

## **DETERMINANTS OF MALAYSIAN TRADE BALANCE: AN ARDL BOUND TESTING APPROACH**

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This paper examines the short and long run relationships between trade balance, real exchange rates, income and money supply in the case of Malaysia. The inclusion of income and money variables in the study is purposely to examine the monetary and absorption approaches to the balance of payments beside the conventional approach of elasticity, using exchange rates. Using the bound testing approach to cointegration and error correction models, developed within an autoregressive distributed lag (ARDL) framework, we investigate whether a long-run equilibrium relationship exists between trade balance and the determinants. Additionally, we adopt an innovation accounting by simulating variance decompositions (VDC) and impulse response functions (IRF) for further inferences. Using this approach, we find evidence of long-run relationship between trade balance and income and money supply variables but not between trade balance and real exchange rate. The findings also suggest that Marshall-Lerner condition does not hold in long-run for Malaysia and for policy wise the Malaysian trade balance/balance of payments should be viewed from absorption and monetary approaches.

### **1. Introduction**

Despite the fact that, in theory, nominal depreciation or appreciation of exchange rate is assumed to change the real exchange rate and thus has a direct effect on the trade balance (Himarios, 1989; Bahmani-Oskooee, 2001), various studies have found weak statistical evidence connecting exchange rate changes and the trade balance (see for example Greenwood, 1984; Mahdavi and Sohrabian, 1993; Rahman and Mustafa, 1996; Rahman *et al.*, 1997). Empirical evidence also shows that changes

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in real exchange rate have affected trade balances in some countries but not for all countries which implies that the direction of the impact of real exchange rate changes on trade balance is still unclear.

In particular, a study on ASEAN-5 countries (including Malaysia) by Kim-sen Liew et.al (2003) has shown that trade balance in these countries is affected by real money rather than nominal exchange rate and therefore it concludes that the role of exchange rate changes in the trade balances has been exaggerated. However, as of now, very few attempts have been made to incorporate other views on balance of trade/balance of payments analysis or to test these other views empirically.

Thus, this study aims to use the Autoregressive Distributed Lag (ARDL) approach to cointegration and error correction models (ECM) to determine whether there is evidence of relationship between trade balance and exchange rate, under *elasticity* approach, in long run and short run in regard of Malaysian data. In addition, it attempts to test the empirical relevance of the *absorption* and *monetarist* approaches for the data by incorporating variables of income and money supply in the models.

The rest of the paper is outlined as follows. Section 2 describes briefly the theory of balance of payments from three different views: elasticity, absorption and monetary. Section 3 will discuss empirical data used and the ARDL approach to cointegration, including further inferences using variance decompositions (VDC) and impulse response functions (IRF). Section 4 presents some results and the final section (Section 5) concludes this study.

## **2. Theoretical Framework**

Theoretically, the conventional view of the balance of payments says that a nominal devaluation of currency improves trade balance. This view is rooted in a static and partial equilibrium approach to the balance of payments that is well known as *elasticity* approach (Bickerdike, 1920; Robinson, 1947; Metzler, 1948). The essence of this view is the substitution effects in consumption and production induced by the relative price (domestic versus foreign) changes caused by a devaluation. The model, which commonly known as BRM model, has

been recognized in literature as providing a sufficient condition for an improvement of trade balance as exchange rates devalue. In particular, the *Marshall-Lerner* condition states that for a positive effect of devaluation on the trade balance, and implicitly for a stable exchange market, the absolute values of the sum of the demand elasticities for exports and imports must exceed unity. Holding this Marshall-Lerner condition, when the exchange rate is above the equilibrium there is excess supply for foreign exchange and when the exchange rate is below the equilibrium there is excess demand of foreign exchange. The BRM and Marshall-Lerner conditions have become the underlying assumptions for those who support devaluation as means to stabilize the foreign exchange market and/or to improve the trade balance.

A different approach to the balance of payments emerged at the beginning of 1950s when authors such as Harberger (1950), Meade (1951), and Alexander (1952, 1959) shifted the focus of economic analysis to the balance of payments. This approach is referred as *absorption approach*. The core of this approach is the proposition that any improvement in the trade balance requires an increase of income over total domestic expenditures. In other words, it analyses the economy from the point of view of aggregate expenditures, in particular, the direct effects of exchange rate changes on relative prices, income and absorption, and ultimately on the trade balance.

At the end of 1950s, the monetary view of the balance of payments emerged. As regard to monetary or global monetarist approach (Polak, 1957; Hahn, 1959; Pearce, 1961; Prais, 1961; Mundell, 1968, 1971), the balance of payments is essentially a monetary phenomenon. The balance of payments behaviour is analysed from the point of view of the supply and demand of money. In very simple terms, if people demand more money than is being supplied by the Central Bank then the excess demand for money would be satisfied by inflows of money from abroad. In this case, the trade balance will improve. On the other hand, if the Central Bank is supplying more money than is demanded, the excess supply of money is eliminated by outflows of money to other countries and this will worsen the trade balance.

In regard to these different views, the present study develops such a model which incorporates the three views for the analysis of Malaysian

trade balance. The following section will discuss how the model is developed and how tests will be done on the collected data.

### 3. Data and Methodology

All series examined in this study –trade balance, real exchange rate, income and money supply- are collected from the *IMF Statistics* and *Bank Negara Malaysia (BNM) Bulletin*. The data is annual and spans the time period 1974 to 2003. Usually, trade balance is measured by the difference of value of total exports and value of total imports. In this study, trade balance is measured as the ratio of export value (X) to import value (M). The ratio of X to M (ie. X/M) or its inverse has been widely used in many empirical investigation of trade balance-exchange rate relationship, such as Bahmani-Oskooee and Brooks (1999), Lal and Lowinger (2001) and Onafowora (2003). This ratio is preferable because it is not sensitive to the unit of measurement and can be interpreted as nominal or real trade balance (Bahmani-Oskooee, 1991). As for exchange rate, the indicator used is real exchange rate index<sup>1</sup>. Gross Domestic Product (GDP) is used as a proxy of income and M3 for money supply. All variables are expressed in natural logarithm.

In terms of methodology, the paper adopts the recently developed autoregressive distributed lag (ARDL) framework by Pesaran and Shin (1995, 1999), Pesaran *et al.* (1996) and Pesaran (1997) to establish the direction of causation between variables. There are advantages of using this approach instead of the conventional Johansen (1998) and Johansen and Juselius (1990). While the conventional cointegration method estimates the long run relationships within a context of a system of equations, the ARDL method employs only a single reduced form equation (Pesaran and Shin, 1995). The ARDL approach does not involve pre-testing variables, which means that the test on the existence relationship between variables in levels is applicable irrespective of whether the underlying regressors are purely I(0), purely I(1) or mixture of both. This feature alone, given the characteristics of the cyclical components of the data, makes the standard of cointegration technique unsuitable and even the existing unit root tests to identify the order of integration are still highly questionable. Furthermore, the ARDL method avoids the larger number of specification to be made in the standard cointegration test. These include decisions regarding the number of endogenous and exogenous variables (if any) to be included, the

treatment of deterministic elements, as well as the optimal number of lags to be specified. The empirical results are generally very sensitive to the method and various alternative choices available in the estimation procedure (Pesaran and Smith, 1998). With the ARDL, it is possible that different variables have different optimal lags, which is impossible with the standard cointegration test. Most importantly, the model could be used with limited sample data (30 observations to 80 observations) in which the set of critical values were developed originally by Narayan (2004) by using GAUSS.

Basically, the ARDL approach to cointegration (see Pesaran et al., 2001) involves estimating the conditional error correction (EC) version of the ARDL model for trade balance and its determinants:

$$\begin{aligned} \Delta \ln(X/M)_t = & \alpha_0 + \sum_{i=1}^p \phi_i \Delta \ln(X/M)_{t-i} + \sum_{i=0}^p \theta_i \Delta \ln(REER)_{t-i} + \sum_{i=0}^p \lambda_i \Delta \ln(GDP)_{t-i} \\ & + \sum_{i=0}^p \varphi_i \Delta \ln(M3)_{t-i} + \delta_1 \ln(X/M)_{t-1} + \delta_2 \ln ER_{t-1} + \delta_3 \ln(GDP)_{t-1} + \delta_4 \ln(M3)_{t-1} + v_t \end{aligned} \quad (1)$$

where  $\ln(X/M)$ ,  $\ln(REER)$ ,  $\ln(GDP)$  and  $\ln(M3)$  are trade balance, real exchange rates, income and money supply in natural logarithm, respectively,  $\Delta$  is first-difference operator and  $p$  is the optimal lag length.

The  $F$  test is used for testing the existence of long-run relationship. When long-run relationship exist,  $F$  test indicates which variable should be normalized. The null hypothesis for no cointegration among variables in equation (1) is  $H_0: \delta_1 = \delta_2 = \delta_3 = \delta_4 = 0$  against the alternative hypothesis  $H_1: \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq 0$ . The  $F$ -test has a non-standard distribution which depends on (i) whether variables included in the model are  $I(0)$  or  $I(1)$ , (ii) the number of regressors, and (iii) whether the model contains an intercept and/or a trend. Given a relatively small sample size in this study of 30 observations, the critical values used are as reported by Narayan (2004) which based on small sample size between 30 and 80<sup>2</sup>. The test involves asymptotic critical value bounds, depending whether the variables are  $I(0)$  or  $I(1)$  or a mixture of both. Two sets of critical values are generated which one set refers to the  $I(1)$  series and the other for the  $I(0)$  series. Critical values for the  $I(1)$  series

are referred to as *upper* bound critical values, while the critical values for I(0) series are referred to as the *lower* bound critical values.

If the  $F$  test statistic exceeds their respective upper critical values, we can conclude that there is evidence of a long-run relationship between the variables regardless of the order of integration of the variables. If the test statistic is below the upper critical value, we cannot reject the null hypothesis of no cointegration and if it lies between the bounds, a conclusive inference cannot be made without knowing the order of integration of the underlying regressors.

If there is evidence of long-run relationship (cointegration) of the variables, the following long-run model is estimated:

$$\ln(X/M)_t = \alpha_1 + \sum_{i=1}^p \phi_{1i} \ln(X/M)_{t-i} + \sum_{i=0}^p \beta_{1i} \ln(REER)_{t-i} + \sum_{i=0}^p \theta_{1i} \ln(GDP)_{t-i} + \sum_{i=0}^p \lambda_{1i} \ln(M3)_{t-i} + \mu_t \quad (2)$$

The orders of the lags in the ARDL model are selected by either the Akaike Information criterion (AIC) or the Schwarz Bayesian criterion (SBC), before the selected model is estimated by ordinary least squares. For annual data, Pesaran and Shin (1999) recommended choosing a maximum of 2 lags. From this, the lag length that minimizes SBC is selected.

The ARDL specification of the short-run dynamics can be derived by constructing an error correction model (ECM) of the following form:

$$\Delta \ln(X/M)_t = \alpha_2 + \sum_{i=1}^p \phi_{2i} \Delta \ln(X/M)_{t-i} + \sum_{i=0}^p \theta_{2i} \Delta \ln(REER)_{t-i} + \sum_{i=0}^p \lambda_{2i} \Delta \ln(GDP)_{t-i} + \sum_{i=0}^p \phi_{2i} \Delta \ln(M3)_{t-i} + \psi ECM_{t-1} + v_t \quad (3)$$

where  $ECM_{t-1}$  is the error correction term, defined as:

$$ECM_t = \ln(X/M)_t - \alpha_1 - \sum_{i=1}^p \phi_{1i} \ln(X/M)_{t-i} - \sum_{i=0}^p \beta_{1i} \ln(REER)_{t-i} - \sum_{i=0}^p \theta_{1i} \ln(GDP)_{t-i} - \sum_{i=0}^p \lambda_{1i} \ln(M3)_{t-i} \quad (4)$$

All coefficients of short-run equation are coefficients relating to the short run dynamics of the model's convergence to equilibrium and  $\psi$  represents the speed of adjustment.

In addition, we adopt an innovation accounting by simulating variance decompositions (VDC) and impulse response functions (IRF) for further inferences. VDC and IRF serve as tools for evaluating the dynamic interactions and strength of causal relations among variables in the system. The VDC indicate the percentages of a variable's forecast error variance attributable to its own innovations and innovations in other variables. Thus, from the VDC, we can measure the relative importance of real exchange rate, income and money fluctuations in accounting for fluctuation in trade balance variable. Moreover, the IRF trace the directional responses of a variable to a one standard deviation shock of another variable. This means that we can observe the direction, magnitude and persistence of trade balance to variation in the real exchange rate, income and money supply.

#### 4. Results

Prior to the testing of cointegration, we conducted a test of order of integration for each variable using Augmented Dickey-Fuller (ADF) and Phillip Perron(P-P) (see Table 1). Even though the ARDL framework does not require pre-testing variables to be done, the unit root test could convince us whether or not the ARDL model should be used. The results in Table 1 show that there is a mixture of I(1) and I(0) of underlying regressors and therefore, the ARDL testing could be proceeded.

**Table 1: Unit Root Test**

Variable	ADF test statistic (with trend and intercept)		P-P test statistic (with trend and intercept)	
	<i>Level</i>	<i>First Difference</i>	<i>Level</i>	<i>First Difference</i>
<i>Trade Balance</i> [ln(X/M)]	-3.13	-4.14**	-2.29	-4.07**
<i>Real Exchange Rates</i> [ln(ER)]	-3.05	-4.32**	-2.47	-4.55***
<i>Income</i> [ln(GDP)]	-3.45*	-3.84**	-2.73	-3.75**
<i>Money Supply</i> [ln(M3)]	-2.85	-8.03***	-3.64**	-12.35***

Note: \*\*\* significant at 1% level

\*\* significant at 5% level

\* significant at 10% level

The next step is where equation 1 is estimated to examine the long-run relationships among the variables. As suggested by Pesaran and Shin(1999) and Narayan(2004), since the observations are annual, we choose 2 as the maximum order of lags in the ARDL and estimate for the period of 1974-2003. In fact, we also used the Schwarz-Bayesian criteria (SBC) to determine the optimal number of lags to be included in the conditional ECM (error correction model), whilst ensuring there was no evidence of serial correlation, as emphasized by Pesaran et al.(2001). The lag length that minimizes SBC is one. The calculated  $F$ -statistics for the cointegration test is displayed in Table 2. The critical value is reported together in the same table which based on critical value suggested by Narayan (2004) using small sample size between 30 and 80. The calculated  $F$ -statistic ( $F$ -statistic = 4.775) is higher than the upper bound critical value at 5 per cent level of significance (4.306), using restricted intercept and no trend. But the  $F$ -statistic is only higher than the upper bound critical value at 10 per cent level of significance (4.150), using restricted intercept and trend. This implies that the null hypothesis of no cointegration cannot be accepted at 5 per cent and 10 per cent level and therefore, there is a cointegration relationship among the variables.



**Table 2: F-statistic of Cointegration Relationship**

Test statistic	Value	lag	Significance level	Bound Critical values* (restricted intercept and no trend)		Bound Critical values* (restricted intercept and trend)	
				I(0)	I(1)	I(0)	I(1)
<i>F</i> -statistic	<b>4.775</b>	1	1%	4.614	5.966	5.333	7.063
			5%	3.272	<b>4.306</b>	3.710	5.018
			10%	2.676	<b>3.586</b>	3.008	<b>4.150</b>

Note: \* base on Narayan (2004)

We also test the model using Hendry “General to Specific Approach” to get the parsimonious specification. In doing so, we set initially lag 1 (optimal lag length base on SBC) and we eliminate the variables which are not significant, except for the level variables and the intercept. The *F*-statistic (5.2301) of Wald-test on the level variables of the new model, as displayed in Table 3, shows stronger result as compare to the previous model. This confirms the existence of long-run relationship among the variables used.

**Table 3: F-statistic of Cointegration Relationship (in Parsimonious Specification)**

Test statistic	Value	Lag	Significance level	Bound Critical values* (restricted intercept and no trend)		Bound Critical values* (restricted intercept and trend)	
				I(0)	I(1)	I(0)	I(1)
<i>F</i> -statistic	<b>5.230</b>	1	1%	4.614	5.966	5.333	7.063
			5%	3.272	<b>4.306</b>	3.710	<b>5.018</b>
			10%	2.676	<b>3.586</b>	3.008	<b>4.150</b>

The empirical results of the long-run model, obtained by normalizing on trade balance, are presented in Table 4. The significant variables which appear to affect trade balance are income (GDP) and money supply (M3). Both signs for income and money supply are consistent to monetary theories. The theories indicate that a rise in domestic income increases the demand for money and therefore will increase exports and

improve trade balance. This could be observed from the trends of growth and trade balance experienced by Malaysia since the recession of 1980s. Since the worst recession of 1985-86, the economy has rebound which led by strong growth in both foreign and domestic investment. Within this period, real GDP was growing at an average rate of over 8 per cent. The economy also experienced high growth in exports contributed by not only by the strong growth but also by the global trade liberalization measures supported by the government particularly in export-oriented manufacturing and high technology products. It has been very active in the Uruguay Round negotiations and ratified the agreement on September 6, 1994. Multinational corporations (US and Japanese firms) control a substantial share of this manufacturing sector in producing electronic components, consumer electronics and electrical goods.

Results of the long-run model also show a negative relationship between money supply and trade balance. A fall in domestic money supply improves trade balance since foreigners send their money domestically for more goods and services. The fall in money supply was resulted from tight monetary policy in Malaysia which aimed to control inflation while providing adequate liquidity to stimulate economic growth. Monetary aggregates are controlled by the Central Bank through its influence over interest rates in banking sector, open market operations and occasionally, changes in reserve requirements.

Even though exchange rate is one of possible explanatory variables for trade balance, the insignificant of the variable in the model suggests that the Marshall-Lerner condition is not hold in long-run in the case of Malaysia. These results are somehow consistent with a study by Kim-sen Liew et al. (2003) which found that the role of exchange rate is rather insignificant in initiating changes in the trade balances in the case of Malaysia, Singapore, Thailand and the Phillipines. This insignificant effect of exchange rate on trade balance probably due to the exchange rate policy exercised by the government. While the ringgit (RM) is considered to be market determined, the government has intervened in few occasions to maintain the ringgit's target zone. The target zone is a band within which the currency would be allowed to float and it is usually considered to be the range within which the currency was at its 'correct' level. In late 1993, for example, following a prolonged period of strong capital inflows which resulted on upward pressure on the

currency, the government had intervened aggressively in the market to bring the value down in a few weeks as the pressure was perceived as a sign of excessive foreign exchange speculation. By mid-January 1994, the intervention and the set of controls were abandoned and gradually the currency was allowed to return to its early value against the US dollar. By mid-1995, when there was a combination of a slowdown in the electronics markets and an appreciating US dollar resulted to over valued of ringgit in real terms and downward pressure on the exchange rate, the ringgit should have been allowed to depreciate. Once again, the government commitment to the zone required it to support the ringgit. The latest intervention was after the hit of 1997 Asiann financial crisis through capital outflow controls and fixed exchange rate against US dollar which implemented in September 1998. The controls gradually reduced and ended in 2005. These extensive interventions from the government on the regime of exchange rate is perceived to be a main factor that hardly allows the linkage between the exchange rate and exports/imports to be observed through the market system.

**Table 4: Long-run Model**

Dependent variable:	Independent variables		
	<i>ln(ER)</i>	<i>Ln(GDP)</i>	<i>ln(M3)</i>
<i>ln (X/M)</i>	0.0834 (0.2314)	0.8893*** (0.1581)	-0.6563*** (0.1033)

Note: standard error in parentheses

\*\*\* significant at 1% level.

The results of the error correction model for trade balance are presented in Table 5. Most of the coefficients in the ECM are insignificant, except for lag difference of income. The negative sign of the coefficient of this variable supports Keynesian view that income increases will encourage citizens to buy more imported goods and thus worsens the trade balance. But this impact could only be observed in short run period. We applied a number of diagnostic tests to the error correction model. We find no evidence of serial correlation, heteroskedasticity and ARCH (Autoregressive Conditional Heteroskedasticity) effect in the disturbances. The model also passes the Jarque-Bera normality test which suggesting that the errors are normally distributed.

The significant of an error correction term (ECT) shows the evidence of causality in at least one direction. The lagged error term ( $ECT_{t-1}$ ) in our results is negative and significant at 1% level. The coefficient of -0.5726 indicates high rate of convergence to equilibrium.

**Table 5: Error Correction Model for Trade Balance**

Dependent variable: $d(\ln(X/M))_t$	
Independent variables	Coefficient
<i>Constant</i>	0.0547 (1.389)
$D(\ln(X/M))_{t-1}$	-0.0737 (-0.3938)
$D(\ln REER)_t$	-0.5284 (-1.6493)
$D(\ln REER)_{t-1}$	-0.0214 (-0.0693)
$D(\ln GDP)_t$	0.2835 (0.7246)
$D(\ln GDP)_{t-1}$	-0.7616** (-2.3827)
$D(\ln M3)_t$	-0.1232 (-1.5267)
$D(\ln M3)_{t-1}$	-0.0250 (-0.3367)
$ECT_{t-1}$	-0.5726*** (-3.1364)
<b>Diagnostic tests:</b>	
<i>Far</i>	0.3005
<i>Farch</i>	0.7269
<i>Fhet</i>	0.8457
<i>JBnormal</i>	1.7142
<b>R-square</b>	0.4941

Notes: 1. t-statistic in parentheses

2. *Far* is the F-statistic of Breusch-Godfrey Serial Correlation LM Test

*Farch* is the F-statistic of ARCH Test *JBnormal* is the Jarque-Bera Statistic of Normality Test *Fhet* is the F-statistic of White Heteroskedasticity Test

3. \*\*\* significant at 1% level \*\* significant at 5% level \*significant at 10% level.

From an estimated VAR, we compute variance decompositions and impulse-response functions, which serve as tools for evaluating the dynamic interactions and strength of causal relations among variables in the system. In simulating variance decompositions and impulse response functions, it should be noted that the VAR innovations may be contemporaneously correlated. This means that a shock in one variable may work through the contemporaneous correlation with innovations in other variables. The responses of a variable to innovations in another variable of interest cannot be adequately represented since isolated shocks to individual variables cannot be identified due to contemporaneous correlation (Lutkepohl, 1991). Therefore, we are using Cholesky factorization that orthogonalizes the innovations as suggested by Sims (1980) to solve this identification problem. The strategy

requires a pre-specified causal ordering of the variables. The results from variance decomposition and impulse response functions may be sensitive to the variables' ordering unless the error terms' contemporaneous correlations are low. The ordering of variables suggested by Sims (1980) is started with the most exogenous variables in the system and ended by the most endogenous variable.

To see whether the ordering could be a problem, the contemporaneous correlations of VAR error terms are checked and displayed in Table 6. The results show that there are highly correlations between trade balance and real exchange rate, between real exchange rates and M3 and between GDP and M3. Other correlations are mostly less than 0.2. Base on this, we therefore arrange the variables according to the following order: M3, GDP, REER and TB.

**Table 6: Contemporaneous Correlations of VAR Error Terms**

	<b>TB</b>	<b>REER</b>	<b>GDP</b>	<b>M3</b>
<b>TB</b>	1			
<b>REER</b>	-0.251	1		
<b>GDP</b>	0.179	0.082	1	
<b>M3</b>	0.007	-0.318	0.457	1

The results of variance decomposition and impulse response functions are displayed in Table 7 and Figure 1, respectively. From Figure 1, the IRF can produce the time path of dependent variables in the VAR, to shocks from all the explanatory variables. It could be seen that, at any dependent variable, any shock of the explanatory variables makes the impulse responses dies out to zero. This implies that the system of equation developed, ie. the VECM, is a stable system. Furthermore, from the figure, the directions of variables' responses to innovations in the system are theoretically reasonable in most cases. Trade balance does react significantly to income innovations as it respond negatively for the first 6 years and then subsides to zero afterwards. As mentioned in the ECM model earlier, this result conforms to the Keynesian view that a rise in domestic income encourages more demand for imported goods and therefore worsens trade balance. The figure also shows that the trade balance responds negatively to a shock in money supply for about 7 years before it subsided to zero. This confirms the monetary view that the fall in money supply will improve trade balance. As for the exchange rate, the figure clearly suggests that Malaysia's trade balance

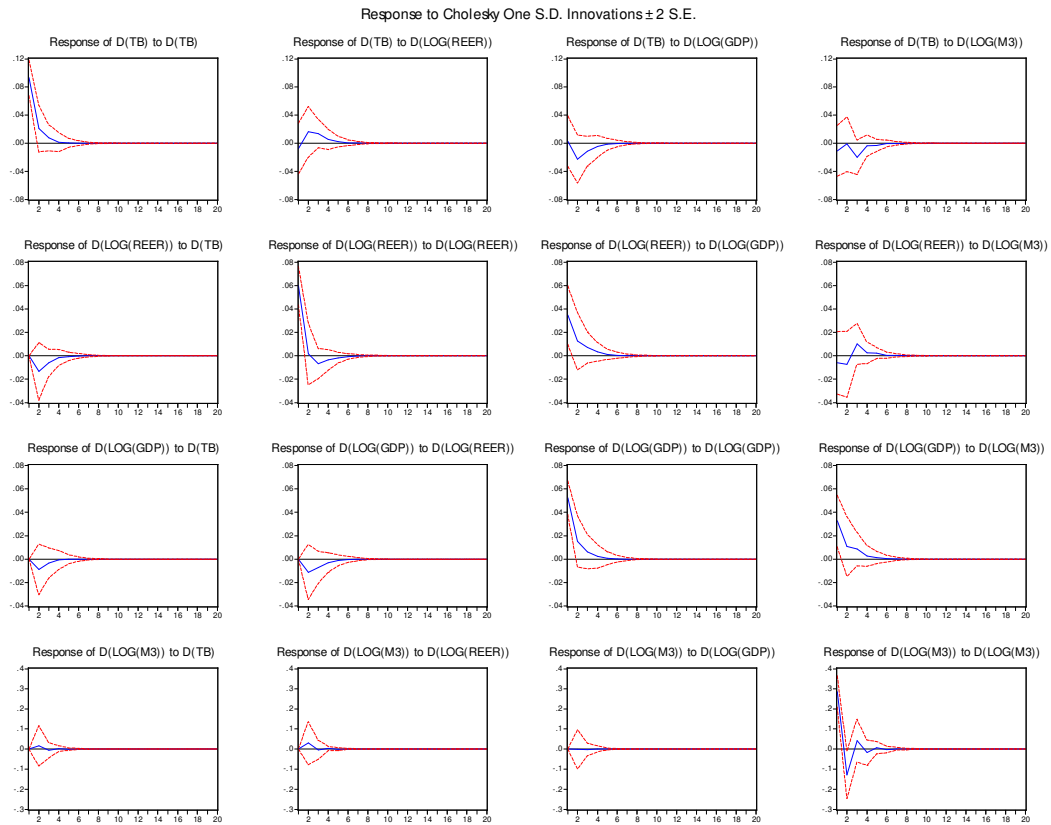
felt significantly to the shock in real exchange rate for the first 6 years but the direction of responses is not consistent with the theory. This is not surprise as real exchange rate variables are mostly insignificant in ECM model.

As discussed earlier, the variance decomposition is an alternative method to IRF for examining the effects of shocks to the dependent variables. It determines how much of the forecast error variance for any variable in a system is explained by innovations to each explanatory variable, over a series of time horizons. Usually own series shocks explain most of the error variance, although the shock will also affect other variables in the system. From Table 7(a) the VDC substantiate the significant role played by REER, GDP and M3 in accounting for fluctuations in Malaysian TB. At 1 year horizon, the fraction of Malaysian trade balance forecast error variance attributable to variations in the real exchange rate, income and money supply are 0.69%, 0.1% and 1.33% respectively. The explanatory power of all variables, namely exchange rate (REER), income (GDP) and money supply (M3), increases further at 3-year horizon, but the percentage of trade balance forecast variance explained by innovations in real exchange rate (REER) is smaller than explained by innovations in other variables. However, the portion of trade balance variations explained by all explanatory variables continuously increase at longer horizon. Obviously, at longer time horizon, percentage of forecast variance in trade balance is largely explained by innovation in GDP, among other explanatory variables as it maintains higher percentage than the other. The results again strengthen the findings earlier that real exchange rate is has insignificant role in determining the trade balance of the country.

Looking along the main diagonal, the results reveal that the own shock is relatively high for TB and M3, with 83.84% and 98.83% respectively. This implies the exogeneity of TB and M3 in variance decompositions, as after the first year after the shock, the variance appears to be less explained by innovations in other explanatory variables. On the other hand, the results shows that the percentage of variance explained by own shock for REER and GDP are relatively similar with 66.34% and 66.44% respectively. The small difference of the range of own shock's contribution means that no single variable, in relation to others, highly exogenous or highly endogenous, at least after a 20-year post-shock horizon.

**Table 7: Variance Decompositions**

Horizon	% of Forecast Variance Explained by innovations in			
	<i>TB</i>	<i>REER</i>	<i>GDP</i>	<i>M3</i>
<i>(a) Variance Decompositions of TB</i>				
1	97.88	0.69	0.10	1.33
3	84.44	4.76	5.95	4.84
5	83.84	5.04	6.11	5.01
10	83.84	5.04	6.11	5.01
15	83.84	5.04	6.11	5.01
20	83.84	5.04	6.11	5.01
<i>(b) Variance Decompositions of REER</i>				
1	0.00	74.18	25.04	0.78
3	3.94	66.57	25.94	3.55
5	3.96	66.35	25.96	3.73
10	3.96	66.34	25.96	3.73
15	3.96	66.34	25.96	3.73
20	3.96	66.34	25.96	3.73
<i>(c) Variance Decompositions of GDP</i>				
1	0.00	0.00	72.27	27.73
3	1.98	3.86	66.69	27.47
5	1.98	4.06	66.44	27.52
10	1.98	4.06	66.44	27.52
15	1.98	4.06	66.44	27.52
20	1.98	4.06	66.44	27.52
<i>(d) Variance Decompositions of M3</i>				
1	0.00	0.00	0.00	100.00
3	0.28	0.87	0.01	98.84
5	0.29	0.87	0.01	98.83
10	0.29	0.87	0.01	98.83
15	0.29	0.87	0.01	98.83
20	0.29	0.87	0.01	98.83

**Figure 1: Impulse Response Functions**

## 5. Conclusion

Few studies have found evidence of weak relationship between exchange rates and trade balance against the theory developed under the elasticity approach of balance of trade. A study on Malaysia and other ASEAN countries had also found the existence of this weak relationship but an effort to test on other approaches to balance of trade was not being done. Thus, the present study attempts to explore further on possibility of other approaches to Malaysian balance of trade by incorporating absorption and monetary views into discussion.



The method used is a bound testing approach to cointegration, developed within an autoregressive distributed lag framework, to investigate the existence of a long-run equilibrium relationship between trade balance, exchange rates, income and money supply. The results provide strong evidence that money supply and income do play a role in determining the long-run behaviour of the Malaysian trade balance as compare to exchange rates. This is perceived to be the fact that Malaysia has been always set the exchange rate within its target zone with a series of controls and intervention. The policy implication which could be drawn from the study is that the difficulties in trade balance or balance of payments, as regard to Malaysia context, would better be corrected through its policies on income or growth and money supply rather than on the exchange rates regime.

### **End Notes**

1. Increase in real exchange rate index represents revaluation of Ringgit Malaysia(RM) vice versa.
2. Pesaran and Pesaran (1997) and Pesaran et al. (2001), however, generated critical values based on 500 and 1000 observations and 20,000 and 40,000 replications, respectively, which suitable for large sample size.

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