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INDONESIAN CAPITAL MARKET REVIEW

Are The ASEAN-5 Foreign Exchange Markets Efficient? Evidence from Indonesia, Thailand, Malaysia, Singapore, and Philippines: Post-Global Economic Crisis 2008

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This paper examines market efficiency of foreign exchange markets in South East Asia (Indonesia, Thailand, Malaysia, Singapore, and Philippines) after the global crisis period 2008. The time span covered by the samples are from 2009 to 2014, with the total number of observations for spot and forward exchange rate data amounting to 1565 data points. This study uses three different approaches to examine efficiency within countries and across countries. The result of this study shows that foreign exchange markets in the ASEAN-5 countries are efficient within countries, but have not been efficient across countries, especially when the country has a bivariate relationship with Thailand's foreign exchange market. The main implication of this study is that investors in the ASEAN-5 market cannot obtain abnormal returns using technical analysis on within countries foreign exchange market. In addition, there is no significant differences for participants in the foreign exchange market whether they are using hedging or not hedging.

Keywords: ASEAN-5 exchange rate; Cointegration; Efficient Market; Wald Test; Financial Crisis

JEL classification: G01; G14; C32

Introduction

The role of the foreign exchange market in the ASEAN economies are becoming increasingly important. This is because ASEAN will soon welcome the ASEAN Economic Community (MEA), a process of economic integration that will reduce regulatory constraints between the countries. It is hoped that this will increase the trade and investment flow between countries in the area, causing an increase in demand for foreign currencies to facilitate business, trade and investment among ASEAN countries. Therefore, understanding the efficiency of the

ASEAN foreign exchange market will become an important issue, and is beneficial for business and investment. International business between ASEAN countries have the potential to increase. Thus, based on the business perspective, when the foreign exchange market is inefficient, it would be beneficial for treasurers of a company to be more active in the foreign exchange market as opposed to being more involved with the company's balance sheet and transaction flow. Any company can improve their value by exploiting this condition by selecting currency actively and timing transaction. On other hand, when the foreign exchange

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markets are efficient, it will be better for the treasurer to minimize transaction costs (Levich, 1989).

On the investment side, according to Aroskar, Sarkar, and Swanson (2004), the gains or losses in the foreign exchange market is a component of investment return in foreign security; the other being gains or losses in security value. Actors in the foreign exchange market can consider exposure in exchange rate risk as a variable that determines the decision-making. Therefore, decreasing that particular risk by improving the ability to predict the foreign exchange market can be very useful. For that reason, this paper aims to discuss the behavior of the foreign exchange market in ASEAN-5 countries, namely, Indonesia, Thailand, Malaysia, Singapore, and Philippines from the standpoint of market efficiency.

Market efficiency is a condition in which the price of speculative asset reflects all relevant available information (Fama, 1970). The idea behind this hypothesis is, since all relevant available information is already reflected in the price in an efficient market, price moves only when there is new and unexpected information (innovation). Therefore, because new and unexpected information cannot be predicted, the price movement of speculative asset in an efficient market can be represented by a random walk (Meggison, 1997).

Wickremasinghe (2004) and Katusiime, Shamuddin, and Agbola (2015) stated that in an inefficient foreign exchange market, the actors within can build a model that can predict foreign exchange movement. This results in an inefficient market, as there are transactions in foreign currencies that can earn abnormal profit in the market. In addition, Wickremasinghe (2004) said that, in an inefficient market, the government can set policy to influence foreign exchange movement to reduce volatility and evaluate the impact of the policy. In the case of hedging strategy, Soenen (1979) stated that when cost is ignored, an efficient market will lead to zero transaction cost. Thus, any company, whether with a hedging strategy or not, will have the same expected return. It can be concluded that the company, whether they ac-

tively hedged or not, had to accept a loss or gain due to foreign exchange transaction.

Testing market efficiency in the foreign exchange market has been done several times with different samples and techniques. Wickremasinghe (2004) tested the efficiency of the Sri Lankan foreign exchange market within country scope. He used unit root test to check for the weak form market efficiency in Sri Lanka and found that this test is consistent with the weak form market efficiency. In addition, his study also used a Johansen Cointegration test to see long-term relationships within the country and conclude that the Sri Lankan foreign exchange market have not been efficient in semi-strong form. Ahmad, Rhee, and Wong (2012) studied Asia Pacific foreign exchange market efficiency, both within country and across the country. They found that Asia Pacific foreign market are generally efficient from within the county and across the countries. However, there is a problem in this study, as they did not consider the issue of risk premium. Tests to determine the risk premium for market efficiency was performed by Aroskar, Sarkar, and Swanson (2004) using data from British Pounds, Italian Lira, German Mark, and French Franc. This study showed the presence of market inefficiencies in those four countries. However, this study has not examined the relationship between the foreign exchange market across the countries. The most comprehensive study conducted by Kan and O'Callagan (2007) by testing the efficient market hypothesis in the foreign exchange market in Asia Pacific. This study examines the cointegration between spot and forward market (within the countries), cointegration between countries (across the countries) and also a test of risk premium. The results from this study support the efficient market hypothesis.

In this paper, we examine the theory of efficient market hypothesis, the foreign exchange market in the ASEAN area. We developed a study conducted by Kan and O'Callagan (2007) by extending the observation period, to see whether there are differences in the aftermath of the Asian crisis 1997-1998 and the aftermath of the global economic crisis 2008. We focus on the ASEAN countries to see whether there are

implications that can affect AEC. We argue that economic integration will increase the importance of foreign exchange market, since trade and investment across the member states will increase. We choose to start the sample at the beginning of 2009, to ignore the difference before and after the 2008 global economic crisis. To test long-term relationship within a country and across countries, we conduct Johansen cointegration test. We found that foreign exchange markets in the ASEAN-5 countries are efficient within the countries, but have not been efficient at across countries level.

The remainder of the paper is organized as follows. The literature review is described in the next section. The third section presents the research methods and data. The fourth section, discusses the empirical results of this study, which we grouped into three sub-sections: Subsection 1) market efficiency test within the country; Subsection 2) the f-efficiency test across countries; Subsection 3) Forward premium test as a predictor of the spot value of foreign exchange in the future respectively. Last section contains conclusions, suggestion, and implications.

Literature Review

An efficient market is a market where the prices of speculative assets is a reflection of all available information (Fama, 1970). In other words, the Efficient Market Hypothesis (EMH) explains that price is determined using all the relevant information from the past and the present combined to determine pricing. In the context of speculative assets associated with foreign exchange, the price of a foreign currency is a reflection of all the available information in the market. Fama (1970) stated that there are three levels of efficient market, based on the availability of information. The first is *weak form*, a form in which the price of a speculative asset reflects all relevant historical information. In this form, the investor cannot get abnormal returns by using technical analysis because there is no correlation between the historical price of an asset and its current price. Thus it cannot be predicted. The second form

is *semi-strong form*, the form of efficiency of the market where prices of speculative assets reflect all publicly available information. The implication of this form is investors who use fundamental analysis cannot obtain abnormal returns, because all publicly information is already reflected in the speculative assets. The last is *strong form*, where the price of a speculative asset reflects all relevant information, both public information and private information. Therefore, insider trading cannot generate abnormal returns.

Efficient market theory states that price only react when there is new relevant information. This is because all the expected and non-new information are already included in the price. Because the new information is information that cannot be predicted, price movements cannot be predicted in an efficient market. That is why, a change in the market price should be a random walk (Meggison, 1997), which means the price of an asset moves randomly. If the price of speculative asset can be predicted, then it indicates that the market is inefficient, because not all information is reflected in asset prices. Therefore, in an efficient market, there are opportunities for arbitration and getting abnormal returns.

There are two common test used in order to test foreign exchange market efficiency, namely foreign exchange efficiency (1) across countries test and (2) within the country test. From the angle of across countries test, the test is such in an efficient market there is no element of predictability, thus if the foreign exchange market has additional information that makes it possible to predict one country's exchange rate from another country's exchange rate, then there will be opportunity for arbitrage, leading to ability to earn abnormal profit. Accordingly, the presence of such a relationship is a characteristic of an inefficient market. Therefore, foreign exchange market is only efficient when the returns of spot of forward rate is not predictable by using other currency's spot or forward rate (Kan & O'Callagan, 2007).

To test this predictability, one can use the cointegration method. This statement is supported by Baillie and Bollerslev (1989), which

stated that if there is a long-term relationship between two or more prices of different assets, where in other words the assets are cointegrated, then deviation from the long run trend can be used to predict future direction of return on these foreign exchange rate. To strengthen the argument, Kuhl (2010) said that cointegration between two prices, would be an indication of predictability of at least one of the prices based on the past movement of the other asset, as indicated by the presence of an error correction term. Consequently, the foreign exchange market is efficient when the return of the foreign exchange market cannot be predicted. Supporting the arguments of Bollerslev (1989) and Kuhl (2010), Pengphis (2006) expressed the opinion that the absence of cointegration and Error Correction Model (ECM) implies a price in the foreign exchange that cannot be predicted by historical value of other foreign exchanges (across countries). Therefore, we can conclude that if there are two or more foreign exchanges (across the country) that are cointegrated, then the market is inefficient.

Market efficiency test across countries between two or more foreign exchange using cointegration has been carried out by several researchers. Pengphis (2006) used three cointegration test; Johansen test, Harris-Hinder test, and Gregory-Hansen test. Using Johansen test, Pengphis (2006) found evidence of cointegration and concluded that the foreign exchange markets of Europe and Asia in times of crisis are inefficient. By using Harris-Hinder and Gregory-Hansen test, Pengphis (2006) found a different result with the previous test (Johansen test), and rejected the hypothesis that there is cointegration between foreign exchanges in Asia and Europe.

The within-country foreign exchange efficiency test is concerned about the relationship between future spot and forward rate in the same currency. In an efficient foreign exchange market, based on rational expectations, the forward rate should be the reflection of the economic expectations of future spot rate (Jeon & Seo, 2003). Thus, the price of the forward must become an unbiased predictor of spot prices in the future, on assumptions of risk neutrality

and rationality (Westerlund & Narayan, 2013). Ahmad et al (2012) argued that if the forward rate fails to become an unbiased predictor of the future spot, it will create an opportunity to gain profit through arbitrage, enabling the possibility of excess return. This condition violates efficient market conditions. In simpler terms, in efficient market the forward price must be a forecast for future spot price (Rapp & Sharma, 1999). Rapp and Sharma (1999) added that, in an efficient market, there must be a long-term relationship between spot and forward rate. To strengthen the argument, Hossfeld and Rothig (in press) states that future market is the primary market for speculators, and speculators are well-informed individuals who seek profit by forecasting futures prices by studying the future market.

Therefore, in review, cointegration test approaches are different for within country test and across countries test. In a within-the-country test, the market is said to be efficient if there is a long-term relationship (cointegration) between the forward and the spot rate in the future. While in a test across countries, the market is said to be efficient if there is no long-term relationship (cointegration) between the value foreign exchange to the value of other foreign exchange rate.

However, if cointegration exists in the foreign exchange market, we cannot directly conclude that the market is inefficient. This is because according to Aroskar (2004), there are three possible interpretations of cointegration in a market, specifically: 1. Market is inefficient; 2. Market is efficient but there is a risk premium; 3. Market is inefficient and there is a risk premium. Therefore, it is necessary to test the forward premium.

Based on the literature review that has been conducted, we give three hypotheses in this study:

- H1:** Indonesia's, Thailand's, Malaysia's, Singapore's, and Philippines' foreign exchange markets are efficient on within-the-country test perspective
- H2:** Indonesia's, Thailand's, Malaysia's, Singapore's, and Philippines' foreign exchange

markets are efficient on across-countries perspective

H3: Forward premiums on the ASEAN-5 exchange rate are an unbiased predictor of the future spot rate, thus the market is efficient

Research Methods

The dataset in this paper contains the spot and forward rates from five countries with the highest GDP in Southeast Asia according to the World Bank, known as ASEAN-5 (Indonesia, Thailand, Malaysia, Singapore, and Philippines). These are daily rates spanning the years 2009 – 2014, with the aim of ignoring the differences before and after the global financial crisis of 2008. In total, the dataset consists of 1565 observations of spot rate and forward rate from each country. We used the one-month forward rate in this paper as used by Villanueva (2007) and Kan and Callaghan (2007). All dataset was obtained from Datastream, where all exchange rates are expressed in the US dollar and expressed in natural logarithm.

To find relations between simultaneous values of variables to understand the economic interaction involved, we test the long run economic relations between these variables using the methodology of Johansen (1988) and Johansen and Juselius (1990):

$$y_t^k = \alpha_0 + \beta_1 y_t^l + \eta_t \quad (1)$$

where y_t^k and y_t^l are the log values of exchange rate. Both time series data can be said to be cointegrated if y_t^k and y_t^l are found to be $I(1)$ and if η_t (error term) is $I(0)$. Predictably return to currencies can be found if y_t^k and y_t^l are cointegrated, which implies a long run relationship among these series (Baillie & Bollerslev, 1989). Cointegration test procedure using the method of Johansen (1988) is used to identify the data, test data with stationarity, and transform the data to a stationary form with Augmented Dickey-Fuller (Said & Dickey, 1984) unit root test, with the purpose of testing the degree of integration and cointegration.

Foreign Exchange Market Efficiency Testing Within Country

The first cointegration test we carried out aims to find whether there is a long-term relationship between the spot and forward exchange rate within each countries selected. We employ VAR Cointegration Test by Johansen (1988) to test unbiased predictability of forward exchange rates with the estimation equation:

$$s_{t+k} = \alpha + \beta f_t^k + \varepsilon_t \quad (2)$$

where s_{t+k} is spot exchange rate of a currency in the period $t+k$, f_t^k is the forward exchange rate in the period t with maturity period k , and ε_t is the error term followed by white noise process. If there is a cointegration vector between forward and spot exchange rate of the same currency, it can be concluded that the forward exchange rate is an unbiased predictor of the future spot exchange rate. This reinforces the hypothesis of market efficiency by Jeon and Seo (2003).

Foreign Exchange Market Efficiency Testing Across Country

To determine the market efficiency across countries, we used cointegration test between spot rate across the countries selected. The cointegration test aims to determine whether there is a trend in the long term relationship between the exchange rate of ASEAN 5 currencies. In this section we describe our approach to find those relations, involving bivariate and multivariate testing.

Bivariate Testing

As stated on the literature review, in an efficient market, there is no element of predictability. If cointegration exists between spot or forward exchange rates among two countries, it can be concluded that the changes in the spot (forward) rate in one country can be predicted by a spot (forward) rate of other countries. This will create an opportunity for arbitrage, leading to ability to earn abnormal profit; in the other

words the two markets are not efficient. Market efficiency suggests that two markets with different assets cannot be cointegrated (Granger, 1986). In other words, in an efficient market, two currency's spot (forward) rate cannot be cointegrated. Therefore, by testing the cointegration between one currency spot (forward) rate on other currency spot (forward) rate, it can be concluded whether foreign exchange market is efficient or not.

Multivariate Testing

We employ cointegration testing in multivariate level in order to determine whether there is co-trending among spot or forward exchange rate in group of exchange rate in ASEAN-5 as a whole.

Forward Premium Testing as an Unbiased Predictor of the Future Spot Exchange Rates

Another approach is to conduct a test by reducing the spot rate as follows:

$$s_{t+k} - s_t = \alpha + \beta(f_t^k - s_t) + \varepsilon_{t+k} \quad (3)$$

According to Taylor (1995), under the assumption of rational expectations, the expected exchange rate changes should deviate from actual change only by errors in prediction. Taylor (1995) argues that if the agent is risk neutral and has rational expectations, the slope of the equation must be equal to one. Based on the model, a hypothesis can be formed as follows:

$$H_0 : \alpha = 0 \text{ and } \beta = 1; H_1 : \alpha \neq 0 \text{ and } \beta \neq 1$$

This hypothesis will be tested using Wald Test, which has a chi-square distribution with a degree of freedom. The parameter β is crucial in indicating f_t^k whether it can be used in predicting s_{t+k} . Similar approach for market efficiency has also been done by Choudhry (1999) Jeon and Seo (2003) and Villanueva (2007) and which tested the efficiency of foreign exchange market. Aroskar, et al (2004) also applied the same test to foreign exchange market in Europe. The existence of unit root in the forward premi-

um implies the impossibility of error correction term used as a forward risk premium. Aroskar et al (2004) added that if the risk premium is stationary, then the evidence for market inefficiency is reduced. To test whether there is a unit root in forward premium, we used the Augmented Dickey Fuller (ADF) test. The value of the premium forwards is obtained from:

$$p_t^k = f_t^k - s_t^k \quad (4)$$

where p_t^k is the forward premium at time t , f_t^k is the value of forward rate at time t , and s_t^k is spot rate at time t . These rate are in the form of natural logarithm.

Results and Discussions

Unit Root Test

We conducted the ADF test in order to prove the presence of unit root in the time series. ADF test results for all series of spot and forward exchange rates are given in Table 1 and Table 2. The results using the first differenced series rejected the hypothesis where there is no unit root for both the spot and forward rate within the country on ASEAN-5 at the 5% significance level.

Efficiency Test within Countries

Cointegration test using spot and forward rates within countries are given in Table 3. The results show that each country has at least one cointegration relationship between future spot and forward exchange rates. Our results are similar with Kan and O'Callaghan (2007) and Ahmad et al (2012) who tested for within-countries currency market efficiency in the case of Asia Pacific. We rejected the hypothesis of no cointegration at the 5% significance level. The cointegration relation is estimated between s_{t+k} and f_t^k based on the equation (2). Therefore, based on result in Table 3, we conclude that the validity of unbiased predictor hypothesis when it is applied in these countries remain stable. The results also illustrate that the forward exchange rate is an unbiased predictor and can be used as

Table 1. Unit root test results for spot exchange rates in the ASEAN-5 region

	L-ADF	1 st ADF
Indonesia	0.3151	-37.2167
Malaysia	-1.4816	-39.6942
Philippines	-1.9085	-38.0408
Singapore	-1.7143	-41.9578
Thailand	-1.5789	-23.8195

Notes: 95% Critical Value for Augmented Dickey Fuller statistical value is -2.86318; the number of observations in 1565 were used in the estimation of regression ADF

Table 2. Unit root test results for forward exchange rates in the ASEAN-5 region

	L-ADF	1 st ADF
Indonesia	0.2320199	-37.311673
Malaysia	-1.4744116	-39.730729
Philippines	-1.9322138	-39.165729
Singapore	-1.6965013	-41.43346
Thailand	-1.6724677	-23.793932

Notes: 95% Critical Value for Augmented Dickey Fuller statistical value is -2.86318; the number of observations in 1565 were used in the estimation of regression ADF

Table 3. Cointegration tests for unbiased predictor hypothesis

Country	Maximum Eigen-value					Trace						
	H ₀ r=0	H ₁ r=1	Crit. Value	H ₀ r≤1	H ₁ r=2	Crit. Value	H ₀ r=0	H ₁ r=1	Crit. Value	H ₀ r≤1	H ₁ r=2	Crit. Value
Indonesia	162.7887*		14.2646	0.9846		3.8415	163.7733*		15.4947	0.9846		3.8415
Malaysia	76.1308*		14.2646	3.7211		3.8415	79.8520*		15.4947	3.7211		3.8415
Philippines	66.0781*		14.2646	3.3974		3.8415	69.4754*		15.4947	3.3974		3.8415
Thailand	564.4065*		14.2646	3.7705		3.8415	568.1770*		15.4947	3.7705		3.8415
Singapore	67.4371*		14.2646	5.9864*		3.8415	73.4235*		15.4947	5.9864*		3.8415

Notes: * and ** indicate significance level at 5% and 10%

a robust predictor of future spot exchange rates, contributing to the efficient market hypothesis. In accordance with previous studies by Jeon and Seo (2003), as the forward exchange rate is proven to be an unbiased predictor of future spot, this shows that the countries studied have a weakly efficient form of currency market.

Efficiency Test across Countries

Bivariate Test

The results of cointegration test for the spot and forward exchange rates across countries are reported in Table 4 and 5. Maximum Eigen-value and Trace value are obtained from cointegration test on bivariate level. The results indicate that the cointegration is mostly between foreign exchange rate (Spot and Forward) in bivariate cointegration test on the ASEAN-5. Table 4 shows that there are several cointegration relations that have been found between the following country pairs: Indonesia – Thailand,

Malaysia – Thailand, Philippines – Thailand, and Singapore – Thailand. The presence of cointegration implies that the market between those country pairs were inefficient under the study period. It may have created arbitrage opportunities to gain abnormal profits. Similarly, the country pairs of Philippines – Singapore and Singapore – Thailand are not cointegrated, which is significant at the 5% level. We also found that each country which is paired with Thailand has a long-term relationship, indicating inefficient markets. This supports Kan and O'Callaghan's finding (2007), in which the countries of ASEAN-5 that is cointegrated with Thailand such as Indonesia, Malaysia, and Philippines have inefficient market.

Cointegration test results for forward exchange rate has a similar pattern with the spot exchange rate as shown in Table 5. Therefore, we can conclude that several pairs of countries are cointegrated, indicating that not all of pairs of countries have efficient market.

Table 4. Results of cointegration tests for spot exchange rates

	Maximum Eigen Value				Trace			
	H0	H1	H0	H1	H0	H1	H0	H1
	r = 0	r = 1	r ≤ 1	r = 2	r = 0	r = 1	r ≤ 1	r = 2
Indonesia – Malaysia	11.5025		0.7719		12.2744		0.7719	
Indonesia – Philippines	13.3231		0.2789		13.6020		0.2789	
Indonesia – Singapore	12.8485		0.9903		13.8387		0.9903	
Indonesia – Thailand	61.5401*		0.0133		61.5534*		0.0133	
Malaysia – Philippines	6.0830		1.9379		8.0209		1.9379	
Malaysia - Singapore	4.4220		1.8265		6.2485		1.8265	
Malaysia – Thailand	515.9732*		2.2297		518.2029*		2.2297	
Philippines - Singapore	7.8494		4.0114*		11.8607		4.0114*	
Philippines – Thailand	489.6123*		3.8096		493.4219*		3.8096	
Singapore - Thailand	281.1569*		3.8475*		285.0044*		3.8475*	

Notes: * and ** indicate significance level at 5% and 10%

Table 5. Results of cointegration tests for forward exchange rates

	Maximum Eigen Value				Trace			
	H0	H1	H0	H1	H0	H1	H0	H1
	r = 0	r = 1	r ≤ 1	r = 2	r = 0	r = 1	r ≤ 1	r = 2
Indonesia - Malaysia	12.0008		0.9284		12.9292		0.9284	
Indonesia - Philippines	14.0135		0.3763		14.3898		0.3763	
Indonesia - Singapore	12.9936		0.9794		13.9730		0.9794	
Indonesia – Thailand	62.5874*		0.0115		62.5989*		0.0115	
Malaysia – Philippines	5.8470		1.9030		7.7501		1.9030	
Malaysia - Singapura	4.8530		1.6988		6.5517		1.6988	
Malaysia – Thailand	519.9978*		2.2222		522.2200*		2.2222	
Philippines - Singapore	8.0177		4.0191		12.0368		4.0191*	
Philippines – Thailand	486.1598*		3.7794		489.9392*		3.7794	
Singapore - Thailand	279.5392*		3.9055		283.4446*		3.9055*	

Notes: * and ** indicate significance level at 5% and 10%

Table 6. Multivariate cointegration test results for spot exchange rates

	Maximum Eigen Value										Trace									
	H0	H1	H0	H1	H0	H1	H0	H1	H0	H1	H0	H1	H0	H1	H0	H1	H0	H1	H0	H1
	r=0	r=1	r ≤ 1	r = 2	r ≤ 2	r = 3	r ≤ 3	r = 4	r ≤ 4	r = 5	r=0	r=1	r ≤ 1	r = 2	r ≤ 2	r = 3	r ≤ 3	r = 4	r ≤ 4	r = 5
Indonesia - Malaysia - Philippines - Singapore - Thailand	372.7464*		16.3797		14.5084		8.2547		0.7504		412.6395*		39.8932*		23.5135		9.0051		0.7504	

Notes: * indicates rejection the null hypothesis at 5%

Table 7. Multivariate cointegration test results for forward exchange rates

	Maximum Eigen Value										Trace									
	H0	H1	H0	H1	H0	H1	H0	H1	H0	H1	H0	H1	H0	H1	H0	H1	H0	H1	H0	H1
	r=0	r=1	r ≤ 1	r = 2	r ≤ 2	r = 3	r ≤ 3	r = 4	r ≤ 4	r = 5	r=0	r=1	r ≤ 1	r = 2	r ≤ 2	r = 3	r ≤ 3	r = 4	r ≤ 4	r = 5
Indonesia - Malaysia - Philippines - Singapore - Thailand	375.6019*		16.9841		14.0414		8.1477		0.7915		415.5667*		39.9647		22.9807		8.9392		0.7915	

Notes: * indicates rejection the null hypothesis at 5%

Multivariate Test

As shown by Table 6 and Table 7, multivariate cointegration test results for both spot and

forward exchange rate are cointegrated at 5% level of significance, either by the Maximum Eigenvalue or Trace Value. Multivariate cointegration results for currency market in ASIAN-5

Table 8. Estimation Results of Eq. (3)

Country	α	Standard Error	β	Standard Error	Wald - Statistic
Indonesia	0,0159	0,0021	-3,8762	0,4124	116.4820
Malaysia	-0,0232	0,0025	10.6132	1,2238	97.6420
Philippines	0,0024	0.0006	-2,9068	0.2514	171.5661
Thailand	-0,0035	0.0027	-0,3592	1,3184	6.4311
Singapore	-0,0018	0,0004	-0,4139	0,2540	21,9467

Table 9. Unit root tests for foreign exchange premium

Country	ADF		PP	
	t statistic	t crit 5%	t statistic	t crit 5%
Indonesia	-4.0511	-2.8632	-9.2751	-2.8631
Malaysia	-2.3859	-2.8632	-3.5899	-2.8631
Philippines	-3.1440	-2.8632	-12.8614	-2.8631
Thailand	-4.9957	-2.8632	-5.9551	-2.8631
Singapore	-40.3372	-2.8632	-40.5646	-2.8631

using spot and forward exchange rates suggest the presence of cointegration relationship. This implies that the foreign exchange market in ASEAN-5 is inefficient. These findings support the results of bivariate cointegration test which showed inefficiency on the market of a few country pairs, Indonesia – Thailand, Malaysia – Thailand, and Singapore – Thailand.

Risk Premium as Unbiased Predictor

Wald test results (Table 8) reject the joint hypothesis; there is no abnormal return in the foreign exchange market in all countries due to the value of α and β not being equal to zero and one. Thus, we conclude that the foreign exchange market in the ASEAN-5 over the period after global crisis is not efficient.

Food and Thaler (1990) argues that the coefficient of α and β of Wald test that are not consistent with the expected results ($\alpha = 0$ and $\beta = 1$) can be explained by the existence of a risk premium in the foreign exchange market. Therefore, we conduct a risk premium test. In testing risk premium, we use two methods of unit root test, i.e. the Augmented Dickey-Fuller (ADF) dan Phillips–Perron (PP). Aroskar et al. (2004) argues that if the risk premium is stationary, then the evidence for market inefficiency is reduced. The test results are shown in the Table 9.

The unit root test results reject the null hypothesis that there is a unit root in the forward premium (except for Malaysia in the ADF test), indicating that the forward premiums are sta-

tionary. Though we found inefficiency in the foreign exchange market in ASEAN using the Wald Test, it cannot be concluded that ASEAN-5 is an inefficient market. Therefore, the differences in coefficients obtained from Wald Test can be explained by risk premium. This supports the efficiency of the foreign exchange market in ASEAN over the period of study. In addition, this result is consistent with the findings by Kan and O'Callaghan (2007) that the currency markets are inefficient based on Wald test, but there is a risk premium on the forward premium stationary testing.

Conclusions and Implications

This study aims to examine the efficiency of the foreign exchange market through spot and forward exchange rates of the ASEAN-5 countries, namely Indonesia, Malaysia, Philippines, Thailand, and Singapore for the period after the 2008 global crisis (2009-2014).

Based on the results of within-countries testing, we find that the foreign exchange market in each ASEAN-5 countries are efficient. While in across-countries testing, bivariate test shows that not all pairs of countries have efficient foreign exchange markets. This is also supported by multivariate test in which the test results illustrate that the foreign exchange market of ASEAN-5 countries simultaneously cannot be said to be efficient.

By examining the forward premium, we found that the market is not efficient. However, the stationarity test of the forward premium

results state that the foreign exchange market in the ASEAN-5 is efficient, so the difference is not explained by inefficiency, but by risk premium. Based on the results, the foreign exchange market the ASEAN-5 is efficient within-countries but not efficient across-countries, especially in the bivariate relation to Thailand.

The foreign exchange market in ASEAN-5 is efficient in weak form. This implies that investors or actors in foreign exchange market cannot obtain abnormal return using technical analysis due to the unpredictability of future returns by using historical return. Since the the foreign exchange market in ASEAN-5 is cointegrated within-countries and is inefficient across the countries, the foreign exchange market participants in the ASEAN-5 will earn abnormal

profit transactions by using other currencies in ASEAN-5, especially Thai Baht. We also recommend any company that requires Thai Baht for its business operations to be more active in the foreign exchange market. Since the market is efficient within-countries, it does not make much difference whether the company is using hedge strategy or not, because in efficient market the transaction cost is zero. Either way, with or without hedging the company will end up with the same expected return (Soenen, 1979). This paper also provides input for government policy: if the market is inefficient, policies to regulate foreign exchange market can reduce the volatility of the foreign exchange rates and evaluate the policies against foreign currencies.

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