TRADE BALANCE AND REAL EXCHANGE RATE IN MALAYSIA

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ABSTRACT

This study investigates the long-run relationship between Malaysian trade balance and the real exchange rate using the cointegration technique.The results suggest that real ringgit exchange rate depreciation improves the Malaysian balance of trade in the long run. An error-correction model is then estimated to study the short-run dynamics and found that the effects of ringgit real exchange rate depreciation last for about 2 years and exhibit the J-curve phenomenon. Approximately 55 percent of the adjustment to long run equilibrium takes place in the first quarter.

Keywords: Trade balance, ringgit, real exchange rate, Malaysia.

INTRODUCTION

Malaysia's decision to follow the path of an export-oriented economic development strategy has been very fruitful to generate high economic growth. The Malaysia economy grew at an average rate of about 9 percent, in real terms, a decade prior to the financial crisis in 1997. At the same time Malaysia also followed the import substitution development strategy in heavy industries such as cars and steel industries. During the period the economy was approaching full employment which had caused severe resource bottleneck. In order to push the economy's production frontier, she had to increase the supplies of resources, including labor and capital, and also employ the more advanced modern technology. This was done by importing more capital goods, technology and raw-materials from abroad, including labor from neighboring countries, to generate further growth through increasing the production of exportables and importables. In her quest to push for further growth, Malaysia experienced worsening trade balance beginning in late 1980s and the first half of 1990s as the import growth had outpaced the export growth.

The trade balance of a country is determined by a number of factors such as exchange rate changes, monetary and fiscal policies, domestic and foreign income growth, supply shocks, and competitiveness. This study focuses mainly on the exchange rate changes, domestic and foreign incomes. The real exchange rate is an important determinant of exports and imports of a country since it represents the rate at which the domestic goods and services that can be exchanged with the output produced by foreign countries. A depreciation of ringgit real exchange rate, for example, will spur the demand for Malaysian exports as foreigners find that they are able to purchase more of Malaysian goods with the same amount of their exports since their imports have become relatively cheaper. On the other hand, Malaysians will find that their imports have become more expensive and therefore they may reduce the purchase of foreign goods and increase the consumption of domestic substitute goods. This suggests that real exchange rate depreciation affects trade balance which in turn has a direct positive impact on the exportable and importable industries in the domestic economy creating more

jobs and income for the citizens. On the other hand, real exchange rate appreciation will lead to negative impact on the trade balance and the domestic economy as the exportable and importable sectors contract as demand slackens giving rise to more unemployment problem. Thus real exchange rate changes are major concerns to both developed and developing countries.

The main objective of this paper is to examine the effects of real exchange rate changes on Malaysian trade balance. Specifically the objectives are: to determine whether there is a long-run relationship among the variables: trade balance, real exchange rate, domestic income and real foreign income. Then the dynamic relationship between trade balance and real exchange rate is examined to see whether there exists the J-curve effect. And finally the direction of the causal relationship among the trade balance, exchange rate, and incomes are also examined. Thus, the paper is organized as follows. Section II discusses the review of literature, followed by the formulation of the model to be estimated, methodology, empirical results and the conclusion.

REVIEW OF LITERATURE

Numerous studies have been carried out to measure the effects of exchange rate changes on trade balance. The results have been mixed; some studies have found that exchange rate is an important determinant of trade balance while others found otherwise. Specifically, Gafar (1981) conducts a study to find the effects of devaluation on the balance of payments of Jamaica and he finds that the Marshall-Lerner condition for exchange rate stability is satisfied, implying that devaluation is an effective adjustment of trade balance. On the other hand, Ogbonna (1982) analyzes the 1973 devaluation of the Naira (Nigerian currency) in Nigeria's balance of payments and he concludes that devaluation fails to improve the balance of payments. Briguglio (1989) investigates to see whether a decrease in the external value of the Maltese Lira would improve the Maltese balance of trade. The estimates of export and import demand price elasticities indicate that the Marshall-Lerner condition is satisfied and therefore devaluation would improve trade balance. Himarios (1989) examines the effectiveness of devaluation on trade balance for twenty seven countries involving sixty devaluation episodes and he finds that nominal devaluation result in real devaluation that lasts for at least three years and has been a successful policy tool for adjustment of trade balance.

Rose (1991) estimates directly the responsiveness of the trade balances of five OECD countries to real exchange rates in the post Bretton Woods era using a number of techniques and he concludes that there is little to support the view that real exchange rates affects the trade balance. Rose (1990) also examines the empirical impact of the real exchange rates on trade balance of several developing countries using the three-stage least squares and he finds that there is little evidence to show that their trade balances are significantly affected by the real exchange rates.

Bahmani-Oskooee (1991) conducts a study on the long run relationship between the trade balance and the real effective exchange of eight LDCs, using quarterly data over 1973-1988 employing the co-integration analysis. The results suggest that the trade balance and real effective exchange rate are co-integrated and that in the long run devaluation improves the trade balance of most LDCs under study. In another study, Bahmani-Oskooee (1998) estimates the long-run trade elasticities for a group of LDCs, namely Greece, Korea, Pakistan, the Philippines, Singapore and South Africa. The study also employs cointegration technique, using quarterly data over the floating exchange rate period of 1973I-1990IV. This

long-run approach to estimate the long-run Marshall-Lerner condition reveals that indeed in most LDCs considered in the study, the condition was satisfied, indicating that devaluations could improve their trade balances. Bahmani-Oskooee and Niroomand (1998) re-estimate the long-run price elasticities and the Marshall - Lerner condition for 30 countries, using annual data over the 1960-92 period, using Johansen and Juselius cointegration technique to estimate the trade elasticities. In almost all countries considered in the study, the condition is satisfied, indicating that devaluations could improve the trade balance. The results from the previous studies tend to suggest that when the co-integration technique is used it is found that the real exchange rate changes affect the trade balance.

THE MODEL

In evaluating the effects of devaluation on the trade balance it is now a common practice to link directly the trade balance and the exchange rate. Following Dornbusch (1980: 58-59) and Rose (1990), we assume the domestic economy produces only exportables and consume both exportables and importables. The nominal trade balance, T, in terms of domestic currency is written as

$$T = P \,.\, X - e\, P^{*}.\, M \qquad (1)$$

where X is the quantities of exports, P is the price of exportables, M is the amount of imports, P* is the price of imports in foreign currency, and e is the nominal exchange rate expressed in domestic currency per unit of foreign currency. Dividing equation (1) by P, we obtain the real trade balance (TB) equation

$$TB = X - \frac{e\, P^{*}}{P}.\, M \qquad (2)$$

Where $\frac{e\, P^{*}}{P} = q$ as the real exchange rate. The export demand equation, X, is written as

$$X = X(q, Y^{*}) \qquad (3)$$

where Y* is the foreign income. The import demand is

$$M = M(q, Y) \qquad (4)$$

where Y is the domestic income. Substituting equations (3) and (4) into the trade balance equation (2), we obtain the reduced form trade balance equation as

$$TB = X(q, Y^{*}) - q\, M(q, Y)$$

$$TB = TB(q, Y, Y^{*}) \qquad (5)$$

Differentiating TB with respect to q in (5), we obtain

$$\partial TB/\partial q = \partial X/\partial q - q\partial M/\partial q - M$$

$$= X/q[(\partial X/\partial q)\,(q/X) - (\partial M/\partial q)\,(q/M) - 1)]$$

$$= X/q[\,\varepsilon_x + \varepsilon_m - 1\,] \qquad (6)$$

where ε_x and ε_m are the elasticities for domestic exports and imports with respect to relative price of foreign goods in terms of domestic goods respectively. It is assumed that initially the trade balance is balanced. From equation (6) it is clear that $\partial TB/\partial q > 0$ if $(\varepsilon_x + \varepsilon_m - 1) > 0$, that is if the Marshall-Lerner condition is satisfied.

Empirical Model

The reduced form model to be estimated is specified as

$$TB_t = \alpha_0 + \alpha_1 YM_t + \alpha_2 YW_t + \alpha_3 RER + u_t \qquad (7)$$

where TB is the real trade balance, YM is the real Malaysian income, YW is the real foreign income, RER is the real exchange rate, and u is the error term. For estimation purposes all the variables are log-transformed. The trade balance is defined in this study as the logarithm of the ratio of exports to imports. The expected signs of the coefficient of domestic income could be negative or positive; as domestic income rises, Malaysia will import more goods and services causing the trade balance to deteriorate. In order to purchase the imports, the domestic residents must exchange the domestic currency for foreign currencies and therefore the domestic currency tends to depreciate. However, if the increase in the domestic income is due to an increase in the production of and domestic demand for import-substitute goods, imports may actually decline, yielding a positive sign for α_1. On the other hand, an increase in foreign income will lead to foreigners to import more goods from abroad giving α_2 a positive sign. Thus, an increase in foreign income will increase the demand for Malaysian exports which tends to improve the trade balance. As foreigners increase their purchases of Malaysian exports they have to buy Malaysian currency and therefore the ringgit tends to appreciate.

The effect of real effective exchange rate, RER, on trade balance could be positive or negative. If $\partial TB/\partial q = \alpha_3$ is positive, then the Marshall-Lerner condition is satisfied and therefore a devaluation of domestic currency is expected to encourage the demand for exports and discourage imports and thus improving the trade balance. If the Marshall-Lerner is not satisfied, α_3 is negative that is devaluation worsens the balance of trade.

SOURCES OF DATA AND DEFINITION OF VARIABLES

This study uses quarterly data from 1977:1-1998:3. The variables *TB*, *YM*, and *YW* denote Malaysian real balance of trade on merchandise exports and imports, real Malaysian income, and real foreign income respectively. The Malaysian and foreign incomes are represented by their respective industrial production indices. The nominal effective rates are calculated using the equations

$$NER_t = 100 \prod_{i=1}^{5} E_{it}^{w_i} \qquad (8)$$

$$w_i = [(M+X)_i] / \sum_{i=1}^{5} [(M+X)_i] \qquad (9)$$

where w_i is the share(weight) of i-th Malaysian trading partner in total trade, M_i is the import from i-th Malaysian trading partner, X_i is the export to i-th Malaysian trading partner, NER is the nominal effective exchange rate, E_{it} is an index (1980 = 100) expressed in terms of domestic currency per unit of foreign currency i at time t. For analytical and empirical purposes the price adjusted exchange rate or the real exchange rate is more useful than the nominal exchange rate. The real effective exchange rate (RER) is calculated by

Top

$$RER_t = NER_t / [100 \exp \sum_{i=1}^{5} w_i \ln (P_{it} / P_{mt})] \quad (10)$$

where P_i is the consumer price index of i-th Malaysian trading partner, P_m is the consumer price index of Malaysia. Equation (10) is used to calculate the real effective exchange rate of ringgit (RER). The exports and imports data are taken from Quarterly Bullettin, Bank Negara Malaysia (Central Bank Malaysia) and the rest of the variables are taken from the International Financial Statistics, IMF.

ESTIMATION METHODS AND RESULTS

In this section we shall discuss the techniques that are used in this study and the results. These involved the unit root tests, co-integration test, Vector Error-Correction model (VECM), and the Granger causality test.

Unit Root Tests

Most economic time series variables tend to be non-stationary and regression results
On non-stationary time series variables may be spurious. Unit root tests for non-stationary are carried out by estimating the following regression for each of the variables:

$$\Delta Y_t = c + b_1 t + b_2 Y_{t-1} + \sum_{i=1}^{k} \Phi_i \Delta Y_{t-i} + u_{t1t} \quad (11)$$

where $\Delta Y_t = Y_t - Y_{t-1}$, t = 1, 2, ..., T and u_t are error terms, T is the number of observations and k is the number of lags. Since we work with a quarterly data, we choose the lag length k=4. The residuals from equation (11) are examined to ensure they do not exhibit any statistically significant correlation pattern. The results of Augmented Dickey-Fuller and Phillip & Perron tests are presented in Table 1 which suggest that the series are integrated of order one [1(1)] and therefore non-stationary. This allows us to test for co-integration among the variables.

TABLE 1
Results for Unit Root Tests

Variable	Level (trend & intercept)		First difference (trend & intercept)	
	ADF	PP	ADF	PP
TB	-2.2686	-2.1282	-4. 5008	- 13.8360
PM	-1.1454	-1.3800	-5.7358	-12.4721
YM	-2.4407	-3.4374	-4.0536	-15.4263
PW	-1.4278	-3.1444	-5.2271	-16.5681
YW	-3.2659	-6.0491	-5.8397	-13.3467
RER	-1.2043	-1.2103	-5.5037	-13.2873

Notes: *Significant at 5 percent: Critical value = 3.4000; **Significant at 1 percent: Critical value = 4.0000; PM and PW are the Malaysian and world consumer price indices respectively.

Cointegration

The multivariate cointegration procedure suggested by of Johansen (1991) and Johansen and Juselius (1990) is employed in this study to examine the existence of long-run Relationships among the variables in the model. The results are presented in Table 2. The two likelihood ratio statistics indicate a unique long-run relationship for the trade balance equation.

TABLE 2
Johansen's Test for the Number of Cointegrating Vectors
(VAR with 4 lags)

Test Statistics				
	Maximal Eigenvalue		Trace	
Null	Statistic	5% critical value	Statistic	5% critical value
r = 0	32.9094 **	31.046	61.51920**	60.99
r ≤1	16.29269	25.54	32.42483	42.44
r ≤2	9.677621	18.96	16.13214	25.32
r ≤3	6.454521	12.25	6.454521	12.25

Note: ** significant at 5 % level

The co-integration relationship when normalized by the coefficient of trade balance is

$$TB = 0.745225\ REER + 0.965599\ YM + 2.668932\ YW - 0.031043\ TREND$$
$$(0.37145)^{**} \quad (0.13900)^{***} \quad (0.46195)^{***} \quad (0.00351)^{***}$$

where ** and *** indicate significant at 5% and 1% level respectively, the values in the parentheses are the standard errors of the respective coefficients. The results indicate that the real exchange rate, the domestic and foreign incomes significantly explain the variations in the trade balance. The balance of trade improves about 8 percent in the long run in response to a 10 percent real depreciation. Moreover, a 10 percent rise in the Malaysian income leads to about 9.7 percent improvement in the trade balance suggesting that an expansion of imports results in the increase in the exportables and the domestic income. This is not surprising as Malaysian manufacturing sector has been importing much capital and intermediate goods to produce goods for export market. A 10 percent increase in the world economic activities improves the trade balance by 26 percent indicating that foreign income is a major determinant of Malaysian trade balance. The trend coefficient shows that the trade balance has been deteriorating at a rate of 3 percent annually during the period under study, especially in the first half of 1990s.

Top

Short-Run Dynamics and the J-Curve Effect

The dynamic behavior of the trade balance is examined by estimating the vector error-correction model (VECM):

$$TB_t = c + \sum_{i=1}^{8} \alpha_l TB_{t-i} + \sum_{i=0}^{8} \beta_i RER_{t-i} + \sum_{i=0}^{8} \delta_i YM_{t-i} + \sum_{i=0}^{8} \eta_i YW_{t-i} + \text{ø } ECM + u_t \qquad (12)$$

where ECM is the error correction term. Based on the Akaike's final prediction error criterion, we choose 8 lags for estimation purposes. The results of VECM showing the short-run dynamics of the trade balance equation are given in Table 4. The results suggest that the real exchange rate is an important determinant of trade balance. A depreciation of ringgit worsens the trade balance, slowly reaching its trough in the fifth quarter after which the trade balance starts to improve. The effects of the real exchange rate changes last for about 2 years. The results also indicate that the effect of exchange rate on trade balance exhibits the J-curve phenomenon. Similar results are obtained for the effect of domestic economic activity on trade balance; an increase in domestic activity will decrease trade balance for three quarters after which it starts to improve. This phenomenon is expected for Malaysia since she has been importing substantial amount of investment and intermediate goods to develop the domestic economy. The import of these goods worsens the trade balance in the short-run but it helps improve the trade balance in the long-run as these imports of investment and intermediate goods are used to manufacture Malaysian exports.

TABLE 4
VECM Results
Dependent variable is ΔBM

Lags	Coefficient Estimates of ECM	ΔBM	ΔRER	ΔYM	ΔYW	C
						-0.0405
						(-2.6109)**
1	-0.5473	-0.0713	-1.2222	-0.1918	0.4195	
	(-4.3184)**	(0.5564)	(-2.7143)*	(-2.0690)*	(1.7092)	
2		0.0217	-1.5178	-0.1496	0.5817	
		(0.1793)	(-3.4221)**	(-1.4230)	(2.2927)*	
3		0.2667	-1.3916	-0.1251	0.7580	
		(2.1868)*	(-3.0642)**	(-1.0900)	(2.6458)**	
4		0.4347	-1.9121	0.1037	0.5938	
		(3.1979)**	(-4.1941)**	(0.9223)	(2.0146)*	
5		-0.0980	-2.1928	0.2767	0.7503	
		-0.6740)	(-4.5135)**	(2.5344)*	(2.6688)**	
6		-0.1888	-1.8806	0.2764	-0.0203	
		(-1.2574)	(-3.6705)**	(2.6874)*	(-0.0754)	
7		-0.3295	-1.2521	0.2652	0.1330	
		(-2.2614)*	(-2.0941)*	(2.5810)*	(0.5341)	
8		-0.1498	0.0737	0.0709	-0.5240	
		(-1.1048)	(0.1330)	(0.7755)	(-2.2039)*	
$R^2 = 0.6522$						

Notes: The values in parentheses are t-statistics, *significant at 5% level,
**significant at 1% level

The performance of the world economy is positively related to Malaysian trade balance. An improvement in the world economic activities will improve the trade balance lasting for 5 quarters. That is an increase in the world economic activity will increase the demand for Malaysian exports and help to improve the trade balance. The adjustment coefficient is negative and significant at one percent level. The adjustment to the equilibrium level is quite rapid at about 55 percent.

The results of Granger causality tests are given in Table 5. The real exchange rate, the domestic and foreign economic activities influence only the trade balance and the effects are uni-directional as suggested by the causality tests. The adjustment coefficient is negative and significant. All these suggest that the real exchange rate, the domestic and foreign economic

activities are weakly exogenous, supporting the Johansen test that, in this case, there exists only one cointegration equation.

TABLE 5

Granger Causality Tests

	ΔTB[a]	ΔRER[a]	ΔYM[a]	ΔYW[a]	ECM[b]
Wald Statistics					
ΔTB	-	30.9626 (0.0001)***	18.7415 (0.0163)***	23.3093 (0.0030)***	-0.5473 (-4.3184)***
ΔRER	6.7003 (0.5693)	-	2.5808 (0.9579)	4.9188 (0.7662)	0.0023 (0.0250)
ΔYM	7.2628 (0.5086)	3.5766 (0.8932)	-	0.8682 (0.9990)	-0.1130 (-0.5083)
ΔYW	15.0932 (0.5455)	6.9183 (0.5455)	3.6600 (0.8864)	-	-0.01898 (-0.2023)

Notes: [a]The values in parentheses are the probabilities,
[b]The values in parentheses are the t-statistics.

CONCLUSION

In this study, we have examined the relationship between the Malaysia balance of trade, the real exchange rate, and domestic and foreign incomes. A cointegration analysis is carried out to identify the long run relationship among the variables. The results show that a real depreciation leads to an improvement in the Malaysian trade balance in the long run. An increase in domestic income also helps to improve the trade balance in the long run suggesting that the expansionary effect the of growth on imports has a positive impact on the production of exportables. The short-run dynamics of the trade balance are shown by the vector error-correction model (VECM). The VECM results show that a substantial portion of the adjustment to the long-run equilibrium takes place in the first quarter. There is, however, a worsening in the trade balance immediately after a depreciation but improve later suggesting the J-curve effect. This indicates that real exchange rate depreciation should be able to improve the trade in the long-run.

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Top