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EXCHANGE RATE AND TRADE BALANCE NEXUS IN ASEAN-5

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Abstract

This study analyzes the short run as well as long run impact of exchange rates changes towards trade balances for ASEAN-5 member countries, namely Indonesia, Malaysia, the Philippines, Singapore and Thailand. The stationary test, Johansen-Juselius cointegration test and Granger causality test have been utilized in the study. For the sample period from 1970 to 2004, empirical results indicate that although there is a lacking of long run stable relationship among the exchange rates and trade balances in the ASEAN-5 economies, the exchange rates do have ability to influence trade balances in these countries in the short run except for Indonesia. This implies that the policy makers could use discretionary monetary and fiscal policies to affect the external trade performance in these ASEAN countries. Therefore, the corresponding governments should adopt the appropriate exchange rate regime wisely in boosting the economy and improving the trade deficit for the countries.

JEL Classifications: F10; F31; O52
Keywords: Exchange rate; Trade balance; ASEAN-5 countries

1. Introduction

Currency exchange value, commonly known as exchange rate, has a very important role in achieving monetary stability and supporting other economic activities. A stable exchange rate is essential to create a favorable climate to boost the business activities in a country. Many countries have embarked on different approaches in trying to stabilize

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the exchange rate against its major trading partners. As referring to the Leduc (2001), a report from the International Monetary Fund (IMF) showed that 67 countries pegged their currency, 8 worked with the currency boards, 37 used currency from another country or were part of a monetary union and 73 used flexible arrangement.

As the term of globalization became the famous trend in the world economy, trade liberalization and economy integration continued to expand throughout the century. Thus, corporate nowadays are operating in an environment where exchange rate changes might affect their policy decisions and competitiveness in the market place. Therefore, it was not surprising that the study of exchange rate has been one of the most central areas of economic research over the past few decades. Furthermore, understanding the nature of the exchange rate is essential in achieving internal stability and balance of payments equilibrium in a country.

The relationship between exchange rate and trade balance has become an eminent topic since the early year. Few hypotheses have been created based on previous study on this particular relationship such as J-curve effects in the short run and Marshall-Lerner condition in the long run. According to Koray and McMillin (1998), the J-curve effects have been generated as most of the economics believed that depreciation (appreciation) of the domestic currency against other currencies improves (deteriorates) the trade balance in the long run, but worsen (improves) it in the short run. The explanation of J-curve is based on assumption that the depreciation of the domestic currency caused the prices of import good increased while the price of export goods remains unchanged. Consequently, the trade balance has been deteriorating in the short run. However, export and import quantities adjustment over times to change in relative prices will lead to an improvement in the trade balance in long run. As quoted from Rincon (1988), Marshall-Lerner condition states for a positive effect of devaluation on the trade balance, and absolutely for stable exchange market, the total value of demand elasticity for export and import must exceed unity. Furthermore, Marshall-Lerner condition is holds where there is an excess supply for foreign exchange when the exchange rate is above the equilibrium level and excess demand when it is below.

The causal relationship between the exchange rate and trade balance has been widely discussed in previous studies. Most of the researches signified that exchange rate could influence trade flow in a country. For instant, Himarios (1989) had investigated whether the devaluation of the currency will affect real magnitude of the trade balance and result indicated that the coefficient of the real exchange rate showed significant relationship with the trade balance. Research by Humpage (1998) showed that all the exchange rate systems and managements

have associated with balance of payments. Rincon (1998) also found that exchange rate has a significant relationship on the short- and long-run behavior of Columbia's trade balance. Besides that, Baharumshah (2001) stated that a positive long-run relationship between exchange rate and trade balance has been found in the bilateral trade between Thailand and Malaysia with one of their major trading partners - Japan. A study done by Onafowora (2003) revealed that continued depreciation for East Asian countries currencies has led to an improvement of their trade balances. On the other hand, Stucka (2004) who examined on the effects of exchange rate change towards trade balance in Croatia with six major trading partners has discovered the evidence of the J-curve effect.

Nevertheless, some researchers wonder whether exchange rate changes able to improve or worsen trade balances as empirical evidences showed that not all countries' trade balances were affected by the changes in exchange rate. For example, Brahmasrene (2002) discovered that the real exchange rates changes have significant impact on trade balances in some countries, but not in all countries. On the other hand, Bahmani-Oskooee and Goswami (2004) investigated the impact of exchange rate towards Japan's bilateral trade flows with her nine major trading partners that include Australia, Canada, France, Germany, Italy, the Netherlands, Switzerland, UK, and the US using the ARDL approach. The results revealed that when trade flows are measured in terms of foreign currency or reserve currency, Japan's exports are not sensitive to real exchange rate in most cases. This indicates that the direction of the impact of exchange rate changes on the trade balance is vague.

This study intends to investigate the impact of exchange rate on the trade balance in the context of ASEAN-5 countries, namely Indonesia, Malaysia, the Philippines, Singapore and Thailand, with respect to one of their major trading partners - US. Most of the ASEAN-5 countries enjoyed the trade surplus where the export is greater than import, and generally, it views as a favorable sign from the perspective of economist. However, country might not remain trade surplus all the time if there were not well managed. Thus, study on the relationship of exchange rate and trade balance is necessary where the policy maker in a country might be able to monitor the flow of trade balance through exchange rate adjustment.

After the financial crisis in 1997, most of the ASEAN-5 countries have changed their monetary policy in controlling their economy situation. Be one of the important tools of monetary policy, exchange rate regime has played a vital role in helping these countries to cope with the crisis. For example, Malaysia has adopted the fixed exchange rate policy for foreign trade; meanwhile Indonesia and Thailand floating their exchange rates with the support from IMF. Besides that, ASEAN-5

countries are actively taking part in the international trade recently and this has caught the attention from the world. Thus, it is a necessity to examine the causal relationship of exchange rates and trade balances among ASEAN-5 countries for the short- and long-run. In this study, yearly data from 1970 to 2004 will be used to investigate the effect of exchange rates changes on the trade balances in the ASEAN-5 economies.

This paper is organized as follows. Section 2 provides a brief discussion on the background of the exchange rate regimes in the ASEAN-5 countries. The trend of trade balance in ASEAN-5 countries would be given in Section 3. Data description and methodology used are discussed in Section 4. Empirical findings are reported in Section 5 and finally we conclude.

2. Exchange Rate Policy in ASEAN-5

Since the ASEAN-5 countries have different economic backgrounds and adopted different type of exchange rate regimes, in this section, we would provide a brief discussion on the historical and development of exchange rates policy in each of the member countries.

Indonesia

Indonesia has implemented three exchange rate systems since 1970 that consisted of the fixed rate system over 1970 to 1978, managed floating exchange rate system since 1978, and the free-floating exchange rate system since August 14, 1999. The implementation of free-floating exchange rates after the financial crisis means that the exchange rate of Rupiah is determined solely by the market. Thus, the exchange rate reflects the interaction of supply and demand in the market. Bank Indonesia performed sterilization in foreign exchange market at a certain period, especially during an irregular fluctuation of exchange rate to maintain a stable exchange rate.

Malaysia

Prior mid-1972, Malaysia currency was pegged to the pound sterling, called the Malaysia dollar. However, Malaysia decided to substitute the sterling with US dollar due to the floating of the sterling and the dissolve of the Sterling Area in 1973. The Malaysian currency was floated and named Malaysia Ringgit. In 1989, the exchange rate system of Malaysia moved towards a more flexible regime. The managed float of exchange rate policy was maintained at about RM2.50 to RM2.60 per dollar. Before the financial crisis in 1997, the exchange rate for Ringgit was determined by demand and supply in foreign exchange market.

Nevertheless, Malaysian government adopted capital control measures in 1998 in order to stabilize the Ringgit and prevent massive outflow of Ringgit to foreign market. The Ringgit was pegged at RM3.80 to a US dollar. The measures effectively make the Ringgit non-tradable outside the country, bring offshore Ringgit back to the country, and reduce the ability of non-residents to trade in Ringgit Malaysia. In July 2005, the central Bank of Malaysia, namely Bank Negara Malaysia (BNM) made a systemic change from a fixed exchange rate to a managed float. Most analysts believe that Malaysia should broaden its economic growth as the consumer demand and investment finally recovering from the crisis.

Philippines

From 1970 to 1984, the Central Bank of the Philippines, the Bangko Sentral by Pilipinas (BSP) had imposed different rates to foreign exchange transactions for exports, imports and foreign debts, based on a daily "Guided Rate". During the period of 1970 to 1973, traditional exporters compulsory to give up 80% of the foreign exchange earning at "Official Rate" fixed at 3.9, and this was more disadvantageous to exporters than other rates. However, a stabilization tax has substituted the requirement on traditional exports and worked to siphon off the gains of traditional exports. In 1984, the multiple rate structure has been abolished. Ever since then, the Philippines have maintained a floating exchange rate regime. An inter-bank rate that determined based on supply and demand in the exchange market has governed all transactions.

Singapore

Singapore pegged the value of Singapore Dollar against a fixed and undisclosed trade-weighted basket of currencies from 1973 to 1985. In order to have a more market-oriented regime, Singapore allowed its currency to float according to supply and demand on the foreign exchange market but under the monitor of the Monetary Authority of Singapore (MAS) after 1985 onwards. The current exchange regime of Singapore was classified as a Monitoring Band. The Singapore dollar in circulation is hundred percent funded by international assets for notes-issuance in order to maintain public confidence. Furthermore, Singapore dollar against an undisclosed basket of currencies of Singapore's major trading partners and competitors was well control under the MAS.

Thailand

Thailand applied fixed exchange rate regime by pegging Baht on the US dollar during 1960s to early 1980s. In 1984, Bank of Thailand (BOT) substituted this system to a basket of currencies using Exchange Equalization Fund. However, the new system overvalued the Bath in terms of other currencies because of the appreciation of US dollar in 1990s. This had significantly affected the trade balance in Thailand. In July 1997, Thailand has adopted the free-floating exchange rate regime in replacing the fixed exchange rates system. This is aimed to let the currency moves in line with economic fundamentals. The BOT will only intervene in the market when necessary to avert excessive volatilities and achieve economic policy targets in Thailand. The floating regime is believed to be able to enhance more flexibility and efficiency in monetary policy implementation, increases confidence of domestic and international investors, and improves foreign capital flow supervision.

3. Trade Balance Trend in ASEAN-5

In theory, trade balance is defined as the net merchandise export. Trade balance tends to be sensitive to the exchange rate changes. Thus, economics theory stated when a country's currency depreciates against the currencies of major trading partners, the country's export will increase while the import will fall which will improve the trade balance. However, some researchers were concerned whether the exchange rate able to influence the trade balances. Instead of investigate the effect of exchange rate with the trade balance in a particular country, this study will expand the focus to ASEAN-5 that presented different macro economy policies and economy climates in Southeast Asian region. Table 1 presents the trade balance data for the ASEAN-5 from 1970 to 2004. The development of trade balance for each member of ASEAN-5 will be discussed in the following section.

Indonesia

Indonesia generated merchandise trade surpluses during the boom years of the 1990s. The merchandise trade surplus has expanded substantially that reaching $15 billion in 2000 after the collapse of Rupiah. The depreciation values of Rupiah encourage more volume of exportation as compared to other Asian countries. Nevertheless, the expansion has been falling back with the slowing of the world trade in 2001. For the year 2004, Indonesia's exports grew to a record $79.6 billion with an increase of 9.8 percent from 2003. This has been driven by the strong sales of non-oil and gas commodities such as electronics, palm oil, clothing, coal and tin. Meanwhile, total imports increased by almost 24.5 percent in 2004 to $68.1 billion.

Table 1
Trade Balance Trend in ASEAN-5, 1970-2004

Year	Indonesia	Malaysia	Philippines	Singapore	Thailand
1970	-0.27	0.16	-0.02	-0.38	-0.31
1971	-0.20	0.06	-0.06	-0.51	-0.21
1972	-0.26	-0.07	-0.07	-0.49	-0.08
1973	0.09	0.43	-0.02	-0.42	-0.16
1974	1.96	0.02	-0.44	-0.92	-0.32
1975	0.17	0.04	-1.04	-0.61	-0.69
1976	0.50	1.16	-1.16	-0.49	-0.42
1977	1.56	1.03	-0.79	-0.18	-1.07
1978	2.50	0.96	-1.21	-0.42	-1.01
1979	3.31	1.88	-1.63	-0.67	-1.84
1980	6.01	0.60	-1.57	-1.06	-2.01
1981	3.20	-1.59	-1.15	-0.80	-2.07
1982	-0.12	-2.35	-2.01	-0.68	-0.63
1983	0.22	-1.49	-1.78	-0.31	-2.87
1984	2.94	0.63	-0.28	-0.51	-1.55
1985	1.53	1.64	0.64	-0.45	-1.08
1986	-0.71	1.68	1.17	0.07	0.88
1987	1.22	4.51	0.14	0.04	0.29
1988	2.12	3.47	0.54	1.85	-0.86
1989	2.34	2.36	-0.89	2.57	-1.85
1990	0.54	0.90	-2.22	2.64	-6.49
1991	0.50	-1.82	-1.40	4.86	-6.49
1992	3.21	0.78	-2.64	4.79	-4.45
1993	4.67	-0.06	-4.50	4.57	-5.25
1994	1.99	-1.22	-4.37	10.98	-7.01
1995	-2.63	-3.44	-5.69	13.51	-11.20
1996	-1.38	1.39	-7.26	14.15	-11.30
1997	-0.37	0.66	-6.28	10.83	1.42
1998	11.61	16.39	-4.53	17.16	20.03
1999	12.55	19.83	0.12	14.28	15.56
2000	15.23	18.02	1.28	12.56	9.82
2001	13.09	16.18	-2.22	12.73	7.53
2002	12.83	17.40	-0.36	15.58	8.45
2003	17.81	21.70	-4.61	26.56	10.14
2004	11.55	25.18	-3.16	30.35	7.83

Source: International Financial Statistics (IMF), various issues.
Note: All figures are in billions of US dollar.

Malaysia

There were trade surpluses which driven by oil and gas and manufactured exports before the Asian financial crisis in 1997 for Malaysia. However, imports fell sharply and the trade balance widened significantly in 1998 after the financial crisis. This is when Ringgit Malaysia becomes much weaker, Malaysia's term of trade will make its export becomes more attractive in global market. The trade surplus merchandise expanded in 1999 and 2000 but the momentum of growth

has been decelerated during the global trade recession of 2001. As shown in Table 1, the trade surplus has remained large in year 2004 with $25.2 billion. The export growth has been strong as well with 21.7 percent for the same year.

Philippines

The current account surpluses during the years 1999 and 2000 had assisted the Philippines' economy out of its 1998 recession. There were increasing good export's earning of more than 6 percent per year in 1999 and 2000 and imports fell by more than 5 percent per year within that period. In 2001, export growth recorded a negative value of 6.6 percent due to the effect from depression of the global IT investment to the electronics manufacturing sectors of the Philippines' economy and import grew less than 2.9 percent. By referring to Table 1, the balances of payment for Philippines during 2001 to 2004 are all in deficit status. The country remained in trade deficit because of stronger import demand compared with exportation activity during that period.

Singapore

Singapore's economy is relying more on importation of raw materials and commodities for refining, reprocessing and manufacturing for the export market. Therefore, the volume of exports of goods and services is drastically larger than the country's GDP. The merchandise trade surplus has grown tremendously, averaging about $18.7 billion as compare to less than $10 billion before the Asian financial crisis. Now, Singapore continues to enjoy the trade surplus as the external trade expanded by 10.5 percent in 2005. Both domestic export and re-exports helped to sustain the economy growth.

Thailand

Sakurai (1995) pointed out that Thailand accomplished a high rate of economic growth due to the direct foreign investment by the end of the 1980s. However, Thailand experienced a large trade deficit in the end of 1995 that partly depleted Thailand's foreign exchange rate reserves and reduced its ability to peg the official exchange rate. With the collapse in the value of the Baht in 1997 against other major currencies, Thailand's exports become more attractive where the lower value of Thai Bath in relative with other currencies has improved the export activities. As the economy hit hardest by the financial crisis, Thailand was forced to earn by generating the export surpluses in the foreign goods and services. In year 2000, Thailand has stabilized its economy and balance of payment through the financial assistance from IMF. In 2004, export value amounted $117.45 billion which including high technology products

such as automobiles and automobile parts, electrical appliances, base metal products and plastic products. Meanwhile, import value amounted to $109.62 billion, given a trade surplus of around $7.83 billion.

4. Research Methodology

Data Description

Annual time series data of exchange rates and trade balances from the ASEAN-5 countries that span from 1970 to 2004 will be employed in this research. The exchange rates used are the bilateral nominal exchange rates between these ASEAN countries and the US. For the trade balance, it is defined as the ratio of net exports to nominal output in order to make it insensitive to units of measurement and to avoid the problem of negative value for log transformation when a country has trade deficit. All the data are obtained from various issues of the *International Financial Statistics* published by IMF.

Before we proceed to investigate the causal relationship between the exchange rate and trade balance, we need to obtain the time series properties information for the data under study. If the data are nonstationary and not cointegrated, we follow the standard VAR in the estimation. On the other hand, if the data are nonstationary and cointegrated, the Vector Error Correction Model (VECM) should be adopted. Thus, the first step involves testing the stationarity properties of the data using unit root test. In the second step, we utilize cointegration test to measure the long run equilibrium relationship between the exchange rate and trade balance. Finally, Granger causality test will be used to detect the causality link between these two variables.

The Unit Root Test of Stationary

In this study, the Augmented Dickey-Fuller (ADF) unit root test by Said and Dickey (1984) for ARMA process will be used to detect the existence of unit root in the data, as it is one of the most commonly used unit root tests in empirical work. The ADF test consists in running on ordinary least square (OLS) regression of the first difference of the series against the series lagged once, lagged difference terms and optionally, a constant and a time trend. Besides that, it also considers the problem of autocorrelation in the error process. The ADF regression for a time series Y_t is as below:

$$\Delta Y_t = \beta_1 + \beta_2 T + \delta Y_{t-1} + \alpha_1 \sum_{i=1}^{m} \Delta Y_{t-1} + \nu_t , \qquad (1)$$

where Y_t is variable of interest, Δ represents differencing operator, *T* acts as time trend variable, ν_t is the white noise disturbance term, and $\{\beta_1, \beta_2, \delta, \alpha_1, ..., \alpha_m\}$ is a set of parameters to be estimated. The null hypothesis in the ADF unit root test is δ = 0, implying Y_t is nonstationary. We reject the null hypothesis if the *t*-test statistic from the ADF test is negative and significantly less than the critical value tabulated in MacKinnon (1991).

Cointegration Test

The error-correction cointegration technique due to Johansen (1988) and Johansen-Juselius (1990) will be applied to examine the existence of cointegrating vector(s) amongst the exchange rate and trade balance from the ASEAN-5 economies. The Johansen test is designed in providing the method of cointegration to search for the long run relationship between economies variables within difference model. A long run cointegrating relationship means that the variables will move in one line over time and any short run deviation will be automatically corrected.

Johansen (1988) defined the general polynomial distributed lag model of a vector of variables *Y* as below:

$$Y_t = \Pi_1 Y_{t-1} + ... + \Pi_k Y_{t-k} + \varepsilon_t \text{ , for } t = 1...T, \quad (2)$$

where Y_t is a vector of *p* variables of interest, Π_1 represents *p* x *p* coefficient matrices, ε_t is the distributed *p*-dimensional vector with zero mean and covariance matrix. The cointegrating matrix is given as below:

$$\Pi = I - \Pi_1 - \Pi_2 - ... - \Pi_k \quad (3)$$

where *I* is the identity matrix and Π is a *p* x *p* matrix. Johansen (1988) showed that the coefficient matrix Π_k conveys the information concerning the long run relationship between the Y_t variables. The rank of the matrix Π_k indicates the number of cointegrating relationships existing between the variables in Y_t. If Π_k has zero rank, *p* = 0, then the two variables are not cointegrated, which means all elements of Y_t have unit roots and first differencing could be employed. If Π_k is full rank *p*, all elements are stationary in level. If the rank is *r*, in which *r* < *p*, there will exist *r* possible stationary linear combinations among the elements of Y_t and *p* - *r* common stochastic trends. When *r* < *p*, it implies that $\Pi_k = \alpha\beta'$, where α and β are *p* x *r* matrixes. β is a matrix of cointegrating

vectors while α is a matrix of speed of adjustment parameters representing the speed of error-correction mechanism.

Johansen's cointegration test only can be used to determine the number of cointegration vector(s) if the variables are nonstationary and are integrated of the same order. Johansen and Juselius (1990) suggested two statistic tests with the aim to determine the number of cointegration vector(s). The first test is trace test (λ_{trace}). It tests the null hypothesis, in which the number of distinct cointegrating vector(s) is less than or equal to *r*, against a general unrestricted alternative that the rank of $\Pi \geq r + 1$. The trace statistic test is calculated as follow:

$$\lambda_{\text{trace}} = -T \sum_{i=r+1}^{P} \ln(1 - \lambda_i) \tag{4}$$

where λ_i is the smallest value eigenvectors (p - r) and T is the number of observations. The null hypothesis is at most r cointegrating vector(s). The second test is the maximum eigenvalue test (λ_{max}), which is calculated according to Equation (5) below:

$$\lambda_{\text{max}} = -T \ln(1 - \lambda_{r+1}) \tag{5}$$

where λ_{r+1} is an estimated eigenvalue. The null hypothesis is r cointegrating vector(s), against the alternative of r + 1 cointegrating vector(s). Critical values for both the maximum eigenvalue and trace tests are tabulated in Osterwald-Lenum (1992).

Granger Causality Test

Granger (1969) causality test is used to analyze the causality direction between exchange rate and trade balance. "*X* is said to be a Granger cause of *Y* if present value of *Y* can be predicted with greater accuracy by using past values of *X*". In this study, Granger causality test will present in two ways to detect the direction; they are causality test from trade balance to exchange rate in trade balance leads exchange rate model in Equation (6), and causality test from exchange rate to trade balance in exchange rate leads trade balance model in Equation (7).

$$\begin{aligned} \ln E_t &= \mu_1 + \alpha_1 \ln E_{t-1} + \alpha_2 \ln E_{t-2} + \ldots + \alpha_m \ln E_{t-m} + \beta_1 TBGDP_{t-1} + \beta_2 TBGDP_{t-2} \\ &\quad + \ldots + \beta_n TBGDP_{t-n} + \varepsilon_{1t}, \\ \ln E_t &= \mu_1 + \sum_{k=1}^{m} \alpha_m \ln E_{t-m} + \sum_{k=1}^{n} \beta_n TBGDP_{t-n} + \varepsilon_{1t}, \end{aligned} \tag{6}$$

$$TBGDP_t = \mu_2 + \beta_1 TBGDP_{t-1} + \beta_2 TBGDP_{t-2} + \ldots + \beta_n TBGDP_{t-n} + \alpha_1 \ln E_{t-1}$$
$$\alpha_2 \ln E_{t-2} + \ldots + \alpha_m \ln E_{t-m} + \varepsilon_{2t} ,$$
$$TBGDP_t = \mu_2 + \sum_{k=1}^{n} \beta_n TBGDP_{t-n} + \sum_{k=1}^{m} \alpha_m \ln E_{t-m} + \varepsilon_{2t} , \quad (7)$$

where $\ln E_t$ and $\ln E_{t-1}$ are the natural logarithm of current and lagged values of exchange rate, $TBGDP_t$ and $TBGDP_{t-1}$ are the current and lagged values of trade balance which defined as the ratio of next exports to GDP, μ_1 and μ_2 are constant values, α's and β's are coefficients of lagged exchange rate and trade balance, and ε_{it} represent the error terms.

In Equation (6), the null hypothesis is H_0: β's = 0, and the alternative is H_1: β's ≠ 0. If the coefficients of trade balance are found to be statistically equal to zero, H_0 cannot be rejected, and it would imply that the trade balance does not Granger cause to exchange rate. Meanwhile, Equation (7) has the hypothesis of H_0: α's = 0, against the alternative of H_1: α's ≠ 0. If the coefficients of exchange rate are found to be statistically significant to zero, H_0 cannot be rejected, and it would means that the exchange rate does not Granger cause to trade balance.

5. Empirical Results

Unit Root Test Results

Table 2 reports the results of ADF unit root test that describing the stationarity properties of exchange rates and trade balances in the ASEAN-5 countries. We followed the Schwartz Information Criterion (SIC) in selecting the optimal truncation lag length to ensure the errors are white noise. Series in level contain drift and a deterministic trend while series in first difference only consist a drift term. The results clearly showed that the null hypothesis of a unit root fails to be rejected in the level form for each series. In the first difference, however, all series appear to be stationary. In other words, all series are said to be integrated of order one, that is *I*(1).

Table 2
ADF Unit Root Test Results

Country	Series	Level Trend	First Difference No Trend
Indonesia			
	LEXC	-2.411	-5.082***
	TBGDP	-2.606	-6.026***
Malaysia			
	LEXC	-2.675	-5.908***
	TBGDP	-2.352	-5.132***
Philippines			
	LEXC	-2.294	-5.225***
	TBGDP	-2.837	-4.659***
Singapore			
	LEXC	-1.977	-5.066***
	TBGDP	-2.941	-5.582***
Thailand			
	LEXC	-3.124	-7.655***
	TBGDP	-2.345	-5.510***

Notes: Asterisks (***) denotes significant at 1%. LEXC = natural logarithm of nominal exchange rate and TBGDP = ratio of net exports to nominal GDP.

Johansen-Juselius Cointegration Test Results

Since the variables are integrated of same order, we next proceed to conduct the cointegration test to determine the presence of a long run equilibrium relationship between exchange rate and trade balance in each of the ASEAN-5 countries. The results of Johansen-Juselius maximum likelihood (ML) cointegration tests are tabulated in Table 3. Empirical results show that both trace and maximum eigenvalue tests statistics are insignificant at five percent level, implying that there is no common trend exists within the two-variable set data for all the country under study.

This outcome supports the finding of Rose (1991) who discovered that the Marshall-Lerner condition did not hold and there is no direct relationship among exchange rates and trade balances in Canada, Germany, Japan, UK, and US. Our results also congruence with the finding of Kua and Wilson (2001), in which they found that changes in exchange rate do not have significant effect on the bilateral trade balance for Singapore and the US. In particular, Liew *et al.* (2006) suggested that trade balance is affected by real money, rather than nominal exchange rate. One of the possible explanations is the movement of relative price that influence the relative real money should be taken into account. The logic is trade balance depends on the

demands for domestic goods relative to foreign goods and these demands depend on the comparison of foreign to domestic price.

Table 3
Johansen-Juselius Cointegration Test Results

Country	Trace Test				Maximum Eigen Test			
	H_0	H_1	λ_{trace}	5% CV	H_0	H_1	λ_{max}	5% CV
Indonesia	$r = 0$	$r \geq 1$	9.895	15.495	$r = 0$	$r = 1$	9.703	14.265
	$r \leq 1$	$r \geq 2$	0.191	3.841	$r \leq 1$	$r = 2$	0.191	3.841
Malaysia	$r = 0$	$r \geq 1$	6.715	15.495	$r = 0$	$r = 1$	6.289	14.265
	$r \leq 1$	$r \geq 2$	0.426	3.841	$r \leq 1$	$r = 2$	0.426	3.841
Philippines	$r = 0$	$r \geq 1$	9.443	15.495	$r = 0$	$r = 1$	9.106	14.265
	$r \leq 1$	$r \geq 2$	0.337	3.841	$r \leq 1$	$r = 2$	0.337	3.841
Singapore	$r = 0$	$r \geq 1$	8.016	15.495	$r = 0$	$r = 1$	6.824	14.265
	$r \leq 1$	$r \geq 2$	1.190	3.841	$r \leq 1$	$r = 2$	1.190	3.841
Thailand	$r = 0$	$r \geq 1$	11.460	15.495	$r = 0$	$r = 1$	11.446	14.265
	$r \leq 1$	$r \geq 2$	0.015	3.841	$r \leq 1$	$r = 2$	0.015	3.841

Notes: r is the number of cointegrating vector. Critical values (CV) are taken from Table 1, Osterwald-Lenum (1992). Lag selection is based on Schwert (1987) formula, where $k = [4(T/100)^{1/4}]$.

Granger Causality Test Results

Since the data are nonstationary and not cointegrated, we use the standard VAR in estimating the causal relationship between the exchange rate and trade balance. Granger causality test is applied to analyze the type and direction of causality between the exchange rate and trade balance. Equation (6) is used to test the hypothesis of trade balance leads to exchange rate, and Equation (7) is used to test the hypothesis of exchange rate leads to trade balance.

Table 4 presents the Granger causality test output. Empirical results indicate that the null hypothesis of trade balance leads to exchange rate cannot be rejected for all of the ASEAN-5 member countries. This means that trade balance does not Granger cause to exchange rate in short run for the ASEAN-5. This result thus generally confirms most of the previous works that find only the exchange rate able to affect the trade balance in a country[1], but not the other way. The economic logic signifies that exchange rate was playing the role as key determinant or independent variable that will affect the trade balance in the respective relationship as stated in the study of Koray and McMillin (1998) and Bahmani-Oskooee (1998). Generally, trade balance was obtained

[1] See for example, Rincon (1998), Ariccia (1998), Baharumshah (2001), Lal and Lowinger (2002), and Onafowora (2003).

through the export and import activities in a countries, it does not affect the exchange rate as exchange rate normally monitored by the ASEAN-5's government to influence the trade balance. Therefore, the causality does not run from trade balance to exchange rate in ASEAN-5 countries.

Table 4
Granger Causality Test Results

Country/Null Hypothesis	***F*-statistics**			
Indonesia	Lag 1	Lag 2	Lag 3	Lag 4
Exchange Rate does not Granger cause Trade Balance	0.007	1.628	1.368	1.418
Trade Balance does not Granger cause Exchange Rate	1.197	0.699	0.456	1.407
Malaysia	Lag 1	Lag 2	Lag 3	Lag 4
Exchange Rate does not Granger cause Trade Balance	6.807**	12.189***	7.917***	6.377***
Trade Balance does not Granger cause Exchange Rate	0.080	0.363	0.240	0.302
Philippines	Lag 1	Lag 2	Lag 3	Lag 4
Exchange Rate does not Granger cause Trade Balance	0.491	3.261*	3.355**	2.960**
Trade Balance does not Granger cause Exchange Rate	0.289	0.090	1.004	0.673
Singapore	Lag 1	Lag 2	Lag 3	Lag 4
Exchange Rate does not Granger cause Trade Balance	0.229	4.534**	3.165**	2.943**
Trade Balance does not Granger cause Exchange Rate	2.091	1.780	1.205	1.549
Thailand	Lag 1	Lag 2	Lag 3	Lag 4
Exchange Rate does not Granger cause Trade Balance	13.972*	13.208*	11.479*	8.686*
Trade Balance does not Granger cause Exchange Rate	0.0932	1.388	0.560	1.187

Note: Asterisks (***), (**) and (*) denote significant at 1, 5 and 10% levels, respectively.

On the other hand, the result showed that exchange rate leads to trade balance hypothesis could not be rejected only for the case of Indonesia. The results are consistent when the lag length increases from lags 1 to 4. It implies that exchange rate does not Granger cause to trade balance when the lagged length is added in Indonesia. This has been confirming the statement of Liew *et al.* (2006) who found that Indonesia does not show the improvement of trade balance in short run when there is devaluation of exchange rate. Thus, this study suggests that exchange rate does not have significant impact on Indonesia's trade balance. One

of the explanations is that, after the financial crisis, Indonesia has accepted a broad-based policy package by having financial support from the IMF, and it has indirectly limits the ability to use exchange rate as a policy tool in affecting the trade flow.

For Malaysia and Thailand, the null hypothesis of exchange rate leads to trade balance is rejected for all lag lengths used at different levels of significance. Meanwhile, we found quite similar results for the cases of the Philippines and Singapore, in which the exchange rate could Granger cause trade balance except for the first lag. This result indicates that the short run movement of exchange rates significantly influenced the exports and imports activities in these countries. Malaysia, the Philippines, Singapore and Thailand have the similarity in emphasizing on the export-oriented policy in boosting the country's income and economy. Therefore, changes in the value of currency could play an importance role to influence the trade balance in short run.

5 Conclusion

The focus of this study is to examine the short- and long-run relationship of exchange rate and trade balance among the ASEAN-5 countries that include Indonesia, Malaysia, Singapore, the Philippines, and Thailand based on the annual observation from 1970 to 2004. The unit root tests results indicate that all data are integrated of order one. However, we fail to detect a long run stable relationship between exchange rate and trade balance for each of the county in the cointegration analysis. As such, a difference VAR model was used to gauge the short run causal relationship, and we noticed that except for Indonesia, the movements of exchange rates do have the ability to influence trade performance in these ASEAN countries. Nevertheless, the trade balance leads exchange rate hypothesis does not holds in our study.

The absence of long run cointegrating relationship among exchange rate and trade balance for ASEAN-5 may due to the movements in the nominal exchange rate which are determined mostly by purchasing power parity differentials rather than by trade flows, and this kind of relationship is strengthen by the managed floating regimes used in most of the of ASEAN-5 countries. Study by Liew *et al.* (2006) pointed out that there were insignificant relationship among exchange rate and trade balance in ASEAN countries. Instead, they found that other factors such as real money supply, real GDP and interest rates have greater impacts on trade balance in the long run, rather than exchange rate.

In spite of that, the alternative explanation was the low pass-through effect, which makes it possible for trade flows to stay relatively

insensitive to the currency changes even if export and import demand is highly elastic over the short- and long-run. Besides that, other possibility was trade balance is essentially driven by external demand rather than by currency or price factors or that exchange rate encouraged losses of competitiveness are compensated by improvements in productivity as producers learn to anticipate long periods of currency strength in ASEAN-5 countries.

On the other hand, we found different short run outcomes of the exchange rate and trade balance relationship in the ASEAN-5 economies. This might relate to the differences in bilateral trade imbalances among the ASEAN-5 countries. When the ASEAN-5 countries built up bilateral relationship with other emerging economies like China and European Union, the different profiles of the bilateral imbalance among them may leave different impacts of the exchange rate and trade balance relationship. In general, our results showed that except for Indonesia, these ASEAN-5 countries could revise their exchange rate regimes to stimulate export activities and hence improve the trade balances in the short run.

In view of the importance role of the exchange rate in affecting the trade flows, the policy makers should adopt appropriate exchange rate regime to prevent exchange rate misalignment. Moreover, the ASEAN-5 countries should consider both the existence and the degree of exchange rate volatility and identify the likely impact of the exchange rate volatility for each trading partner in implementation of trade policies. For instance, with the emergence of China as one of the major trading partners for ASEAN-5, the governments of ASEAN-5 have to peruse different policies in their attempt to create a stable bilateral trade with different trading partners.

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