that the model equations can be said true or valid because its ET coefficient value was positive and not more than one (0.207939) and because a significant probability value of ET on the level of significance of 10% ($0.0618 < 0.10$ %).

Variable of exchange rate variability of Philippines was significantly affected by the business cycle synchronization variables and the size of the economy as indicated by the value of t-statistic which was significant at 5% confidence level, with details of the business cycle synchronization coefficient of -0.005255 and -0.828557 coefficient size of the economy. Variability of the exchange rate of the Philippines was also significantly influenced by the synchronization of business the previous year, the growth rate of the previous financial year, and the differentiation of the previous year at 10% confidence level, with details of each variable coefficient of -0.001743, 0.001722, and -0.001212. In general, it can also be said that independent variables significantly affected the variability of the exchange rate variable as indicated by F-statistic probability value smaller than 5% degree of confidence ($0.000000 < 0.5$). This is supported by the adjusted R-squared value of the Philippines which was 0.873439 and indicated that the variable of exchange rate variability was explained by the independent variables in the model of 87.3439%, while the rest was explained by other variables outside the model. Philippine equation model can be said true or valid because its ET coefficient is positive and not more than one.

As for the state of Singapore, the variable of value variability was only significant to affect the growth of the previous financial year. This is shown by the value of t-statistics smaller than t-table at 10% of confidence level ($|-1.620789| > 1.325$). The coefficient of the previous year's financial growth was negative at 1.620789 which indicated that if the variable growth of the previous financial year increased by 1% then the variable of exchange rate variability would decrease by 1.620789%. While the other variables in the model did not significantly affect the variability of the exchange rate. However, Singapore's ET variable showed significant value as indicated by the positive value of its coefficient ET and not more than one that is equal to 0.494640. This is also supported by the significant probability value of ET at 5% confidence level ($0.0020 > 0.05$).

For Thailand, the variable of exchange rate variability was significantly influenced by the variable of the economic size, inflation differentiation, the growth rate of the previous financial year, and the differentiation of the previous year's inflation at 5 % confidence level, with details of each variable coefficient of -0.550070, 0.002229, 0.000654, and -0.000716. In addition, the variable of exchange rate variability was also significantly influenced by the variable of the economic size and the financial growth of the previous year at 10% confidence level, with details of each variable coefficient of 0.001817 and 1.392269. Meanwhile, the business cycle synchronization variables and the business cycle synchronization of previous year were not significant to the variable of exchange rate variability. This is shown by the t-statistic value of the two variables which was smaller than the t-table on the degree of confidence used.

In general, the independent variables significantly affected the variable of exchange rate variability indicated by the F-statistic probability value smaller than 5% degree of confidence ($0.000000 < 0.5$). This is supported by the adjusted R-squared value of the Malaysian state of 0.943316 which indicated that the variable of exchange rate variability was explained by the independent variables in the model by 94.3316 while the rest was explained by the other variables outside the model. Thailand equation model can be said true or valid because its ET coefficient value which was positive and not more than one, that is, 0.267317. This is also supported by the significance of the model equation ET of Singapore at 10% confidence level indicated by the value of the ET probability that was less than 10%.

Overall, the variable of exchange rate variability in the short term was influenced by the different forming variables of OCA index in each country of ASEAN-5. It shows that the economy has not been convergent among ASEAN-5 countries. Then, the model equations of ECM in the short term can be calculated for its scale of and long-term standard deviation to find out the ECM equation model in the long term.

4.2.2 Estimation Results of ECM in the Long Run

Establishment of dynamic model allows to obtain the magnitude and the standard deviation of the regression coefficient of the long-term. Long term is a period of time that allows for full adjustment to the changes occurred. The size and the standard deviation of the long-term regression coefficients can be calculated from the long-term results of short-term equation model estimation. ECM estimation results in the long run in each of ASEAN-5 countries will be presented in table 4.18.

From 4:18 it can be interpreted that that Indonesia's model of long-term, the variable of exchange rate variability was significantly affected by only one independent variable in the model, namely the differentiation inflation variable with coefficient value of $-1.3E+57$. Similarly, the model of long-term variability of the Philippines whose variable of exchange rate variability was only affected by the business cycle synchronization variables. This is shown by the value of t-statistics which was significant at the confidence level used. The value of t-statistics of business cycle synchronization variable of the Philippine was greater than t-table value at 5 % confidence level ($1.3166 > 1.316$). The variable coefficient was positive at 0.77% which means that if the business cycle synchronization variable increased by 1%, then the variable exchange rate variability would increase by 0.77%.

Variable of exchange rate variability of Malaysia, Singapore, and Thailand in the long run was influenced by the four independent variables in the model consisting of business cycle synchronization variables, the economic size, financial growth, and inflation differentiation. This is indicated by the value of t-statistic by the four variables of the three countries which was higher than t-table value at 5% confidence level (1.708). Suppose t-statistic of business cycle synchronization of these countries was greater than t-table at 5% confidence level, with details: Malaysia (1.982687>1.718), Singapore (3.586767>1.718), and Thailand (1.727416>1.718).

Coefficient of business cycle synchronization of Malaysia had positive value of 0.99% which means that if the synchronization of business cycles increases by 1% then the variability of the exchange rate will increase by 0.99%. Coefficient of business cycle synchronization of Singapore and Thailand is also positive, i.e. respectively 1.000699 and 1.0023227%. The coefficient size of the economy of Malaysia, Singapore, and Thailand was positive respectively 0.57%, 0.96%, and 1.09%. Variable coefficient of financial growth and differentiation of these three countries was also positive indicating unidirectional relationship, which means that if the variable increases, the variability of the exchange rate will also increase.

From the results of the estimation using the Error Correction Model (ECM) that has been done in this study, it can be seen the dynamic relationship between exchange rate variability and OCA index forming variables, both in the short term and in the long term. OCA index forming variables in fieldwork consisted of business cycle synchronization variables, the size of economy, financial growth, and inflation differentiation. The estimation results indicated that the variability of the exchange rate of the ASEAN-5 countries was influenced by different forming variables of OCA index.

In the short term, Indonesia's exchange rate variability was significantly influenced by economic growth, financial growth, and inflation differentiation. Meanwhile, the synchronization of business cycles had negative and significant coefficient on the exchange rate variability. Similarly, the synchronization of the business cycles of Philippines also had a negative coefficient but significantly influenced the exchange rate variability. In addition, exchange rate variability of Philippines was also significantly influenced by the size of the economy, business cycle synchronization, financial growth of previous year, and differentiation of the previous year. ET value of Indonesia and the Philippines was positive and not more than one that shows the long-term balance between the exchange rate variability and OCA index forming variables.

Exchange rate variability Malaysia and Thailand was significantly influenced by almost all of the variables in the model, except for the variable synchronization of business cycles and business cycles synchronization of previous year. Conversely, Singapore exchange rate variability was significantly influenced only by the previous year's financial growth with negative coefficients. It showed negative relationship between exchange rate variability and previous financial growth of Singapore. ET values of these countries were equally positive and not more than one that shows the long-term balance between exchange rate variability and OCA index forming variables.

In the short term it can be concluded that the variability of the exchange rate of the ASEAN-5 countries is influenced by different forming variables of OCA index. It shows that the economy among ASEAN countries-5 has not been convergent which can be an obstacle for the establishment of the currency area in ASEAN-5. The existence of divergent economy of the ASEAN-5 countries will lead to ineffectiveness of the regional policy taken by the ASEAN-5.

In the long run, exchange rate variability of ASEAN-5 countries was influenced by various forming variables of OCA index. Indonesia's exchange rate variability was significantly influenced only by the financial growth with negative coefficient. It showed the trade-offs between exchange rate variability and financial growth. Similarly, the variability of the exchange rate of the Philippines which was significantly influenced by only one variable, namely the synchronization of business cycles with positive coefficient. This shows that if the synchronization of business cycles has increased, the variability of exchange rate will also increase. Vice versa, if the synchronization of business cycles has decreased, the variability of the exchange rate will also decrease.

Exchange rate variability of Malaysia, Singapore, and Thailand was significantly influenced by four forming variables of the OCA index in the research consisting of business cycle synchronization variables, the size of the economy, the level of financial growth, and inflation differentiation. Based on the results of the study, the four forming variables of OCA index of these countries have a positive coefficient. This shows the positive relationship between exchange rate variability and four forming variables of OCA index. Compared with Singapore and Thailand, Malaysia has the largest variable coefficient of OCA index forming variables among the three countries which shows that the exchange rate variability changes in Malaysia are mostly vulnerable to changes in OCA index forming variables.

5. Conclusions

From the results of the analysis described previously, either in the form of descriptive analysis and quantitative analysis, it can be concluded as follows:

1. Descriptively, it can be said that the establishment of the currency area in ASEAN-5 is still not able to be optimally implemented because the pattern of development of ASEAN-5 countries is still likely divergent. Under the Maastricht convergence criteria, it can also be said that the ASEAN-5 countries has not converged with each other meaning that the ASEAN-5 countries have different responses to a regional policy that resulted in the ineffectiveness of the policy. None of the ASEAN-5 countries meets the four Maastricht convergence criteria, but Malaysia and Thailand consistently meet three criteria during the period of observation. While based on the OCA index, the ASEAN-5 countries can be said ready to form a currency area because of the variability of the exchange rate of the ASEAN-5 countries is not too high. The formation of the currency area is realized through the establishment of a common currency that can be initiated by Malaysia, Singapore, and Thailand. Then, Indonesia and the Philippines can join the currency area. Singapore's currency can be used as a peg since Singapore has a stable exchange rate movements and the smallest OCA index values compared to the other ASEAN-5 countries.
2. Based on the results of quantitative analysis using the Error Correction Model (ECM), it can be said that the overall variability of the exchange rate of the ASEAN-5 countries is likely affected by various forming variables of OCA index in the short term. It shows that the structure of the ASEAN-5 economies of different countries and the ASEAN-5 economies which has not been convergen. However, it does not prelude the possibility of the establishment of the currency area in ASEAN-5 in the long term. This is supported by the OCA index value of ASEAN-5 countries that is not too high and increasingly smaller economic divergences among the ASEAN-5 countries. Therefore, the ASEAN-5 needs to make a policy strategy that can encourage the creation of convergent pattern of economic development.

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