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BILATERAL TRADE BALANCE OF MALAYSIA TO THE UNITED STATES, JAPAN AND SINGAPORE: AN EMPIRICAL STUDY

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Abstract

This study examines the long-run and short-run impact of real exchange rate on bilateral trade balance of Malaysia to the United States (US), Japan and Singapore using monthly data over the period 1976:1-2004:11. Moreover, this study examines the impact of the implementation of fixed exchange rate in Malaysia in 1994 and the Asian financial crisis (1997-1998) as well as the implementation of fixed exchange rate in Malaysia after the crisis on bilateral trade balance. The generalised impulse response function is estimated to investigate the dynamics of bilateral trade balance to a shock in real exchange rate. This study finds that there is a long-run relationship among bilateral trade balance, real exchange rate, domestic income and foreign income. The generalised impulse response function shows that the J-curve phenomenon is found in the short run, particularly for the whole sample period. In the long run, depreciation or devaluation of exchange rate will improve bilateral trade balance. Thus, Marshall-Lerner condition holds.

Keywords: Bilateral Trade Balance; Exchange Rate; Malaysia; Cointegration; Generalised Impulse Response Function

1. Introduction

Depreciation in exchange rate is expected to lead to increase in trade balance in the long run. However, the response of trade balance to depreciation in exchange rate is expected to follow a J-curve. The J-curve phenomenon is a phenomenon whereby depreciation or devaluation of exchange rate, trade balance deficit of a country may actually worsen before it improves over time. The J-curve phenomenon results from the demand for imports and supply of exports being inelastic in the short run. Thus, depreciation or devaluation of exchange rate, the quantity of imports demanded and the quantity of exports supplied do not change much. As a result, trade balance deficit, as valued in the domestic currency widens (Daniels and Vanhoose, 2005:

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279). Williamson (1983) pointed out that the higher import prices contribute to the higher domestic prices of non-traded goods. The resulting inflation raises the effective real exchange rate, perhaps diminishing the potential for increasing trade balance. A necessary condition for exchange rate changes to improve trade balance is the Marshall-Lerner condition, in which the sum of the elasticity of import demand and the elasticity of export supply must exceed unity. In other words, if depreciation or devaluation of exchange rate would lead to improvement in trade balance, the Marshall-Lerner condition holds.

Nonetheless, the empirical literature of the impact of exchange rate on trade balance is inconclusive including the case of Malaysia. Wilson (1999: 9) examined bilateral trade balance of Malaysia to the United States (US) and Japan, and reported that there is no evidence of a long-run relationship among bilateral trade balance, real exchange rate, domestic income and foreign income. The study also reported no evidence of the J-curve phenomenon. In another paper, Wilson (2001) used the same sample as before. However the study used different estimation methods and reported about the same conclusions, i.e. real exchange rate does not have a significant impact on bilateral trade balance of Malaysia to the US and Japan. Moreover, there is no evidence of the J-curve phenomenon. On the other hand, Baharumshah (2001) employed the Johansen (1988) cointegration method and reported that there is a long-run relationship between bilateral trade balance and exchange rate of Malaysia to the US and Japan. Nonetheless, no evidence of the J-curve phenomenon is reported. Conversely, Onafowora (2003) investigated bilateral trade balance and real exchange rate in East Asia, including bilateral trade balance of Malaysia to the US and Japan. The study claimed that there is a long-run relationship among bilateral trade balance, real exchange rate, domestic income and foreign income. Moreover, the J-curve phenomenon is found to happen in the short run. There are many plausible reasons for the inconclusive of results. The different sample periods are used. Moreover, the different estimation methods and measures of variables are used. Thus, more empirical findings are needed to clarify the findings.

The main aim of this study is to examine the long-run and short-run impact of real exchange rate on bilateral trade balance of Malaysia to the US, Japan and Singapore. This study examines bilateral trade balance of Malaysia to those countries mainly they are important trading partners of Malaysia. Further, previous studies on Malaysia focus only the sub-set of those countries. In addition, they use different sample periods. Bilateral trade balance is used to avoid asymmetric response of trade flows to changes of exchange rate across countries (Wilson, 1999: 2). Moreover, a country could run trade deficit with some trading partners and surplus with others. This may because of the different in composition of bilateral trade. A country may export primary products or raw materials to one partner and manufactures to another. Moreover, this study examines the impact of the implementation of fixed exchange rate in Malaysia in 1994 and the Asian financial crisis (1997-1998) as well as the implementation of fixed exchange rate in Malaysia after the crisis on bilateral trade balance. This study uses monthly data over the period 1976:1-2004:11 and a sub-period of 1976:1-1997:6. Unlike most of previous studies used a shorter period and a lower frequency of data (quarterly data), this study uses a longer period and a higher frequency of data.

This study uses the empirical model of Rose and Yellen (1989), which many empirical studies in the literature use the model (Wilson, 1999, 2001; Baharumshah, 2001; Onafowora, 2003). The model suggests that bilateral trade balance is influenced by real exchange rate, domestic income and foreign income. The Johansen (1988) cointegration method is used to examine the long-run relationship of variables in the model. The dynamics of bilateral trade balance to a shock in real exchange rate are examined using the generalised impulse response function (Pesaran and Shin, 1998). Understanding the long-run and short-run impact of real exchange rate on bilateral trade balance are important for assisting government to conduct an effective policy on trading with other countries. The time pattern of the responsive of bilateral trade balance to real exchange rate changes enables firms to make decision in their business regarding trade between countries.

The structure of this article is as follows. Section 2 presents literature review of trade balance and exchange rate. Section 3 gives some facts of bilateral trade balance and exchange rate of Malaysia to the US, Japan and Singapore. This is followed by section 4, which explains the methodology and data in this study. The empirical results are discussed in section 5. Finally, section 6 provides concluding remarks.

2. Literature Review

Bahmani-Oskooee and Ratha (2004) provided literature review on the J-curve phenomenon. They classified the literature review according to those using aggregate data and those using bilateral data. For each category, the different models, and the different definitions and measurements of the conceptual variables are used. Theoretically, it has been argued that although devaluation improves the trade balance in the long run, the short-run response could be different. Further, in the short run trade balance deteriorates first and improvement comes after passage of some time. Generally, the short-run response of the trade balance to currency depreciation does not follow any specific pattern. The results are country specific.

Instead of a J-curve, some researchers have reported an S-curve and an M-curve for the relationship between trade balance and exchange rate. The S-curve occurred when trade balance worsen as a result of the devaluation of exchange rate and then improved and worsen again. The M-curve occurred when trade balance improved as a result of the devaluation of exchange rate and then worsen and improved. Finally, trade balance returned to its initial level. Caves, Frankel and Jones (1996) proposed a number of reasons for the slow adjustment of quantities to changes in relative prices in the short run. First, there is a lag for importers to recognise that the relative prices have changed due to imperfect information. Second, there is a lag for firms and consumers to place a new import order. Third, there is a lag for production and transaction.

Wilson (1999: 14) examined bilateral trade balance of Malaysia to the US and Japan and reported that real exchange rate does not have a significant impact on real trade balance and found no evidence of the J-curve phenomenon. Moreover, the study found no evidence that Malaysian producers price export in foreign rather than domestic currency. This will generate a rise in the domestic currency value of exports as the currency depreciates, which masks the initial rise in import values associated

with a J-curve. The study used quarterly data over the period 1970-1996. The study employed the empirical model of Rose and Yellen (1989) derived from the two-country imperfect substitutes model. In another paper, Wilson (2001: 408-409) examined the relationship between real bilateral trade balance in merchandise goods and real exchange rate of Singapore, Korea and Malaysia, respectively to the US and Japan. The study used the same empirical model and the same sample period as before. However, the study used different estimation methods. The study reported that real exchange rate does not have a significant impact on real bilateral trade balance, except bilateral trade balance of Korea to the US. Moreover, there is no evidence of the J-curve phenomenon.

Baharumshah (2001: 309) examined the impact of exchange rate on bilateral trade balance of Malaysia to the US and Japan and also bilateral trade balance of Thailand to the US and Japan using quarterly data over the period 1980:I-1996-IV. The study employed the Johansen (1988) cointegration method to examine the long-run relationship among bilateral trade balance, real effective exchange rate, domestic income and foreign income. The study reported that depreciation causes trade balance to improve. This happens because devaluation of Malaysian ringgit (baht) implies an increase in competitiveness of Malaysian (Thailand) goods with foreign goods. Nonetheless, the study found no evidence of the short-run relationship between bilateral trade balance and real exchange rate. In other words, the study found that the J-curve phenomenon does not fit the data well, which is said to be consistent with the findings in the literature. Nonetheless, Bahmani-Oskooee and Ratha (2004: 1394) commented the study for using real effective exchange rate rather than real bilateral exchange rate in examining bilateral trade balance.

Onafowora (2003) examined the short-run and long-run impact of real exchange rate on real trade balance for three ASEAN countries, namely Thailand, Malaysia, and Indonesia in their bilateral trade to both the US and Japan. The study used quarterly data over the period 1980:1-2001:4. The Johansen (1988) cointegration method was used to examine the long-run relationship of variables in the model. The results showed that there is a long-run relationship among real trade balance, real exchange rate, real domestic income and real foreign income. Moreover, the study estimated the generalised impulse response function to investigate the impact of real exchange rate on real trade balance over time. For Indonesia and Malaysia in their bilateral trade to both the US and Japan, and for Thailand in its bilateral trade to the US, the results showed that there is the J-curve phenomenon. Depreciation will initially lead to worsening in trade balance and then this is followed by an improvement in trade balance in the long run. Nonetheless, Thailand has the opposite movement in its bilateral trade to Japan, i.e. real exchange rate devaluation initially improved then worsened and then improved trade balance. This pattern is consistent with the S-curve phenomenon (Backus, Kehoe and Kydland, 1994). Overall, the results of the generalised impulse response function showed that the Marshall-Lerner condition holds in the long run with varying degree of the J-curve phenomenon in the short run.

Yusoff (2005) examined bilateral trade balance of Malaysia to Singapore. The results of the cointegration method showed that there is one cointegrating vector among bilateral trade balance, real exchange rate, real domestic income and real foreign income. Further, the results of the error correction model seem to suggest that exist the short-run relationship among these variables. In particular, the trade balance is

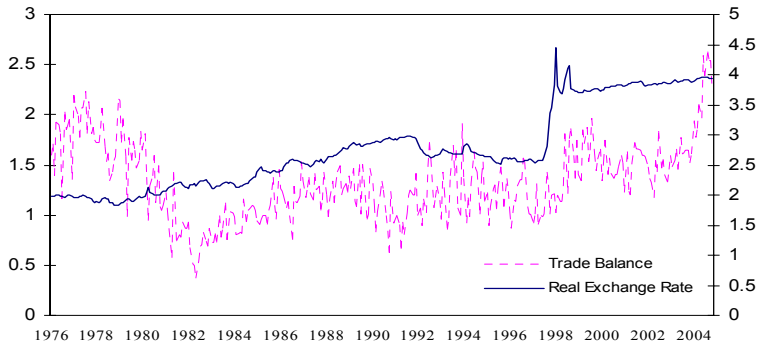
found to be elastic to the changes in the real exchange rate in the long run suggesting that exchange rate depreciation might be able to improve bilateral trade balance of Malaysia to Singapore.

3. Bilateral Trade Balance and Exchange Rate

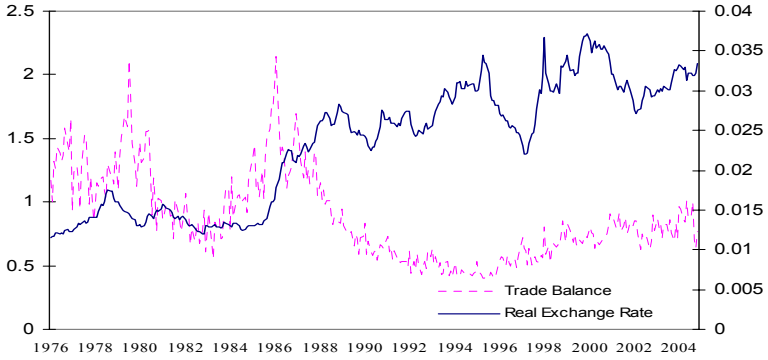
Figure 1 plots bilateral trade balance and real exchange rate of Malaysia to the US, Japan and Singapore, respectively. Generally, all series fluctuated over time. Moreover, all series exhibit trending behaviour indicating that they are to be an I(1) series. Bilateral trade balance and real exchange rate tend to move in an opposite direction. In the figure, rise in real exchange rate is interpreted as real depreciation and vice versa. For the case of Malaysia and the US, real exchange rate of Malaysian ringgit against the US dollar steadily depreciated and bilateral trade balance was positive and rising over time. Generally for the cases of Malaysia and Japan, and Malaysia and Singapore, real exchange rate of Malaysian ringgit against Japanese yen and Singapore dollar, respectively depreciated while bilateral trade balance tended to decrease over time, except the case of Malaysia and Japan before 1988, the relationship between real exchange rate of Malaysian ringgit against Japanese yen and bilateral trade balance was not straight forward. Figure 2 illustrates the scatter plots of bilateral trade balance and real exchange rate of Malaysia to the US, Japan and Singapore. Generally, there is no clear pattern between bilateral trade balance and real exchange rate in each case.

Figure 1
Bilateral Trade Balance and Real Exchange Rate of Malaysia to the US, Japan and Singapore, 1976-2004

Bilateral Trade Balance and Real Exchange Rate of Malaysia to the US



Bilateral Trade Balance and Real Exchange Rate of Malaysia to Japan



Bilateral Trade Balance and Real Exchange Rate of Malaysia to Singapore

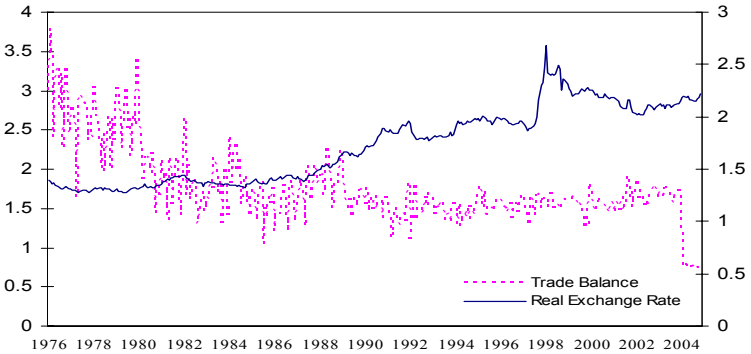
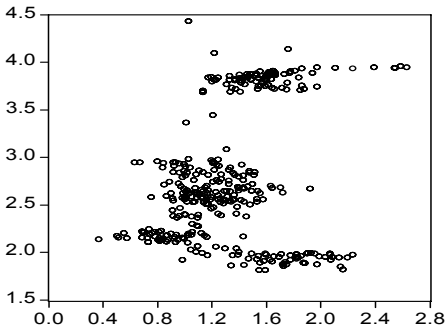
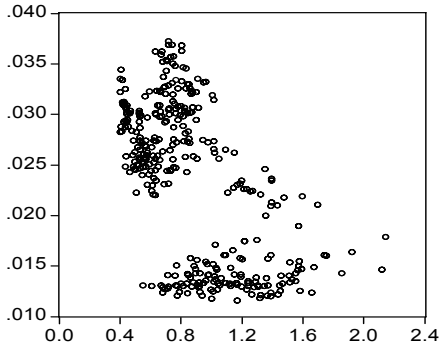


Figure 2
The Scatter Plots of Bilateral Trade Balance and Real Exchange Rate of Malaysia to the US, Japan and Singapore, 1976-2004

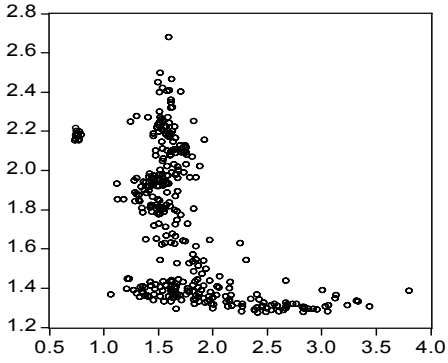
Bilateral Trade Balance and Real Exchange Rate of Malaysia to the US



Bilateral Trade Balance and Real Exchange Rate of Malaysia to Japan



Bilateral Trade Balance and Real Exchange Rate of Malaysia to Singapore



Notes: The vertical axis indicates real exchange rate and the horizontal axis indicates bilateral trade balance.

4. Methodology and Data

This study uses the bilateral trade balance model of Rose and Yellen (1989). The model has been used widely in the literature (Wilson, 1999, 2001; Baharumshah, 2001; Onafowora, 2003).[1] The model is specified as:[2]

$$\ln\left(X_t / M_t\right) = \beta_{10} + \beta_{11} \ln ER_t + \beta_{12} \ln Y_t + \beta_{13} Y_t^* + u_{1t} \quad (1)$$

where ln is logarithm; X_t is exports; M_t is imports; ER_t is real exchange rate; Y_t is domestic income; Y_t^* is foreign income and u_{1t} is a disturbance term. Bilateral trade balance is expressed in the ratio (X_t / M_t) and therefore, it can be expressed in logarithm, regardless of whether exports are greater or less than imports. Moreover, it is not sensitive to the unit measurement and also it could be interpreted as nominal or real trade balance (Onafowora, 2003). In estimating for the whole sample period (1976:1-2004:11), a dummy variable (D_t), i.e. one for the 1994:1-1994:12 and 1997:07-2004:11 periods, and zero otherwise is used to capture the implementation of fixed exchange rate in Malaysia in 1994 and the Asian financial crisis as well as the implementation of fixed exchange rate in Malaysia after the crisis.[3]

The impact of real exchange rate on bilateral trade balance is ambiguous. The coefficient of real exchange rate (β_{11}) could be positive or negative. If there is depreciation or devaluation in real exchange rate, i.e. real exchange rate increase, then the increased competitiveness in prices for domestic country would lead to exporting more than importing, which is called the volume effect. However, the higher real exchange rate will increase the value of each unit of import, which would tend to diminish bilateral trade balance. This is called the import effect. Krugman and Obstfeld (2001) argued that in the short run, import effect prevail, whereas the volume effect dominate in the long run. For $\beta_{11} > 0$, the Marshall-Lerner condition is satisfied. The impact of domestic income and foreign income on bilateral trade balance respectively is also ambiguous. The volume of exports (imports) to a foreign country (domestic country) will increase as income and purchasing power of the trading partner (domestic country) rises and vice versa. Therefore, it is expected that $\beta_{12} < 0$ and $\beta_{13} > 0$. However, if the rise in income is a result of an increase in the production of import-substitute goods, imports may decline as income increases in which case $\beta_{12} > 0$ and $\beta_{13} < 0$ (Onafowora, 2003).

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[1] Krugman and Baldwin (1987) presented a specific case of trade balance model, i.e. a trade deficit model. On the other hand, the model proposed by Rose and Yellen (1989) is a bilateral trade balance model. See the article for the further discussion of the model.

[2] See Wilson (1999) for the derivation and discussion of the model.

[3] The reviewer of the bulletin suggests a dummy variable to capture the implementation of fixed exchange rate in Malaysia in 1994 and the implementation of fixed exchange rate in Malaysia after the Asian financial crisis. However for Malaysia and Japan bilateral trade, the use of the dummy variable produces over estimation for the coefficient of foreign income. One plausible explanation is that the implementation of fixed exchange rate in Malaysia in 1994 has relatively least impact on Malaysian ringgit against Japanese yen. Thus, for Malaysia and Japan bilateral trade balance, the dummy variable, which is included captures only the implementation of fixed exchange rate in Malaysia after the Asian financial crisis is used.

The Dickey and Fuller (1979) (DF) unit root test statistic is used to examine the stationarity of the data. The Johansen (1988) cointegration method is used to test the long-run relationship among variables in the model. The Johansen (1988) cointegration method proposes two likelihood ratio tests to test the number of cointegrating vectors in the system, namely the maximum eigenvalue (λ_{Max}) and trace (λ_{Trace}) statistics, which are respectively computed as:

$$\lambda_{Max} = -T \ln(1 - \lambda_{r+1}) \tag{2}$$

$$\lambda_{Trace} = -T \sum_{i=r+1}^{p} \ln(1 + \lambda_i) \tag{3}$$

where T is the sample size; ln is the logarithm and λ_i is the eigenvalue. The λ_{Max} test statistic tests the null hypothesis (H_0) of r cointegrating vectors against the alternative hypothesis (H_a) that there are $\{r + 1\}$ cointegrating vectors in the system. The λ_{Trace} test statistic tests the H_0 that has at most r cointegrating vectors in the system, i.e. the number of cointegrating vectors is less than or equal to r. The critical values for the λ_{Max} and λ_{Trace} test statistics are tabulated by Osterwald-Lenum (1992). The distribution of the statistics depends upon the number of non-stationary components under the null hypothesis and whether or not a constant is included in the cointegrating vector.

The generalised impulse response function (Pesaran and Shin, 1998) is used to examine the dynamics of bilateral trade balance to a shock in real exchange rate. For variables in a model that are cointegrated, the generalised impulse response is estimated based on the vector error correction model (VECM) as:[4]

$$\Delta X_t = \alpha\beta' X_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta X_{t-i} + \varepsilon_t \tag{4}$$

where Δ is the first difference operator; X_t is a ($m \times 1$) vector of jointly determined I(1) variables; α is a ($m \times r$) matrix of error correction coefficients; β is a ($m \times r$) matrix of co-integrating vectors; Γ_i is a ($m \times m$) matrix of coefficient and ε_t is a ($m \times 1$) vector of n.i.d. disturbances with zero mean and non-diagonal covariance matrix.

In this study, bilateral trade balance $\ln(TB_t)$ is defined as $\ln(X_t / M_t)$, where X_t is the bilateral exports (RM millions) and M_t is the bilateral imports (RM millions). Real exchange rate (ER_t) is defined as $\ln [BER_t(CPI_{it} / CPI_{jt})]$, where BER_t is the bilateral exchange rate of country i against country j; CPI_{it} is the consumer price index of country i and CPI_{jt} is the consumer price index of country j. Domestic income and foreign income are respectively expressed by industrial production index (2000 = 100), except Singapore, which is expressed by manufacture production index (2000 = 100).[5] The values of exports and imports were obtained from Direction of

[4]For series in a model that are not cointegrated, the vector autoregressive (VAR) model shall be used.
[5]Production price index is usually used as a proxy for measure of domestic or foreign income in the literature of bilateral trade balance. For example, see Wilson (1999).

Trade Statistics, the International Monetary Fund (IMF). The rest of the data were obtained from International Financial Statistics, the IMF. The data are monthly. The sample period is 1976:1-2004:11. The length of the sample period is dictated by data availability. A sub-sample period of 1976:1-1997:6 is used to avoid the contagion effect of Asian financial crisis, 1997-1998, on bilateral trade balance.

5. Empirical Results and Discussion

This study begins to examine the stationarity of the data, which is important to distinguish between stationary and non-stationary series. Failure of doing so can lead to a problem of spurious regression (Granger and Newbold, 1974). The results of the DF unit root test statistic are reported in Table 1. The lag length used to compute the DF unit root test statistic is based on Akaike (1973) information criterion (AIC), which initially is set at twenty four given the monthly data. For the sub-sample period (1976:1-1997:6), the results of the DF unit root test statistic show that generally the null hypothesis of a unit root for level data is not rejected. However, they reject the non-stationary hypothesis for differenced data. Thus, all series are said to be integrated of order one, {I(1)}, except Singaporean manufacture production, which the results of the DF unit root test statistic show that it is a stationary series. Nonetheless, it could be considered as a border case and thus it is treated as an I(1) series. On the whole, the same conclusion is obtained for the whole sample period (1976:1-2004:11).[6]

According to Engle and Granger (1987), series that are integrated of the same order may cointegrate together. Thus, the Johansen (1988) cointegration method is used to examine the long-run relationship among bilateral trade balance, real exchange rate, domestic income and foreign income. The likelihood ratio test statistics can be sensitive to the choice of the lag length used in the estimation of the test statistics. Thus, the choice of the lag length in this study is guided by Schwarz Bayesian criterion. The results of the Johansen (1988) cointegration method are reported in Table 2. The λ_{Max} and λ_{Trace} test statistics are computed with restricted intercepts and no trends.

For the sub-sample period, the λ_{Max} and λ_{Trace} test statistics for Malaysia and the US bilateral trade balance respectively show that there is a long-run relationship among the variables in the model. For Malaysia and Japan bilateral trade balance, the λ_{Max} and λ_{Trace} test statistics respectively show that there is no long-run relationship among the variables in the model. Nonetheless, the null hypotheses of no long-run relationship are to be rejected close to 90 percent critical value. Therefore, it is assumed to have one cointegrating vector in the model. For Malaysia and Singapore bilateral trade balance, the λ_{Max} test statistic shows that there is no long-run

[6]The Phillips and Perron (1988) unit root test statistic is also employed to examine the sationarity of the data over the sub-sample period and the whole sample period, which the results are not reported. Generally, the same conclusion is obtained as the DF unit root test statistic, except bilateral trade balance of Malaysia to the US, Japan and Singapore, respectively is found to be stationary at the level. Thus, it is contradicted to the conclusion of the DF unit root test statistic. Nonetheless, this study takes the conclusion of the DF unit root test statistic and in line with the evidence shown in Figure 1. Baharumshah (2001) and Onafowora (2003) also reported that bilateral trade balance of Malaysia to the US and Japan, respectively is a non-stationary series.

relationship among the variables in the model. However, the λ_{Trace} test statistic shows that there is a long-run relationship. Thus, it is concluded that there is one cointegrating vector in the model. For the whole sample period, the λ_{Max} and λ_{Trace} test statistics for Malaysia and the US, and Malaysia and Singapore bilateral trade balance show that there is a long-run relationship among the variables in the model, respectively. For Malaysia and Japan bilateral trade balance, the λ_{Max} and λ_{Trace} test statistics show about the same conclusion as in the sub-sample period. Thus, it is treated to have one cointegrating vector in the model.

Table 1
The Results of the Dickey and Fuller (1979) Unit Root Test Statistic (1976:1-1997:6)

	t_β		t_β
$\ln TB_{us,t}$	-1.8018(10)	$\Delta \ln TB_{us,t}$	-8.1022***(9)
$\ln TB_{j,t}$	-2.0482(12)	$\Delta \ln TB_{j,t}$	-4.4790*** (11)
$\ln TB_{s,t}$	-2.9646(5)	$\Delta \ln TB_{s,t}$	-5.3991*** (12)
$\ln ER_{us,t}$	-1.1828(1)	$\Delta \ln ER_{us,t}$	-12.0277***(0)
$\ln ER_{j,t}$	-1.9079(5)	$\Delta \ln ER_{j,t}$	-6.8227*** (3)
$\ln ER_{s,t}$	-2.2161(1)	$\Delta \ln ER_{s,t}$	-4.8079***(8)
$\ln Y_{us,t}$	-2.3228(8)	$\Delta \ln Y_{us,t}$	-7.6379***(1)
$\ln Y_{j,t}$	-1.8083(5)	$\Delta \ln Y_{j,t}$	-4.3036***(12)
$\ln Y_{s,t}$	-3.9472**(12)	$\Delta \ln Y_{s,t}$	-3.5874**(12)
$\ln Y_{m,t}$	-2.5449(12)	$\Delta \ln Y_{m,t}$	-3.8580**(12)

Notes: t_β is the Dickey-Fuller (DF) or Augmented Dickey-Fuller (ADF) *t*-statistic. Values in parentheses are the lag length used in the estimation of the unit root test statistics. Critical values for t_β with a drift and a time trend at 1 percent and 5 percent for sample size 258 are -3.99 and -3.43, respectively (MacKinnon, 1996). *** Denotes significance at 1 percent level. ** Denotes significance at 5 percent level.

Generally, the results of the Johansen (1988) cointegration method show that there is one cointegrating vector in the model and therefore, this study proceeds to estimate the cointegrating vector by normalising bilateral trade balance. The results of the estimated cointegrating vector normalised by bilateral trade balance are reported in Table 3. On the whole for the sub-sample period, all explanatory variables are found to have the expected signs. An increase in real exchange rate implies depreciation, which leads to an improvement in bilateral trade balance. An increase in domestic income leads to a decrease in bilateral trade balance. An increase in foreign income leads to an increase in bilateral trade balance. Thus, real exchange rate, domestic income and foreign income are generally said to have a long-run impact on bilateral trade balance. The about the same findings are obtained for the whole sample period as the findings of the sub-sample period, except Malaysia and the US bilateral trade balance, and Malaysia and Singapore bilateral trade balance. For the former, the dummy variable is found to have a negative impact on bilateral trade balance. For the

latter, an increase in domestic income leads to an increase in bilateral trade balance. An increase in foreign income leads to a decrease in bilateral trade balance.

Table 2
The Results of the Johansen (1988) Likelihood Ratio Test Statistics

λ_{Max} Test Statistic (1976:1-1997:6)				
H_0:	$r=0$	$r \leq 1$	$r \leq 2$	$r \leq 3$
H_a:	$r=1$	$r=2$	$r=3$	$r=4$
US	29.04**	16.71	2.15	0.22
Japan	22.70	9.97	4.73	1.56
Singapore	24.60	17.15	8.05	0.01
c.v. (95%)	27.07	20.97	14.07	3.76
c.v. (90%)	24.73	18.63	12.07	2.69
λ_{Trace} Test Statistic (1976:1-1997:6)				
H_0:	$r=0$	$r \leq 1$	$r \leq 2$	$r \leq 3$
H_a:	$r \geq 1$	$r \geq 2$	$r \geq 3$	$r \geq 4$
US	48.13**	19.08	2.37	0.22
Japan	38.96	16.27	6.28	1.56
Singapore	49.81**	25.21	8.07	0.01
c.v. (95%)	47.21	29.68	15.41	3.76
c.v. (90%)	43.95	26.79	13.33	2.69

λ_{Max} Test Statistic (1976:1-2004:11)					
H_0:	$r=0$	$r \leq 1$	$r \leq 2$	$r \leq 3$	r<= 4
H_a:	$r=1$	$r=2$	$r=3$	$r=4$	r=5
US	36.28**	23.23	12.42	4.78	0.24
Japan	29.61	15.91	13.12	5.40	0.87
Singapore	36.03**	17.69	12.67	8.03	0.36
c.v. (95%)	33.46	27.07	20.97	14.07	3.76
c.v. (90%)	30.90	24.73	18.60	12.07	2.69
λ_{Trace} Test Statistic (1976:1-2004:11)					
H_0:	$r=0$	$r \leq 1$	$r \leq 2$	$r \leq 3$	r<= 4
H_a:	$r \geq 1$	$r \geq 2$	$r \geq 3$	$r \geq 4$	r≥5
US	76.94**	40.66	17.43	5.01	0.24
Japan	64.91*	35.30	19.38	6.27	0.87
Singapore	74.79**	38.75	21.06	8.39	0.36
c.v. (95%)	68.52	47.21	29.68	15.41	3.76
c.v. (90%)	64.84	43.95	26.79	13.33	2.69

Notes: For the sub-sample period, the VAR=1 is used for the US and the VAR=2 is used for Japan and Singapore in the estimation of the likelihood test statistics. For the whole sample period, the VAR=1 is used for the US, Japan and Singapore in the estimation of the likelihood test statistics. c.v. Denotes critical value. ** Denotes significance at 95 percent critical value. * Denotes significance at 90 percent critical value.

Table 3
The Results of the Normalised Cointegrating Vector

1976:1-1997:6	
US	$\ln(X_t / M_t) = 0.7097 \ln ER_t - 0.9846 \ln Y_t + 2.9264 \ln Y_t^* - 9.1655$
Japan	$\ln(X_t / M_t) = 0.2183 \ln ER_t - 1.4643 \ln Y_t + 2.9671 \ln Y_t^* - 7.2675$
Singapore	$\ln(X_t / M_t) = 2.9826 \ln ER_t - 0.1518 \ln Y_t + 1.1639 \ln Y_t^* + 2.6285$

1976:1-2004:11	
US	$\ln(X_t / M_t) = 0.3364 \ln ER_t - 0.7386 \ln Y_t + 2.5772 \ln Y_t^* - 0.1222 D_t - 8.2438$
Japan	$\ln(X_t / M_t) = 0.1356 \ln ER_t - 1.9405 \ln Y_t + 4.2884 \ln Y_t^* + 1.5537 D_t - 11.82843$
Singapore	$\ln(X_t / M_t) = 1.2895 \ln ER_t + 0.3338 \ln Y_t - 1.2310 \ln Y_t^* + 0.1904 D_t + 1.8696$

Notes: For Malaysia and the US bilateral trade balance and Malaysia and Singapore bilateral trade balance, the dummy variable is used to capture the implementation of fixed exchange rate in Malaysia in 1994 and the implementation of fixed exchange rate in Malaysia after the Asian financial crisis. For Malaysia and Japan bilateral trade balance, the dummy variable is used to capture the implementation of fixed exchange rate in Malaysia after the Asian financial crisis.

The generalised impulse response function (Pesaran and Shin, 1998) is used to examine the dynamics of bilateral trade balance to a shock in exchange rate, which is invariant to the ordering of the variables in the vector autoregressive (VAR) model, unlike the orthogonalised impulse response function (Sims, 1980) and thus, it is unique.[7] The results of the generalised impulse response function are shown in Figure 3. More specifically, the figure shows the simulated impact of a shock of typical size (one standard error) to real exchange rate on bilateral trade balance in twenty four months following this hypothetical shock. For Malaysia and the US bilateral trade balance, one standard deviation shock of real exchange rate to bilateral trade balance, initially bilateral trade balance deteriorate, but it is followed by an improvement in bilateral trade balance. The about the same phenomenon is found for Malaysia and Japan bilateral trade balance, except after bilateral trade balance has improved, it stays at the same level. However, for Malaysia and Singapore bilateral trade balance, one standard deviation shock of real exchange rate to bilateral trade balance will lead to an improvement in bilateral trade balance over time. Thus, bilateral trade balance is adjusted very fast to a change in real exchange rate. Generally, there is no clear evidence of the J-curve phenomenon.

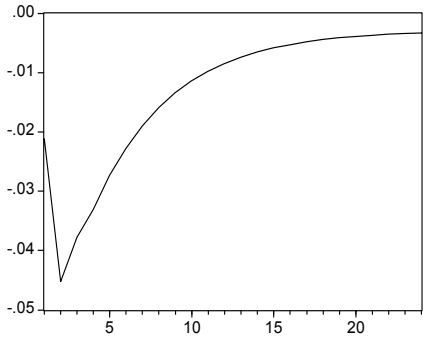
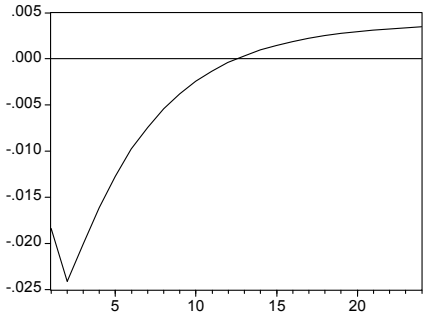
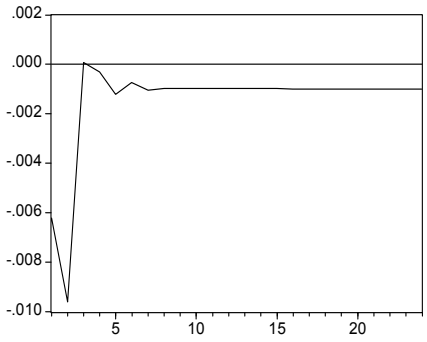
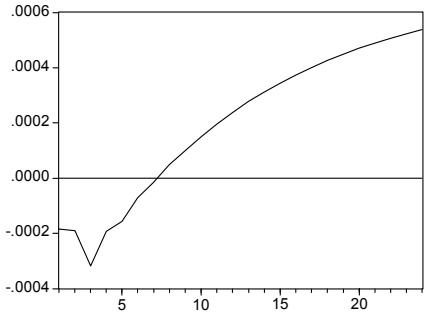
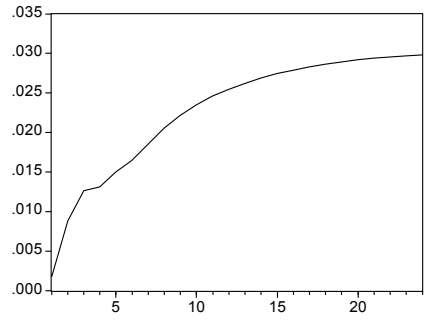
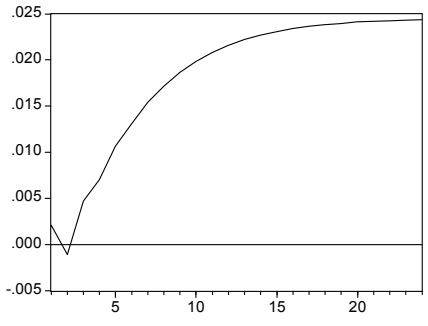
[7]In the analyse of the generalised impulse response function, a shock of typical size to real exchange rate on trade balance, which will lead to positive trade balance can be viewed interpreted that the Marshall-Lerner condition holds.

For the whole sample period, there is the J-curve phenomenon. For one standard deviation shock of real exchange rate to bilateral trade balance, there will be an initially worsening in bilateral trade balance that varies from about one month period (Malaysia and Singapore bilateral trade balance) to about seven month period (Malaysia and Japan bilateral trade balance) and about 12 month period (Malaysia and the US bilateral trade balance), and then it is followed by an improvement in bilateral trade balance. In the long run, depreciation or devaluation of exchange rate will improve trade balance, respectively. On the whole, the results of the generalised impulse response function suggest that depreciation or devaluation of exchange rate will improve trade balance in the long run. Thus, the Marshall-Lerner condition holds. However, the J-curve phenomenon is mixed. It is clearly observed only for the whole sample period and not for the sub-sample period.

Generally, the results of the Johansen (1988) cointegration method show that there is a long-run relationship among bilateral trade balance, real exchange rate, domestic income and foreign income in the estimated models. This finding is consistent with the findings of Baharumshah (2001), Onafowora (2003) and Yusoff (2005), amongst others. Conversely, the finding is contradicted to the findings of Wilson (1991, 2001) that there is no long-run relationship between bilateral trade balance and its determinants. Furthermore, this study finds some evidence of the J-curve phenomenon. Onafowora (2003) also reported that there is the J-curve phenomenon for bilateral trade balance of Malaysia to the US and Japan. However, the finding is contradicted to the findings of Baharumshah (2001) and Wilson (1991, 2001). They reported no evidence of the J-curve phenomenon for bilateral trade balance of Malaysia to the US and Japan. This could be the results of different sample periods and different frequencies of data are used in their studies. Moreover, the previous studies do not consider the impact of the implementation of fixed exchange rate in Malaysia in 1994 and the Asian financial crisis as well as the implementation of fixed exchange rate in Malaysia after the crisis on balance trade balance.

The results show that there is one cointegrating vector in all the estimated models. The positive sign of real exchange rate suggests that devaluation leads to an improvement in bilateral trade balance in the long run. Moreover, the results of the generalised impulse function show the J-curve phenomenon in the short run, particularly for the whole sample period and depreciation or devaluation of exchange rate will improve trade balance in the long run implies that exchange rate is an important trade policy variable for Malaysia in its international trade. This is supported by the trade balance of Malaysia before and after the Asian financial crisis. This could be one plausible reason to explain the improvement of trade balance in Malaysia after it has devaluated its exchange rate. The domestic income and foreign income are also important in determining bilateral trade balance of Malaysia with its major trading partners. More specifically, an increase in domestic income will decrease domestic country exports and thus, it will decrease bilateral trade balance. On the other hand, an increase in foreign income will increase domestic country exports and thus, it will improve trade balance. The level of economic activity is an important factor in influencing bilateral trade balance. The implementation of the of fixed exchange rate in Malaysia in 1994 and the Asian financial crisis as well as the implementation of fixed exchange rate in Malaysia after the crisis is generally found to have a positive impact on balance trade balance.

Figure 3
Plots of the Generalised Impulse Response Function - Response of Bilateral Trade Balance to Generalised One Standard Deviation Real Exchange Rate Innovation

1976:1-1997:6	**1976:1-2004:11**
Malaysia – the US	Malaysia – the US
	
Malaysia – Japan	Malaysia – Japan
	
Malaysia – Singapore	Malaysia – Singapore
	

6. Concluding Remarks

This study has investigated the long-run and short-run impact of real exchange rate on bilateral trade balance of Malaysia to the US, Japan and Singapore, respectively using monthly data. This study found that there is a long-run relationship among bilateral trade balance, real exchange rate, domestic income and foreign income. Moreover, an increase in real exchange rate or depreciation would lead to an improvement in bilateral trade balance. An increase in domestic income would lead to a decrease in bilateral trade balance. An increase in foreign income would lead to an increase in bilateral trade balance. Finally, the implementation of fixed exchange rate in Malaysia is generally found to have a positive impact on bilateral trade balance in Malaysia. The generalised impulse response function shows the J-curve phenomenon in the short run, particularly for the whole sample period whilst in the long run, depreciation or devaluation of exchange rate will improve bilateral trade balance. This implies that the Marshall-Lerner condition holds in the long run. Depreciation in real exchange rate would lead to an improvement in bilateral trade balance, which will occur within 1-12 months period after real devaluation. This occurs because devaluation of Malaysian ringgit implies increase competitiveness of Malaysian goods with foreign goods. Nonetheless, more research is needed before the generalisation is made that there is the J-curve phenomenon in Malaysia.

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