

## DETERMINANTS OF MALAYSIAN TRADE BALANCE: AN ARDL AND FMOLS APPROACH

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### ABSTRACT

*This paper will discuss about the factors that influence the Malaysia trade balance. The main objective of this study is to test whether the Marshall-Lerner condition is hold or not in the case of Malaysia whereby the Marshall-Lerner condition stated that the currency devaluation will improve the trade balance of a country. The methods that were used in this paper are the Autoregressive Distributed Lag (ARDL) and also Fully Modified Ordinary Least Squares (FMOLS) in confirming the analysis done by the first method. The data used in this study is the annual data starting from year 1975 until 2013. The data were taken from Department of Statistics Malaysia (DOSM), Bank Negara Malaysia (BNM) and also from Data Stream. There are four variables that have been used in this study. The variables that has been used in this paper is the Malaysia trade balance where the ratio of the export over import ( $X/M$ ) were taken as the elasticity. Second is the real effective exchange rate (REER), third is Gross Domestic Product (GDP) as a proxy to income and finally the money supply which is M3. The result shows that the Marshall-Lerner condition does not hold in Malaysia by using both methods.*

**Keywords:** *Trade, Trade Balance, International Trade, ARDL, FMOLS.*

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### 1. Introduction

There is no objection regarding the relationship between national income and international trade. Trade is one and the most important thing for a country in gaining its income. Same goes to our country Malaysia. Malaysia depends most on its export in order to get or gain the income and sustain the growth in the economy. The most important thing in trade is the trade balance which is the differences between the export and import. Most of the country in this world wanted to have a positive trade balance so that they can have a positive or surplus in their balance of payment. Malaysia tries to manage its BOP and monitor it closely so that we will have the good BOP. In the economy it is good to have a positive value of BOP. In trade, the exchange rate is the most important things.

Nowadays, there are several big country (big in terms of their economy size not the size of the country) trying to devalue or lower the currency in order to gain more export rather than import. This is because the export will give an income to the country and import will make that particular country to pay to their trading partners. They try to implement the theory which is called as Marshall-Lerner condition which has been discovered by Alfred Marshall, Abba Lerner and Joan Robinson.

In the case of Malaysia, our biggest contributions in export is Electrical and Electronic products which as at January 2014, these product contribute about RM20.55 billion with a share of 32.1% of the total export which also increase from January 2013 by 14.6%. Second isrefined petroleum product which contributes about 9.8% or RM 6.26 billion. The other product was liquefied natural gas, chemicals and chemical products and also palm oil which includes crude palm oil. Those entire product contributed RM 6.19 billion, RM 3.91 billion, and RM 3.88 billion. Our major trading partners are People's Republic of China (PRC), European Union (EU) which consists of Netherlands, Germany, United Kingdom and many other countries in EU. Other Malaysia's major trading partner is Republic of Korea (ROK), Australia, Hong Kong and finally Japan.

Since 2012, our trade balance is starting to drop from RM 124,236 Million in 2011 to RM 95,964 Million which decrease for about 0.23% and in year 2013 it is drop about 0.26% from previous year to RM 70,746 Million. In this situation, it is not good for Malaysia because the trade balance is decreased. Therefore, the action should be taken by the Malaysian government in order to make the export volume or value increase thus it will increase the trade balance.

## **2. Theoretical Framework**

Trade is a basic economic concept that involves multiple parties participating in the voluntary negotiation and then the exchange of one's goods and services for desired goods and services that someone else possesses. The advent of money as a medium of exchange has allowed trade to be conducted in a manner that is much simpler and effective compared to earlier forms of trade, such as bartering. Usually in the economy of a country, they usually do an international trade. International trade is the exchange of goods and services between countries. This type of trade gives a rise to a world economy, in which prices, or supply and demand, affect and are affected by global events

The trade balance or balance of trade maybe defines as the difference between a country's imports and its exports. Balance of trade is the largest component of a country's balance of payments. Debit items include imports, foreign aid, domestic spending abroad and domestic investments abroad. Credit items include exports, foreign spending in the domestic economy and foreign investments in the domestic economy. A country has a trade deficit if it imports more than it exports and on the other hand, the country has a trade surplus if its export value is greater than its import value.

Exchange rate is one of the most important things in discussing about the international trade. This is because in order to buy a goods or using any services we need money. In doing trade with other country, the exchange rate is important because it measure the cost of Malaysia to get something from outside which is other country and it also measure the return that Malaysia get in doing business with other country. According to the theory, the depreciation of the currency of one country will make the export volume to increase. This is because, for the importing country, they need less of their money in getting our goods and services. On the other hand, an appreciation of currency of one country will make the import of that country to increase. This is because less amount of money needed in order to the home country people to buy the outside product.

The Marshall-Lerner condition or also known as Marshall-Lerner-Robinson (MLR) condition is the heart of the elasticities approach to the balance of payment. The MLR condition or

theory was discovered by Alfred Marshall, Abba Lerner and Joan Robinson. The MLR condition stated that a real devaluation or real depreciation of the currency will improve the trade balance if the sum of the elasticities which is in the absolute value of the demand for import and export with respect to the real exchange rate is greater than one, ( $\varepsilon + \varepsilon^* > 1$ ). According to the book entitled International Economics written by Dominick Salvatore, the Marshall-Lerner condition indicates that the foreign exchange market is stable when the sum of the price elasticities of the demand for imports and export is larger than 1 (when the supply elasticities of imports and exports are infinite).

### 3. Data and Methodology

In this paper, the series that has been examined are the trade balance, real effective exchange rate, Gross Domestic Product (GDP) as the proxy to income and also the money supply which is M3. All the data is the secondary data which has been taken from the World Data Bank and *Bank Negara Malaysia* (BNM) website. All the data used is the annually data from year 1975 until 2013. By referring to the previous study, the trade balance was usually measured by the differences between the value of total exports and value of total import. Same goes to this study which the trade balance is measured as the ration of export value (X) to import value (M). The ratio of X to M or its inverse has been widely used in many empirical investigations of trade balance and exchange rate relationship such as the study conducted by [7], [4], [11], [2], [12] and also by [1]. According to [3] reason why this ratio is used because it is not sensitive to the unit of the measurement and can be interpreted as nominal or real trade balance. The entire variables used are expressed in the natural logarithm.

The method that is used in this study developed and popularized by [9], [8] and [10] which is Autoregressive Distributed Lag (ARDL). The ARDL is used to look at the relationship between variables or the co-integration between variable. The advantages using this method compared to the conventional [5] (JJ) is that, the ARDL method did not need for a pre-testing for variables. But for the sake of this paper, the unit root test is still conducted in order to look at the variable whether it is stationary at level I(0) or stationary at the first difference I(1). The advantage of ARDL approach is that the variable can be mixed with I(0) or I(1). The ARDL approach to cointegration involves estimation of the conditional error correction (EC) version of the ARDL model for trade balance and its determinants:

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

where  $\ln(X/M)$  is the trade balance,  $\ln(REER)$  is the real exchange rates,  $\ln(GDP)$  is the income and finally  $\ln(M3)$  is for the money supply where all the variable as stated before in the natural logarithm. The  $\Delta$  is the first difference operator and the  $p$  is the number of optimal lag length.

In this ARDL method, the F-test is used in order to indicate the long-run relationship. If there is a long-run relationship, the F test will indicates which variable should be normalized. The null hypothesis for this test is  $H_0: \delta_1 = \delta_2 = \delta_3 = \delta_4 = 0$  which mean that there is no

cointegration between the variables. Whereas, the alternative hypothesis of at least one variable cointegrated is  $H_1: \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq 0$

The F test that has been used in testing the existence of the long-run relationship has a non-standard distribution which depends on the variables included in the model are I(0) or I(1), the number of regressors and finally either the model contains an intercept and/or a trend. Because this study contain a small sample size which is 34 observations, the critical values that were used is based on the sample size as what has been reported by [6]. This test involve asymptotic critical value bonds depending whether the variables are I(0) or I(1) or a mixture of both. These sets of critical value were generated which one set refers to the I(1) series and the other is I(0). The critical values for the I(1) series are referred as upper bound critical values and for I(0) as lower bound critical values.

The result is taken by comparing the value of the F test with the value of the upper and the lower bound critical value. The decision made was, when the statistical value of F test greater than the upper bound critical value, the implication is that there is a long-run relationship between the variables. If the F statistic value lower compared to the upper bound, therefore there is not enough evidence to reject the null hypothesis of no cointegration between variables.

If there is a long-run relationship between the variables, the long-run model is estimated as below:

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

The optimal lag lengths for the ARDL model were selected by using either Akaike Information Criterion (AIC) or the Schwarz Bayesian Criterion (SBC). As in [8], they recommended choosing or using the maximum lag length of 2. But for the purpose of this paper, the optimal lag length is test starting from 2 until 5 and then the optimal lag length is choose based on the smallest probability value.

The short-run dynamics in ARDL can be derived by using or constructing the error correction model (ECM). The specification can be written as follow:

$$\Delta \ln(X/M)_t = \alpha_2 + \sum_{i=1}^p \phi_{2i} \Delta \ln(X/M)_{t-i} + \sum_{i=0}^p \theta_{2i} \Delta \ln(REER)_{t-i} + \sum_{i=0}^p \lambda_{2i} \Delta \ln(GDP)_{t-i} + \sum_{i=0}^p \phi_{2i} \Delta \ln(M3)_{t-i} + \Psi ECT_{t-1} + \vartheta_t$$

Whereby  $ECT_{t-1}$  is the error correction term which is define as:

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

All of the coefficients in the short-run equation are the coefficient that related to the short run dynamics of the model's convergence to equilibrium and the speed of adjustment is representing by the '*psi*' symbol ( $\Psi$ ).

After do the bound testing and error correction model, this paper also will look at the impulse response functions (IRF) which is used to look at the response of the variable at a given shock. In order to confirm the analysis done by ARDL, another method used in this paper is the Fully Modified Ordinary Least Squares (FMOLS).

#### 4. Result

It is good for any econometric analysis to pre-test the variable. The unit root test was conducted in order to know the order of integration. The test was conducted by using two methods which is Augmented Dickey-Fuller (ADF) and Phillip Perron (P-P). The rest is shows below (refer Table 1).

Table 1: Unit Root Test

Variable	ADF Test Statistics (with trend and intercept)		P-P Test Statistics (with trend and intercept)	
	Level	1 <sup>st</sup> Difference	Level	1 <sup>st</sup> Difference
Trade Balance [ln(X/M)]	-2.3936	-5.7918***	-2.6159	-5.7789***
Real Effective Exchange Rate [ln(REER)]	-1.8597	-5.3139***	-1.8597	-5.3012***
Income [ln(GDP)]	-2.9036	-5.4625***	-3.0185	-5.4515***
Money Supply [ln(M3)]	-1.4225	-3.7939**	-1.8118	-8.2631**

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

\*\* Significant at 5% level

\* Significant at 10% level

The table above shows that all variable are stationary at the first difference I(1). Therefore, the ARDL method can be proceed. This is because in the ARDL method, the dependent variable must be I(1) and the regressors can be either I(0) or I(1).

Table 2: F-Statistic for Testing the Existence of a Long-Run Trade Balance

Order of Lag	F-Statistic
2	4.6821 (0.008)
3	5.9784 (0.004)
4	4.5395 (0.024)
5	4.6297 (0.062)

Note: \* The value in parenthesis is the probability value.

\* The critical value bound which given in table C1(iii) by M.H Pesaran, Y.Shin and R.J Smith were referred. The values of 3 regressors are 2.72 – 3.77 at 90% level and 3.23 – 4.35 at 95% level.

Table 2 above is used in order to know the level of the optimum lag length that should be used in the next step. According to [10] for the annual data, the optimum lag length should be 2 and by referring to [3], he stated that the lag length decision is based on the first value that significant. In this case the lag length should be 2. But for this paper, the lag length that will be used for next step is 3 because the value of the probability of the F-statistic is significant at 95% level until lag 4 only and most significant at lag 3. Thus, the next step will involve the lag length 3.

Table 3: Long-Run Coefficient Estimates of Trade Balance

Regressors	Model Selection Criterion		
	R-Bar	AIC	SBC
	<b>2,0,0,3</b>	<b>2,0,0,1</b>	<b>2,0,1,0</b>
<b>LREER</b>	-0.3262 (0.027)	-0.3140 (0.101)	-0.3140 (0.101)
<b>LGDP</b>	0.3485 (0.018)	0.3223 (0.093)	0.3223 (0.093)
<b>LM3</b>	-0.3028 (0.014)	-0.2728 (0.088)	-0.2728 (0.088)
<b>C</b>	-3.5099 (0.126)	-3.2967 (0.273)	-3.2967 (0.273)

Note: \* Value in parenthesis is the probability value.

Table 3 shows the long-run coefficient estimates of trade balance by using lag length which is 3. The result shows a various value in the coefficient and also the probability value but same in the sign of the model. For variable LREER and LM3 the signs for all two lags were consistent which is negative and it also shows that there is a negative relationship between the exchange rate and money supply toward the trade balance.

The negative relationship between the money supply and trade balance occurs because when there is a fall in the domestic money supply which resulted from the tight monetary policy done by the Bank Negara Malaysia in order to control the inflation, it will make the foreigners to send their money domestically for more goods and services. On the other words, they will used their money to buy our products. Therefore it will improve our trade balance because we gain more export compared to import.

As for the GDP which has been used as the proxy to income, it shows a positive value and it also indicates that there is a positive relationship between the income and also the trade balance. This is following the monetary theory where the theory stated that an increase in the domestic income will lead to an increase in the demand for money and thus will make the export to increase and it will improve the trade balance.

The coefficient of the real effective exchange rate shows that it is a negative and it is significant at 5%. It also shows that the depreciation of our currency will not lead to an improvement in the trade balance. Thus it is not following the Marshall-Lerner condition which stated that suppose the depreciation of money or currency of one country that will lead to an improvement of the trade balance because the depreciation of money will make the export of the country to increase. This result were same as what stated by [4] where she found that the Marshall-Lerner condition were not hold. The different between this study and [4] is that she does not get a significant value for the real effective exchange rate but this study found that it is significant.

Table 4: Error Correction Representation of ARDL Model (Lag 3)  
(Dependent Variable is  $\Delta LTB_t$ )

Regressors	Model Selection Criterion		
	R-Bar	AIC	SBC
	2,0,0,3	2,0,0,1	2,0,1,0
$\Delta LTB_1$	0.5033 (0.012), [2.6869]	0.4485 (0.022), [2.4233]	0.4485 (0.022), [2.4233]
$\Delta LREER$	-0.2561 (0.097), [-1.7164]	-0.1889 (0.203), [-1.3006]	-0.1889 (0.203), [-1.3006]
$\Delta LGDP$	0.2737 (0.077), [1.8347]	0.1939 (0.187), [1.3506]	0.1939 (0.187), [1.3506]
$\Delta LM3$	-0.7057 (0.021), [-2.4480]	-0.7313 (0.015), [-2.5911]	-0.7313 (0.015), [-2.5911]
$\Delta LM3_{t-1}$	-0.2161 (0.420), [-0.81770]		
$\Delta LM3_{t-2}$	-0.2967 (0.227), [-1.2345]		
C	-2.7558 (0.183), [-1.3669]	-1.9833 (0.328), [-0.99484]	-1.9833 (0.328), [-0.99484]
ECM(-1)	-0.7852 (0.001), [-3.8265]	-0.6016 (0.002), [-3.4034]	-0.6016 (0.002), [-3.4034]
Adj R <sup>2</sup>	0.3270	0.3066	0.3066
F-Statistics	3.5726 (0.007)	4.2954 (0.005)	4.2954 (0.005)
DW-Statistics	2.0663	2.2586	2.2586

Note: Value in ( ) is the probability value and in [ ] is the t-ratios value.

Table 4 shows the result of error correction model for trade balance. As we can see in the table, most of the coefficient are insignificant at 5% except for lag difference of money supply. The negative sign of the coefficient is following the theory which stated that an increase in the money supply will make the local to buy more imported product. Therefore it will make the trade balance become worsen. From both table also, it shows that the money supply of that year only will affect the trade balance.

The error correction term ECM shows the negative coefficient and all the coefficient is greater than 0.5 and it is significant. It shows that the correction occur from the upper to bottom. The coefficient of the ECM for all criteria is greater than 0.5 and it shows that the correction can be said as a very fast action.

In figure 1, it shows the CUSUM and CUSUMSQ of the model. From the graph, it shows that the CUSUM for the model or analysis is still in the par or border. It also shows that the model is stable. The model also had passed the stability test of normality test, autocorrelation and heteroscedasticity test.

Table 5: FMOLS Result

<b>Regressors</b>	<b>Coefficient</b>
<b>LREER</b>	-0.4643***
<b>LGDP</b>	0.4383***
<b>LM3</b>	-0.3629***
<b>C</b>	-4.5935

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

\*\* Significant at 5% level

\* Significant at 10% level

Table 5 above shows the result of FMOLS where it shows that the LRER have a same sign which is negative and it also shows that the Marshall-Lerner condition in our country is not hold. Therefore, this result supports the ARDL result and does confirm that the Marshall-Lerner condition is not hold.

## 5. Conclusion

The significant effect of the real effective exchange rate is due to exchange rate policy exercised by the government which is Central Bank (Bank Negara Malaysia). It also shows that may be the central banks have made wrong decision during the exchange rate intervention. By looking at the central bank decision based on [4] explanation, it shows that the intention of the Bank Negara Malaysia is not for improving our export but more on attracting the direct investment from foreign countries.

From this study also, it shows that the Malaysia trade balance were most influence by the income which is GDP and also money supply but not the exchange rate because exchange rate were only adjust for attracting the foreign direct investment (FDI) only but not to improve trade. Therefore, as what has been suggested by [4] Malaysia trade balance would be better corrected by using income or growth or money supply policies compared to the exchange rate policy.

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