

Is there a common currency in asean 5? a purchasing power parity and generalized purchasing parity analysis

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Abstract

The aims of this study is to examine international parity between 5 ASEAN countries to find the possibility of common currency among 5 countries in ASEAN. The interdependence of currencies in ASEAN 5 region towards Dollar creates a suggestion that the common currency should be the solution for ASEAN 5 to reach the stability of the exchange rate. The results of PPP to measure the possibility of a common currency shows that the conditions of the nominal exchange rate and price index in ASEAN 5 are cointegrated. The results of GPPP using the Johansen cointegrated test shows that there are long-term cointegrations of REER variables in ASEAN 5. Although the results of the coefficient β test in Johansen cointegration show that there are some unsimilar coefficient signs between the nations. So, the formation of a common currency in ASEAN 5 can not be fully realized.

Key words: Common currency; purchasing power parity (PPP); generalized purchasing power parity (GPPP)

INTRODUCTION

The plan to establish a common currency in ASEAN was discussed at the 2012 ASEAN conference by Romeo A Rayer in 1999 at the ASEAN conference entitled "Common Currency for East Asia: Dream or Reality" in Malaysia there is a statement that although ASEAN does not yet have a common currency, but ASEAN leaders have taken steps to welcome ASEAN's shared currency, such as encouraging bilateral payment arrangements currently applied between Malaysia and the Philippines, capital market development, cooperation in financial regulation and transparency, and the existence of an inter-state economic surveillance system in ASEAN.

In 1992, the establishment of the ASEAN Free Trade Area (AFTA) in Singapore became ASEAN's first step to achieve economic integration, although the implementation of the AFTA only took place in 2003. AFTA was created to create a free trade zone which is expected to increase economic competitiveness in the ASEAN region. AFTA implementation is in the form of eliminating tariffs on incoming goods ranging from 0% to 5%. The formation of AFTA at that time was considered insufficient to eliminate boundaries between countries and realize integration in the ASEAN region.

The aims of this study is to examine international parity between 5 ASEAN member, in order to find that there are possibility to common currency among the 5 country in ASEAN. This study intends to see the similarity in economic conditions in ASEAN 5 as one of the conditions for the establishment of the Southeast Asian Currency (SAC). This study used Purchasing Power Parity (PPP) and Generalized Purchasing Power Parity (GPPP) to test the formation of a common currency in the area. The use of PPP and GPPP approaches for the analysis of the formation of shared currencies has been used in the research of Mishra dan Sharma (2010)(Mishra and Sharma 2010a); Taguchi (2010)(Taguchi 2010); Wilson and Choy (2011)(Wilson and Choy 2011); Zerihun and Breitenbach (2017)(Zerihun and Breitenbach 2017).

Literature Review

Optimum Currency Area (OCA)

Discussion on the formation of a common currency was introduced by Mundell in 1961 in the theory of Optimum Currency Area (OCA). The definition of the Optimum Currency Area (OCA) is a large area that has a single currency that is used to maximize economic efficiency (Shapiro 1984). The basic theory of OCA is to explain the advantages and disadvantages of establishing a common currency in an area. Efficiency gains in the shared currency region create monetary efficiency and economic growth (Friedman and Woodford 2010).

There are special conditions that need to be considered before establishing a common currency area. The first condition that needs to be considered before the formation of a common currency area is that economic conditions among member countries must have a positive response in the event of economic instability in a region (Linde 2015). Another requirement in the formation of a common currency is the existence of one country with large economic conditions to support other countries in terms of benchmark currencies and introducing new currencies to the world (Hayat and Jianqiu 2013). In addition, the existence of common goals, political equality, and member countries having a small open economy scale will make the agreement in the area of a common currency easier. Countries with small open economies of scale will be more easily affected by policies than monetary centralization (Forlati 2015).

Purchasing Power Parity (PPP)

Purchasing Power Parity theory states that the exchange rate will adjust from time to time to reflect the difference in inflation between two countries. Consequently, the purchasing power of consumers to buy domestic products will be the same as their purchasing power to buy foreign products country (Shapiro 1984). To reflect the relationship between the inflation rate and the exchange rate in absolute PPP can be seen in Equation (1).

$$S_T = \frac{P_t}{P_t^*}$$

Where S_t is the nominal exchange rate, P_t is the domestic price level, and P_t^* is the foreign price level. While PPP will relatively adjust the rate of increase or decrease in the exchange rate close to the difference in inflation between different countries so that people's purchasing power will be the same even in different countries (Madura 2011). PPP testing can pass the stationarity test on the real exchange rate variable calculated through equation (2) (Mishra and Sharma 2010b)

$$q_t = S_t + P_t^* - P_t$$

Where q_t is the log of the real exchange rate, s_t is the log of the nominal exchange rate, P_t^* is the log of the base country price level, and P_t is the log of the domestic price level.

Generalized Purchasing Power Parity (GPPP)

GPPP is a theory developed by Enders and Hurn (1997)(Enders and Hurn 1997). According to the GPPP theory. The real exchange rate is generally not stationary because the real exchange rate is determined by macroeconomic variables such as the level of real output and the money supply in which the variable is a variable that is not stationary. Although the real exchange rate is generally not stationary, there is a possibility of cointegration between real exchange rates in the long run. Therefore, countries will be eligible to form monetary unions there must be at least one linear combination of stationary real exchange rates. This implies a long-term equilibrium relationship between real exchange rates between countries in the area of the common currency. The mathematical equation of the GPPP model is shown as

$$r_{12t} = \beta_{10} + \beta_{13}r_{13t} + \beta_{14}r_{14t} + \beta_{15}r_{15t} + \dots + \beta_{ln}r_{ln} + \varepsilon_t$$

Where r_{1it} is the logarithm of the bilateral exchange rate between country 1 and country i in period t . β_{1i} is a parameter of cointegration vector, and ε_t is a stationary static disturbance. To test the cointegration between real exchange rates, this study applies Johansen cointegration. Johansen's cointegration uses the like hood procedure to determine the existence of a cointegration vector in a non-stationary time series.

Some preliminary studies on the formation of a shared currency in ASEAN found that the formation of common currency cannot be done. A research conducted by Engwerda, Boldea, Michalak, Plasmans, and Salmah (2012)(Engwerda et al. 2012) added the budget deficit variable as a variable of fiscal policy the result found that the formation of the SEAMU could not be done because of the possibility of conflict between monetary and fiscal policy if they introduce monetary unions in ASEAN. Research by Rhee (2012)(Rhee 2012) shows that to create a shared currency, especially in ASEAN + 3, it is necessary to create an economic infrastructure to strengthen the exchange rate market and set the Anchor Currency. In addition, research by Gharleghi, Shafighi, and Benjamin (2015)(Gharleghi, Shafighi, and Benjamin 2015); Subagja and Mubarak (2015)(Subagja and Mubarak 2015); Anh dan Mai (2013)(Anh and Mai 2013); and Alvarado (2015)(Alvarado 2015) which states that the formation of a common currency in ASEAN is still not possible because not all countries are integrated ASEAN. However, there has been a correlation between Singapore and Indonesia and between Malaysia and Thailand.

PPP and GPPP testing have been done by several previous studies. PPP testing in ASEAN by Chang, Lee, and Liu (2012)(Chang, Lee, and Liu 2012); Choji and Sek (2017)(Choji and Sek 2017); and Ahmed (2014)(Ahmed 2014) who used unit root tests and cointegration tests found that there were long-term conditions between nominal exchange rate variables with price level variables so that the PPP is valid. GPPP testing has also been carried out by Mishra and Sharma (2010)(Mishra and Sharma 2010b) which shows that GPPP is a minimum standard condition in the formation of a common currency so that if there is a real effective exchange rate relationship between countries of a region then the formation of a shared currency can be applied. The GPPP test in ASEAN 5 has been carried out by Choy and Wilson (2011)(Wilson and Choy 2011) which shows that although there is a long-lasting relationship to the REER variable in ASEAN 5, the formation of a common currency cannot be carried out because there is an asymmetrical relationship in the way countries adjust to economic instability. This research is supported by Beirne (2015)(Beirne and Bank 2015) which states that monetary integration will be more appropriate if there are signs of the same coefficient in the long run.

METHOD

The source of this research data was obtained from the International Monetary Fund (IMF). The data used in this study are nominal exchange rate data, real effective exchange rate, and the consumer price index. The type of data approached used in this study is panel data from five countries in ASEAN, namely Indonesia, Malaysia, Singapore, Thailand, and the Philippines, which began from January 1997 to December 2018.

This research used some testing for panel data estimation. First, we used unit roots panel data such as ADF-Fisher was introduced by Mandala and Wu (1999), Lin Levin and Chu (LLC) unit roots, and Im Pesaran, and Shin (IPS). Second, Cointegration panel testing is used because the panel unit root test implicitly limits asymmetrical and proportional conditions. The cointegration panel test in this study uses the Pedroni cointegration test. Pedroni Test applies several tests to test the null hypothesis in the panel data model by considering heterogeneity. The Pedronian Test also gives flexibility to the limitations that occur in the PPP hypothesis (Mishra and Sharma 2010b). Also, Johansen's cointegration test is a test to see the long-term relationship between variables. Johansen's cointegration test can also be used to see the elasticity of variable in the long run and how quickly the short-term adjustment to the equilibrium conditions. Figure 1 shows the framework of this study which is describe about the theory of PPP and GPPP according to the possibility of the common currency.

Findings and Discussion

Purchasing Power Parity

The results of panel data unit roots test based on LLC, IPS, ADF-Fisher, and PP-Fisher tests, stationary RER variables are at the level (Table 1). The results shows that RER are stasionare at the level and at the first difference. The next test in conducting the PPP test is by conducting a panel data cointegration test. Based on Table (2) the results of seven-panel statistical tests on Pedroni cointegration show that the rejection of the null hypothesis is that there is no long-term cointegration between the nominal exchange rate and the price level in ASEAN 5. Rejecting the null hypothesis provides evidence that there is a long-term relationship between the exchange rates nominal and price levels in ASEAN 5.

Table 1.
Panel Data Unit Roots Test for Real Exchange Rate di ASEAN 5

Method	Level		First Difference	
	Statistics	Prob	Statistics	Prob
Levin, Lin & Chu (LLC)	-1.3114*	0.0949	-36.5251**	0.0000
Im, Pesaran, and Shin W-stat	-2.2027**	0.0138	-32.2887**	0.0000
ADF-Fisher Chi-square	21.2781**	0.0192	543.5850**	0.0000
PP - Fisher Chi-square	22.8329**	0.0114	606.9430**	0.0000

Note: (a) * and ** explain the rejection of the null hypothesis at the 10% and 5% significance levels (b) Optimal lag criteria used for LLC, IPS, ADF-Fisher, and PP-Fisher based on SIC (c) Probability values LLC and IPS are based on the McKinnon table of -1.95 (d) ADF-Fisher and PP-Fisher probability values based on the Chi-Square table.

Table 2.
Pedroni Cointegration Panel Test Results for PPP in ASEAN 5

	Statistics	Prob	Weighted statistics	prob
Within Dimension				
Panel v-Statistic	4.20632**	0.0000	1.08802	0.1383
Panel rho-Statistic	-4.8052**	0.0000	-1.56295	0.0590
Panel PP-Statistic	-4.3845**	0.0000	-2.33143	0.0099
Panel ADF-Statistic	-4.1412**	0.0000	-2.20508	0.0137
Beetween Dimension				
Group rho-Statistic	-2.5385**	0.0056		
Group PP-Statistic	-3.5751**	0.0002		
Group ADF-Statistic	-4.0625**	0.0000		

Note: ** Explain that the inflation variable is significant at the 5% significance level

Generalized Purchasing Power Parity

This study examined the unit roots and the degree of integration of Real Effective Exchange Rate (REER) variables in each country in ASEAN 5. REER is used because it shows an indicator of a country's relative currency in relation to several other currencies. Unit root tests were performed using Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP).

Based on Table 3 it can be seen that the results of the unit root test show that in the PP and ADF test only Indonesia and Malaysia are stationary at the level. Referring to the presence of non-stationary data at the level, the REER variable must pass a degree of integration test. From the results of the integration degree test, it can be seen that the REER variable in all ASEAN 5 countries is stationary at the first difference level.

According to previous research, GPPP was introduced by Enders and Hunt in 1997 (Enders and Hurn 1997), this study uses the Johansen cointegration test on the REER variable to test GPPP in ASEAN 5. The results of the Johansen cointegration test for GPPP in Table 4 show that in the results of the trace statistic, there are three equations that reject the null hypothesis and in the results of Max-Eigen statistical, there are two one equation that rejects the null hypothesis. In the Johansen Cointegration test, the result shows an equation that rejects the null hypothesis this implies that there is a relationship in the REER variable between the countries in ASEAN 5 that is bound by the long-term equilibrium relationship as follows;

$$-0.04IDN + 0.07MLY + 0.2THAI - 0.07FILIP - 0.1SING = 0$$

Equation (4) shows that the value of the cointegration vector equation is $\beta = 0.06$ which means that there is a long-term relationship between countries in ASEAN 5. The long-term equilibrium relationship with the value of $\beta = 0$ indicates that there is a long-term cointegration on the REER variable so that the GPPP in ASEAN 5 can be said to be valid (Enders and Hurn 1997). The coefficient β value in equation 4 is derived from the β coefficient on Johansen's cointegration in Table 3.

Table 3.

Unit Roots of the Real Effective Exchange Rate (REER) Variable Unit in ASEAN 5

Countries	ADF (Augmented Dickey Fuller)			PP (Phillips-Perron)				
	Level		Prob	Level		Prob	First Difference	
	statistics	statistics		statistics	Statistics		Statistics	Prob
Indonesia	-2.6492*	-2.6720*	0.0803	-12.5746**	-2.6720*	0.0803	-12.5746**	0.000
Malaysia	-4.3134**	-3.7998**	0.0033	-12.6470**	-3.7998**	0.0033	-12.6470**	0.000
Singapura	-0.55	-0.4688	0.8936	-13.4379**	-0.4688	0.8936	-13.4379**	0.000
Thailand	-2.1613	-1.942	0.3127	-12.1532**	-1.942	0.3127	-12.1532**	0.000
Filipina	-1.2661	-1.0979	0.7172	-11.7959**	-1.0979	0.7172	-11.7959**	0.000

Description: (a) * and ** explain the rejection of the null hypothesis at the 10% and 5% significance levels (b) Optimal lag criteria used for ADF based on SIC and PP based on Newey-West bandwidth selection using Bartlett Kernel (c) c symbol constant (d) The probability value of ADF and PP based on the McKinnon table is -1.95 (e) Unit root (Individual unit root process).

Table 4.

Johansen's Cointegration Test Results in ASEAN 5 (America as Base Country)

Hypothesized	Trace Statistic	0.05	Critical	Prob	Max-Eigen Statistic	0.05	Critical	Prob
No. of CE(s)		Value	Value			Value	Value	
None	91.54974**	69.81889	0.0004	32.1521	33.8769	0.0792		
At most 1	59.39769**	47.85613	0.0029	25.3825	27.5843	0.0932		
At most 2	34.01518**	29.79707	0.0154	19.3223	21.1316	0.0879		
At most 3	14.69293	15.49471	0.0658	14.5482**	14.2646	0.0451		
At most 4	0.144745	3.841466	0.7036	0.14475	3.84147	0.7036		

Note: (a) ** explains the rejection of the null hypothesis at the 5% significance level (b) The probability value based on the McKinnon-Haug-Michelis table (c) The log used is log 1 (d) Hypothesis zero: No cointegration.

Table 5.Normalized β in REER Variables in ASEAN 5

Unrestricted Cointegration Coefficient (normalized by $b^*S11b=1$)				
SING	IDN	MLY	THAI	FILIP
-0.092774	-0.040513	0.069956	0.22163	-0.0682
0.035815	-0.052794	-0.07191	0.19294	-0.1232
0.041025	-0.056243	0.083407	-0.0476	0.02136
-0.201049	-0.054466	0.00907	-0.0598	0.23212
0.061225	-0.003591	-0.03067	0.02443	0.00778

Adjustment coefficient (α) in Table 6 gives an estimate of the speed of short-run adjustment in each REER to its long-term balance. Based on Table 7 it can be seen that the Thai REER expressed in Dollars moves the fastest among other countries at the rate of 52.6% per month to reach long-term equilibrium, REER Indonesia moves at 31.5% per month, Malaysian REER moves at the level of 30% per month, Philippine REER moves at a rate of 10.3% per month, and Singapore's REER moves at a rate of 2.5% per month. The lower the alpha coefficient, the slower the speed of adjustment to balance which means that it can limit the effectiveness of policies made in the event of economic instability in ASEAN 5 (Zerihun and Breitenbach 2017).

The coefficient β in the normalized cointegration equation in Table 7 shows the reciprocal relationship between REER in ASEAN 5 in terms of long-term elasticity. The results of the coefficient values in Table 7 show that if Singapore exchange rate against the dollar depreciates by 1%, it will lead to the depreciation of the Indonesian exchange rate against the dollar by 0.44% and the depreciation of the Philippine exchange rate against the dollar by 0.74%. Also, if Singapore exchange rate against the dollar depreciates by 1%, it will lead to an appreciation of the Malaysian exchange rate against the dollar by 0.75% and an appreciation of the Thai exchange rate against the dollar by 2.4%. Table 7 also shows that there are different coefficient signs in each country in ASEAN 5. Indonesia and the Philippines have positive coefficient signs while Malaysia and Thailand have negative coefficient signs. According to Beirne & Bank (2015)(Beirne and Bank 2015), the formation of a shared currency will be better if the coefficient of long-term cointegration has the same sign to see the same response to economic instability.

Table 6.The coefficient (α) in the REER variable in ASEAN 5

Unrestricted Adjustment Coefficient (alpha)					
D(SING)	-0.024698	-0.114186	-0.13482	0.07223	-0.0145
D(IDN)	0.315197	0.61181	0.166027	0.50763	-0.0596
D(MLY)	-0.29952	0.326479	-0.45279	0.29216	0.00449
D(THAI)	-0.526014	0.142191	0.109682	0.07352	-0.0314
D(FILIP)	-0.1033	0.249326	-1.14E-01	-0.119	-0.0299

Table 7.Coefficient β on Normalized Cointegration in REER Variables in ASEAN 5

Normalized Cointegrating Coefficient		
REER	β Coefficient	SE
Singapura	1	
Indonesia	0.436683	0.17395
Malaysia	-0.754047	0.23979
Thailand	-2.388867	0.56878
Filipina	0.735019	0.37559

CONCLUSION

The results of a PPP study using the Pedroni cointegration panel show that the conditions of the nominal exchange rate and price index in ASEAN are cointegrated. The results of the GPPP using the Johansen cointegration test show that there is a long-term cointegration of the REER variable in ASEAN 5. However, the results of the β coefficient test in the Johansen cointegration show that there are signs that do not the same coefficients in each country. The unequal coefficient sign indicates that there is an asymmetrical relationship in the exchange rate adjustment process in the event of an economic shock. So that the formation of a common currency in ASEAN 5 cannot be fully realized. Suggestions in this research are the need for cooperation and policies between countries in ASEAN 5 that lead to the stability of the exchange rate and economic conditions in each country.

REFERENCES

- Ahmed, Elsadig. 2014. "Testing The Evidence of Purchasing Power Parity for ASEAN 5 Countries Using Panel Estimation." *International Journal of Economics and Business Modelling* Vol. 2(April 2011): 42–56.
- Alvarado, Sylvia. 2015. "Analysis of the Optimum Currency Area For." *Journal of US-China Public Administration* 11(12): 995–1004.
- Anh, Thu. Nguyen ;, and Anh. Nguyen Thi Mai. 2013. *ASEAN and EU Economic Integration: A Comparative Analysis*.
- Beirne, John, and European Central Bank. 2015. *Real Exchange Rate Dynamics and Monetary Integration in Crisis-Affected Real Exchange Rate Dynamics and Monetary Integration in Crisis-Affected Regions*.
- Chang, Tsangyao, Chia-hao Lee, and Wen-chi Liu. 2012. "Nonlinear Adjustment to Purchasing Power Parity for ASEAN Countries." *Japan & The World Economy* 24(4): 325–31.
- Choji, Niri Martha, and Siok Kun Sek. 2017. "Testing for Purchasing Power Parity in the Long-Run for ASEAN 5." 080017.
- Enders, Walter, and Stan Hurn. 1997. *00 Common Trends and Generalized Purchasing Power Parity*.
- Engwerda, J. et al. 2012. "A Simulation Study of an ASEAN Monetary Union." *Economic Modelling* 29(5): 1870–90.
- Forlati, Chiara. 2015. "On the Benefits of a Monetary Union: Does It Pay to Be Bigger?" *Journal of International Economics* 97(2): 448–63.
- Friedman, M, and Michael Woodford. 2010. *Handbook of Monetary Economics*. Volume 3B. North Holland.
- Gharleghi, Behrooz, Najla Shafighi, and Chan Yin Fah Benjamin. 2015. "Financial Integration and Common Currency Area in ASEAN." *Journal of Economics, Business and Management* 3(1): 111–14.
- Hayat, Khuhawar Khizer, and Zeng Jianqiu. 2013. "Common Currency for Asia 'Now or Never.'" *Economic Modelling* 35: 170–74.
- Linde, Bennie. 2015. *Macroeconomics Analysis of Monetary Union*. SpringerBriefs.
- Madura, Jeff. 2011. *Multinational Financial Management Ninth Edition*. America: Thomson South Western.
- Mishra, Ritesh Kumar, and Chandan Sharma. 2010a. "Real Exchange Rate Behavior and Optimum Currency Area in East Asia: Evidence from Generalized Purchasing Power Parity." *International Review of Financial Analysis* 19(3): 205–13.

- . 2010b. “Real Exchange Rate Behavior and Optimum Currency Area in East Asia: Evidence from Generalized Purchasing Power Parity.” *International Review of Financial Analysis* 19(3): 205–13.
- Rhee, Hyun Jae. 2012. “Testing for the Possibility of a Monetary Union in the ASEAN+3 Countries: Rationality and Asymmetric Loss Functions.” *Applied Economics Letters* 19(3): 261–68.
- Shapiro, Alan C. (University of Southern California). 1984. 15 *Journal of International Business Studies Multinational Financial Management*. 10th ed. America: Wiley.
- Subagja, Ridha, and Syahid Irfan Mubarak. 2015. “241 Analisis Kapasitas Ekonomi Negara-Negara Anggota Asean Dalam Rencana Pembentukan Mata Uang Bersama.” *Kajian Ekonomi* 20: 241–54.
- Taguchi, Hiroyuki. 2010. “Feasibility of Currency Unions in Asia — An Assessment Using Generalized Purchasing Power Parity — 1.” *Public Policy Review* 6(5): 859–72.
- Wilson, Peter, and Keen Meng Choy. 2011. “Prospects for Enhanced Exchange Rate Cooperation in East Asia: Some Preliminary Findings from Generalized PPP Theory Prospects for Enhanced Exchange Rate Cooperation in East Asia: Some Preliminary Findings from Generalized PPP Theory 1.” *Applied Economics Letters* 8(November 2014): 981–95.
- Zerihun, Mulatu F, and Marthinus C Breitenbach. 2017. “Is SADC an Optimal Currency Area? Evidence from the Generalized Purchasing Power Parity Test.” *Economic Change and Restructuring*.