AN EMPIRICAL EVIDENCE ON THE IMPACT OF REAL EFFECTIVE EXCHANGE RATE ON TRADE BALANCE

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ABSTRACT

This study aimed to examine whether the real effective exchange rate has an impact on trade balance in short run and long run, as well as to investigate if the Marshall-Lerner condition and J-curve phenomenon is satisfied by the variables in Malaysia from 2010 until 2019. Monthly data was used where the dependent variable was trade balance and the independent variable was real effective exchange rate. Several econometric models are applied including the Johansen co-integration to investigate long run relationship and Marshall-Lerner condition estimation, VECM model to investigate short run relationship estimation and impulse response test for J-curve phenomenon estimation. The findings revealed that there was long run relationship between the variables and there was existence of Marshall-Lerner condition. Meanwhile, there was no short run relationship between the variables and J-curve phenomenon was not satisfied in this study. This could be due to devaluation of real effective exchange rate where will help to improve the trade balance in the long run but give a negative effect in the short run which not followed the J-curve pattern. Hence, the Malaysia government should take high concern of exchange rate policy as well as monetary and fiscal policy in order to help stimulate the exports and reduce the inflationary pressure due to devaluation of exchange rate.

INTRODUCTION

Based on Kenton (2020), trade balance which also referred as the international trade balance is one of the largest fundamental in a country balance of payments. As a definition, when we take the difference on import and export of a country of goods and services, it is classified as trade balance. According to the economists, the use of trade balance is to evaluate the relative strength of an economy within a country. And they also stated that a country will have a trade deficit if in value terms, it imports more goods and services than exports. Contrarily, a country will take into a trade surplus when their imports is less than the exports products and services. Generally, there are countries where a trade deficit is virtually likely to exist. However, it is good that Malaysia is going towards a trade surplus in 2020, specifically in February, where the exports has increased to 11.8% year-on-year (yoy) in ringgit terms from January: -1.5% (yoy). And it is supported by the value of imports which also increase to 10.0% yoy in USD terms from January: -1.7% yoy.

According to the increase value of Malaysia's trade balance, we supposed to know what factors that can give an effect to the trade balance of a country. Therefore, one of the factors that will be discussed in this research is the real effective exchange rate (REER), which according to Hayes (2020), it is the currency of a country weighted average relative to a basket of other main currencies. The weight mentioned are assessed by multiplying the relative trade balance of the currency of a nation against currency each country within the index. In general, the purpose of this exchange rate is to assess the currency value of a particular country in comparison with the other major currencies in the index and it is essential to use when the country want to assess its trade efficiency.

Since there is a trade surplus in Malaysia, it means that the value of real exchange rate in Malaysia is higher. This has been explained in Standard Trade Theory, which is related to merchandise, where if the real exchange rate in Malaysia (home country) increase, it will leads to a real depreciation. If real depreciation occur, the households in Malaysia will not be able to buy more imported goods and services, while the foreign households will purchase more domestics goods from Malaysia (Ali et. al., 2014). Therefore, Malaysia exports will be increased than imports and leads towards a trade surplus.

In addition to the previous situation, the trade balance will improve as the fall in domestic imports value declines over the domestic exports value. However, when a country is dealing with trade balance deficit, the Elasticity Approach is considered to apply, where it is necessary to evaluate the robustness of exports and imports to exchange rate changes in order to assess to which degree of devaluation will then have an effect on the balance of trade. Nonetheless, if the demand for foreign and domestic international trade is elastic, there will be high significance on trade balance when the REER change slightly (Daniels et. al., 2005). So in general, Elasticity Approach is where the trade balance and current account of both foreign and domestic nations are fully assessed by the movement of real exchange rate and domestic real income. This therefore supported by Marshall-Lerner Condition (M-L) where they stated that real currency depreciation will enhanced the current account if the import and export amount with respect to the REER are fairly elastic when all the determinants are equal.

Over three decades of revising on the M-L Condition, the J-curve phenomenon came as a continuation of the previous theory where it demonstrates how the trade balance can be affected by the devaluation of exchange rate of a nation over the time. In short, this J-curve theory is described as a complex view of Marshall-Lerner Condition. In this new era, this theory is one of the important theory or phenomenon that been revised by many economists and particularly tested by the researchers in their study, since it can

indirectly test the elasticity and M-L Condition approaches by evaluating the long term and short term coefficients of the exchange rate in the econometrics analysis which allowed the effect of the real depreciation of the exchange rate to be traced and it is easy to obtain trade data in testing this theory (Demirden and Pastine, 1995).

PROBLEM STATEMENT

The balance of trade includes the imports and exports condition, and it might influence by all the factors such as trade policy, inflation, demand, and exchange rate, that will affect the international trade. Throughout this study, we will focused on the REER as the factor that might affect the trade balance.

Malaysia's trade balance performance in 2020 is in the positive condition where the trade surplus of Malaysia is widened by 98.7% to RM20.9 billion in June 2020 (Figure 1) and was the largest achievement recorded up to this time (Syafiqah Salim, 2020).
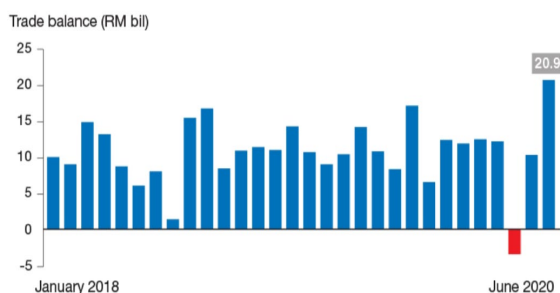

Figure 1 Malaysia trade surplus from January 2018 to June 2020
Source: Department of Statistics Malaysia (DOSM)

The balance of trade in Malaysia is in trade surplus generally because of the increase in exports value and from the decline of the imports value. Based on the Department of Statistics Malaysia (DOSM), the exports of Malaysia has been increased of 8.8% to RM82.9 billion (Figure 2) in June (now 98.7% to RM20.9 billion) from a decline of 25.5% in May 2020. Whereas, the imports value is declined by 5.6% year-on-year, valued at RM62 billion.
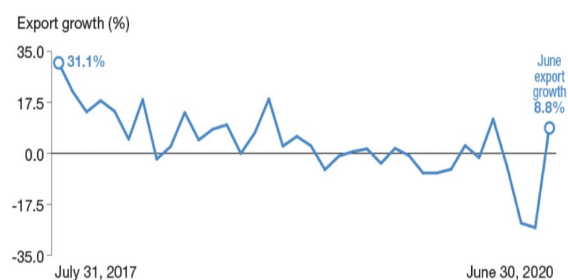

Figure 2 Malaysia export growth from July 2017 to June 2020
Source: Bloomberg

Apart from that, DOSM mentioned that the exports value expand by three main countries which are the US, China and Hong Kong with addition of exports value for about RM2.1 billion, RM4.7 billion and RM1.4 billion respectively. While the lower imports were mainly from the Republic of Korea, Thailand, Singapore and European Union, which has decrease for about RM706.6 million, RM723.1 million, RM772.8 million, and RM1.1 billion respectively. In addition regarding the exports and imports, there is a key point to remember that both products and services are listed for exports and imports, where it is will determined a trade deficit which is a situation where exports is less than imports, and trade surplus where exports is more than imports.

Considering the difference across countries and time in trade balance, it is crucial to ask what are the key factors influencing trade balance, and different effects occur across the countries. Generally, one of the major economic variables of the comparative advantage of the economy is the REER, and thus has a tremendous effect on foreign trade growth in the world. This indicates that the trade balance will be boost when the real effective exchange rate is depreciated. When this happen, the export and import industries within a country's economy will has a positive impact and will help citizens to get more jobs and income. However, there will be negative impact on balance of trade when the real exchange rate is appreciated, where it will increase the problem of greater unemployment on the domestic economy

when the demand drop off. Because of this, it is confirmed that real effective exchange rate is being focused by all countries in measuring the effectiveness of trade balance.

RESEARCH QUESTIONS

Since one of the major concern in assessing the trade balance for both developed and developing countries is the real effective exchange rate, it seeks to answer this three main questions: (1) does real effective exchange rate give an impact on trade balance in the long run? (2) does real effective exchange rate give an impact on trade balance in the short run? (3) does real effective exchange rate and trade balance will satisfied the Marshall-Lerner condition and J-curve phenomenon?

RESEARCH OBJECTIVES

Regarding to the questions, the specific objectives of this study is to analyze whether the real effective exchange rate has a significant impact on trade balance in short run and long run for a developing country which is Malaysia, and to investigate if the Marshall-Lerner condition and J-curve phenomenon will be satisfied by the both variables.

LITERATURE REVIEW

Up to this time, the impact of real effective exchange rate on trade balance of both developed and developing countries has attracted a large number of researchers all over the world where numerous studies have been carried out and the results were mixed in general and both in short run and long run and most of them take some theories into their studies such as Marshall-Lerner condition, elasticities approach and J-curve phenomenon. Some of the researchers found that the real effective exchange rate will affect the trade balance of a country, and some found that there is insignificant impact of the real exchange rate on the trade balance, while some stated that there is no any affiliation between the both variables.

Basically, there will be different effects on the trade balance of a country in short and long run when there is a changes in the real effective exchange rate (REER). Before we take into the explanation of theories, here is the definition of the trade balance (TB_t) where it is defined as the exports value ($Qx_t \times Px_t$) minus the imports value ($Qm_t \times Pm_t$) and can be shown in the following equation.

$$TB_t = (Qx_t \times Px_t) - (Qm_t \times Pm_t) \qquad (1)$$

Where:

Qx_t = exports volume in domestic currency in time period t
Px_t = exports price in domestic currency in time period t
Qm_t = imports volume in domestic currency in time period t
Pm_t = imports price in domestic currency in time period t.

Generally, there are many factors that will affect the trade balance other than real effective exchange rate which can explain some theories that related in this study. One of it is a devaluation on the currency of a country. A devaluation in brief can leads to a decline in the currency value of a country with the other currencies and will makes the exports to be cheaper in the foreign currency units, while makes imports to be more expensive in terms of domestic currency units. When the price of exports decrease, the quantity demanded of exports will increase. Whereas, when the price of imports increase, the quantity demanded will decrease. Unless such limits on demand and supply of imports and exports are met, a currency depreciation will lead to a rise in export value and a decline in import value. Therefore, a devaluation of a country's currency over time, it can be expected to improve its trade balance.

This can explain the elasticity approach to the balance of payments where sits under the Marshall-Lerner condition (M-L) which also called the Marshall-Lerner-Robinson condition (MLR). Before we take into the M-L condition, here is some view of elasticity approach.

Basically in this approach, the changes in balance of trade is determined by the basic of demand elasticity for imports and exports. In brief, demand elasticity is the quantity of demanded goods and services that being responsive to the price changes (Howitt et al., 1980). In general view, most of the discussions on this elasticities approach regarding the changes in real exchange rate has involved the volume and value, and implies the view of the supply and demand of imports and exports, and the initial volume of trade. Thus, to understand more about this approach, it can be summarize by the following figure (Figure 3).
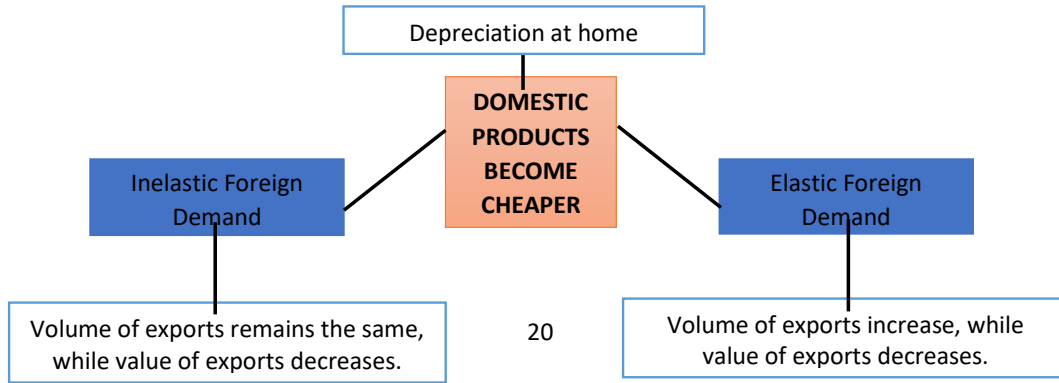

FIGURE 3 Elasticities Approach (foreign demand case)

To take further purview of the elasticities approach, Marshall-Lerner (M-L) condition is taken into account. Based on Caves et al. (1996), when the M-L condition holds, the export will increase while the imports will decrease. This is due to the supply curves of import and export which are perfectly elastic and because of the import absolute value and export relative prices has exceed one. Otherwise, when the supply curve of import and export are not perfectly elastic, the theory of Bickerdicke-Robinson-Metzler condition must be satisfied to improve the trade balance rather than the Marshall-Lerner condition.

So in brief, there are two basic assumptions of M-L condition which firstly, trade must be balanced to make sure the ratio is equals between the value of foreign currency of imports and exports when the exchange rate depreciated. Secondly, to ensure the elasticity of supply are infinite, the prices must be fixed in seller's currencies. Hence, this assumptions can be explain briefly in the following figure.
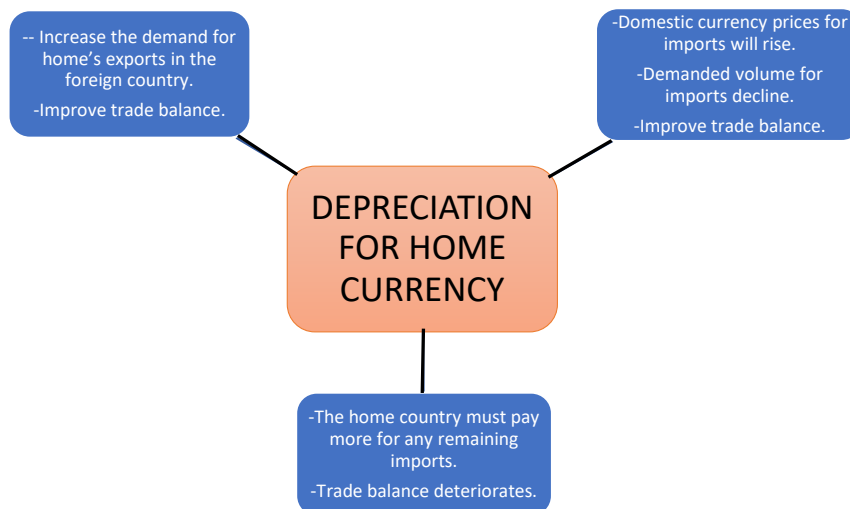

Figure 4 Marshall-Lerner Condition

Therefore, in order to see if the factor which is a devaluation will influence the trade balance and holds the Marshall-Lerner condition (M-L) or not, some previous studies will be discussed. In a test on Jamaica's balance of payments, Gafar (1981) analyzed that devaluation was effectively influence the adjustment of trade balance as the M-L condition was fulfilled for the exchange rate stability. This was supported by Briguglio (1989) who investigating whether or not a decline in the Maltese lira's external value would improve the Maltese trade balance, where he also assist that the M-L condition was hold by indicating the estimation export and import demand price elasticity and therefore will improve the balance of trade.

Apart from that, Himarios (1989) also support that devaluation has been a strong policy in adjusting the balance of trade. In his study, 27 countries which includes 60 episodes of devaluation were involved in examining the effectiveness of devaluation on the balance of trade. Other than that, based on the empirical results that tested by Hernan Rincon (1999) using Johansen-Juselius method, there is also a significant evident for the M-L condition among the exchange rate and trade balance. And as indicated by Onafowora (2003), there is significant result on exchange rate effecting trade balance under the M-L condition of some Asian countries including Malaysia.

Furthermore, Mahmud et al. (2004) who focused on the import and export price elasticity for six developed countries also found that the Marshall-Lerner condition is satisfied but only for some periods. He also added that the Marshall-Lerner condition is fully valid in a fixed exchange rate regime according to his findings. The other researchers from my exploration that found the same results is Hooy and Chan (2008) where they use the analysis from Bounds Testing Approach with the data period from January 1990 to January 2008. And the latest researcher that I found supporting this positive result is Türkay (2014). In his research for the case of Turkey,

he observed that when the export and import demand elasticity has exceed one, the M-L condition will exists.

Notwithstanding with some of the researcher's study, there are several studies that found a diverse results. Firstly is Rose (1991) who studied on the relationship between the trade balance and exchange rate of the United States, Japan, Germany, Canada and United Kingdom which are the major OECD countries. Based on his results, he found that the M-L condition does not exist and there is insignificant between the variables and stated that trade balance could not improve because of devaluation. In the end, he predict that significant results will hold through the balance of trade with respect to the exchange rate that treated as exogenous variable. Apart from this, South Asian countries also failed to fulfil the M-L condition according to Shahzad et al. (2017). This is because of the total value of export and import trade balance is less than one and because of there is currency depreciation which cannot improve the trade balance. This is also same with Hatemi and Irandoust's (2005) who used co-integration test, where they determined that the M-L condition does not satisfied the variables in Sweden. This might be because of the Sweden's balance of trade that is not sensitive in the real exchange rate.

Regarding to the M-L condition, there are also few researchers that supports that M-L condition with the view on elasticities approach in devaluation aspects. This is because the elasticities approach has mentioned that devaluation of a country's currency will make the balance of payments to be offset to be depending on the elasticity of demand of imported and exported products. So in short, there will be three ways of effects on balance of payments due to the devaluation. Firstly, when the imported goods decrease, the price will increase. Secondly, when price of exported goods decrease, the value of export will increase. And thirdly, devaluation will lower the revenue from one exported good.

Thus, the final results of these three impacts will basically depend on the export and import elasticity, where the impact will be positive when the total of export and import elasticity has exceed one.

Over the time, a comprehensive literature has developed in explaining the continuation of the Marshall-Lerner condition and elasticities approach, which is the J-curve phenomenon.
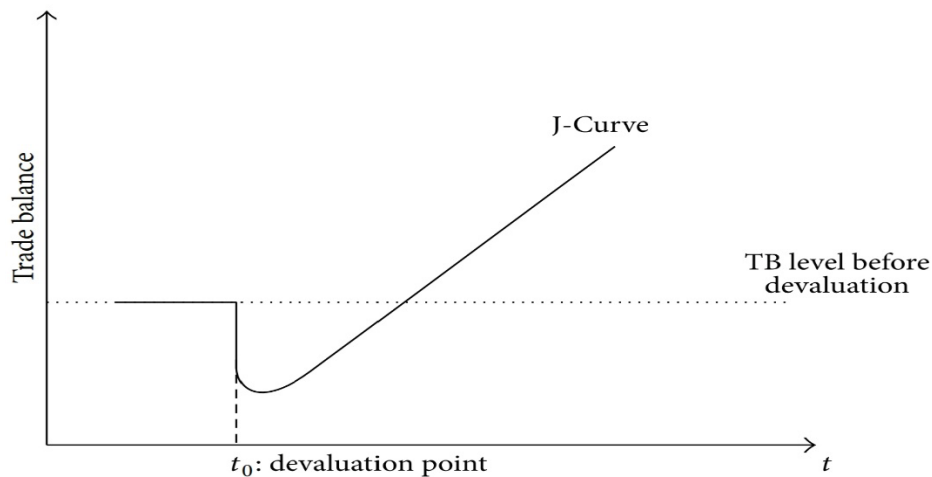

Figure 5 J-curve Phenomenon

The J-curve phenomenon basically is the phenomenon where after a devaluation or weakening of its currency, a country's balance of trade is initially worsens until it recovers to a higher level than where it began. Or in other point of view, the J-curve phenomenon is called the unfavourable effect of devaluation on the trade balance. In the trade balance of a country, this effect is observed due to the more cheaper exports and expensive imports forced by the weakened currency which give results of a smaller surplus or a greater initial trade deficit.

Nevertheless, since the currency terms of exports from the affected nation are now cheaper, the imports products will be expensive and leads the local consumers to substitute them with comparable products within their country which have now become more affordable. Hence, the balance of trade gradually improves and snaps back to a higher level than it was at before the exchange rate fell and the uncertainty is due to the fact that pre-existing contracts have to be honoured by importers and exporters, so that the trade levels remain constant at first, although the exchange rate and relative prices have

changed. And the main reason why this J-curve phenomenon is among the literature's greatest tested and debated theories is because it can indirectly tested the elasticity and M-L condition approaches by comparing the long run and short run coefficients of the real exchange rate in the econometric analysis by the empirical research.

Instantly after currency devaluation in the short run, inflated import prices were face by the domestic importers and make a decline in net exports. Conversely, the exporters within the home country in the devaluating country face lower export prices since the demand of imports and exports is fairly inelastic in the short run. The reason why inelasticity of demand occur is due to the sluggishness changes of consumer's behaviour and the renegotiating deals lag. However, according to the J-Curve phenomenon prediction, the balance of trade will improve to a higher level compared to its level before depreciation in the long run. Therefore, the shape of J-Curve phenomenon is in a flattened J letter where there is a dynamic reaction of balance of trade as a short run deterioration and long run improvement.

In overall view of the theories, firstly based on Krueger (1983) through the elasticity approach to exchange rate, when the devaluation or depreciation could influence a shift in the balance of trade over the short term, the transactions will be fulfilled. However, Williamson (1983) in his study revealed that devaluation that cause higher import prices can make the non-commercial goods within the home country to be more costly. Thus, the results of overall inflation will raise the REER and hence will eliminate the possibility of the trade balance to increase. To add, when there is an increase in imports and exports elasticity, the quantities will change to the regulated effective price and will improve the balance of trade subsequently.

Otherwise, the persistence of trade deficit against currency depreciation implement that the J-curve effect is characterized by a real currency depreciation on trade balance as an initial unfavorable effect before leading to an improvement in long run. Besides, it is also can be explained in terms of price and volume effects. On the other hand, when Marshall-Lerner condition is satisfied, the imports price will increase because of the depreciation of currency and thus will make the export quantity to decrease and leads to a conducive effect on the trade balance and vice versa. Therefore, based on the discuss theories, a country should focus on the REER as a determinant of their trade balance as it represents the goods and services rate for the home country to be exchanged with the foreign products.

Consequently, to show the results of the main focus of this study which is the impact of real effective exchange rate (REER) on trade balance in both short run and long run, there are several studies that has been done. In general findings or conclusion in previous study, there are many of them showed an insignificant result on this two variables. Firstly, Rose (1990) analyzed that there was few evidence to show that the real exchange rate can effect the balance of trade although he used the three-stage least squares on several developing countries. Also in his further study in 1991, he still get the same results even though he using a number of techniques for five OECD countries.

While for Liew, Lim and Hussain (2003) who focused on ASEAN countries in investigating the impact of REER towards trade balance, they suggest that real money has been the main factor that effect the trade balance rather than the exchange rate. This result also consistent in Singapore and United States which investigated by Wilson and Kua (2001), where they indicated that there is no significant impact of the exchange rate on the bilateral trade balance. In further research by Har W. M. et al. (2014), he also found the same results as Wilson and Kua (2001) but he added that the M-L condition also does not exist in Malaysia.

Despite of this negative result in general view, there still a few studies which give a positive impact on this two variables. Firstly, Thorbecke (2006) demonstrate that the export will decline when appreciation holds based on his empirical study for Malaysia, Indonesia and Thailand. Besides, he also indicates that the trade within the Asian country could be affected by the change of exchange rate. This results also supported by the research of Ahmad et al. (2014), where the real exchange rate can improve the balance of trade in Pakistan, and by Baharumshah (2001) who found the same results but added that devaluation can improve the trade balance of domestic and foreign economies in the long run.

Aside from that, the results in short run where almost all researchers take the perspectives of J-curve phenomenon, showed mixed outcome. According to Kapoor and Ramakrishnan (1999) who employed the error correction model (ECM) to investigate the impact of exchange rate on trade balance during the floating regime for Japan, they determined that J-curve effect was existed. Whereas for the researchers who studied this dissertation in 2001, mostly found that

there is no significant results on J-curve phenomenon by this two variables, which are balance of trade and real exchange rate. Firstly by Baharumshah (2001) who used Johansen Multivariate method where he showed that J-curve phenomenon and causal run from exchange rate to trade balance does not exist. Secondly by Boyd et al. (2001) who found that the existence of J-curve approach will shows a depreciation that cause the trade balance in the very short-run to be worse. Kale (2001) also found the similar results but used differ explanation which he found that a delayed J-curve effect on trade balance of Turkey occur due to the real depreciation. And the last researcher in 2001 who found the same result is Wilson (2001). He indicated that there is no evidence of the J-curve phenomenon, except for South Korea's trade with the United States through his study on determining the relationships between exchange rate and the bilateral merchandise trade balance among Malaysia, Singapore and South Korea against the US and Japan.

Apart from this negative results that not supporting the result from Kapoor and Ramakrishnan (1999), there still many other previous study that give a positive results. Firstly by Anil and Thomas (2002) where they confirmed the existence of J-curve effect in their investigation of seven East Asian countries. In their research, they employed error correction model to analyzed the results and they showed a significant differences in the duration and the extent of the J-curve effect. Also, they mentioned that the short run dynamics of this approach can be the main role in modelling the trade balance of the countries. This is supported by Narayan P. and Narayan S. (2004) where they stated that J-curve effect can be demonstrated by the effect of exchange rate on balance of trade. In recent study by Jamilov (2011), he concludes that trade balance can be affected negatively when the exchange rate increase. This probably happen in some period of time which basically 12 months, and after some time, positive impact will holds where the J-curve effect is valid at that time.

Done for the results in short run for the trade balance and real exchange rate, there are also mixed results in the long run. In a case study of Least Developed Countries (LDC), Bahmani-Oskooee (1991) investigate the relationship between exchange rate and trade balance and has found negative results in some of her samples. This conclude that in certain cases, there will be an existence of inelastic demand of import and export. While in her further study of 11 Middle East countries which carried out by co-integration techniques in 2001 for long run relationship, she found that trade balance could be improve by devaluation and she also stated that there is co-integration between the two variables. This study coincides with Arize (1994) where he found positive long run relationship for both variables by using data of nine Asian economies. However, it is still argued by Boyd et al. (2001) where they found negative long run relationship in the United States, and by Yamak and Korkmaz (2005) where they found no correlation between both variables in long run although they employed the Granger causality test and VaR model based on quarterly data for Turkey from 1995 until 2004.

Nevertheless, there still more of the positive results regarding the two variables rather than negative. To continue showing the previous study's significant results, Narayan et al. (2004) who make research on Fiji, found that there is relationship between the real exchange rate, trade balance and income of foreign and domestic in long run. In the investigation of the two variables in Nigeria by Igue and Ogunleye (2014), the trade balance was found to exhibit positive relationship with the depreciation of exchange rate in long run. While in the case of Bangladesh, Aziz (2008) demonstrate that Bangladesh's trade balance was significantly influenced by the REER in both long and short run, where it is proved by the Granger Causality. In addition to that, he also study on the Marshall–Lerner condition in Bangladesh and has showed an opposite response of J-curve effect to exchange rate depreciation.

Aside from that, Yasmina Guechari (2012) who done empirical research on the Algeria bilateral trade balance against France and the US, and on the total balance of trade, state that it is significantly affected by the REER. While according to Yuen-Ling et al. (2009) who studied on the relationship of trade balance and real exchange rate in the case of Malaysia covering the period of 1955 to 2006, found that there is relationship between the variables in long run. In addition to that, they explain that the real exchange rate is important to a country's balance of trade and devaluation is needed to improve the trade balance in the long run which is consistent with the M-L condition. Finally based on their results, J-curve effect does not exist in Malaysia.

In addition to the impact of real effective exchange rate on trade balance in Malaysia, Yusoff (2007) used the co-integration technique in examining the relationships among trade balance, real exchange rate, and world and domestic income in short and long run in the case of Malaysia. In his findings, he shows that the trade balance could be improve in the lomg run when a real ringgit exchange rate is depreciated. Also in his his other determinants of the study which are domestic and world income, he stated that it will be a significant factor in influencing the trade balance of Malaysia and later will prone to external shocks. While in short run where he employed the error correction model, he analyzed that the trade balance can be affected by the exchange rate only in three years period and after some periods of time which the balance of trade starts to dip, the situation will improves again and hence make a delayed in the J-curve effect.

In conjunction with that, Adznan et al. (2018) who run an empirical testing for Malaysia using the most recent monthly data and an advanced techniques which are ARDL and NARDL, found that trade balance can be affected by the REER. They also specified that Malaysia trade balance is worsened together with the J-curve phenomenon in the short run. Besides, they also found the existence of a depreciation trade-off between the import and export sectors and between the long run and short run. And from the overall findings, they conclude that the trade balance could be improve when the currency is depreciated moderately by a policymaker with the needs of managing the cost incurred effectively.

Based on the review of the literature, the impact of real effective exchange rate on the trade balance has been continued to be debated among the researchers for almost three decades which through my investigation on some studies that start from 1981 until 2018. And most of the studies has found an inconsistent results on their analysis regarding to this issue. Furthermore, most of their investigation was focussed on international studies while some of them studied on a wide area which is Asian countries, but owed limited research on the subject in Malaysia specifically (Baharumshah, 2001; Yusoff, 2007; Yuen-Ling et al., 2009; Har W. M. et al., 2014; Adznan et al., 2018). And lastly from my investigation on the previous studies, most of the researchers are likely to use some common methods in testing their data. This include the OLS and ARDL model, VAR model, co-integration techniques (Johansen) and error correction model (VECM).

DATA AND METHODOLOG

Data Collection

In this study, the secondary data is used and the study employed 120 monthly observations from the periods of 2010 to 2019 of Malaysia. Monthly data is used because the annual and quarterly data of both variables (REER and trade balance) on the stated periods are not completely available in the system. The data for trade balance was obtained from the United States Census Bureau which is one of economic indicator database that provide high quality data. The trade balance is in Ringgit Malaysia (converted from US dollar)

based on the data provided. Whereas the data for REER was obtained from World Bank Global Economic Monitor which is observed in index number.

Research Framework

The proposed research framework was adopted from the study by several researchers including Adznan and Mansur (2018), Aziz (2008), Baharumshah (2001), and Yasmina (2012), regarding to both variables used in this study which are trade balance and real effective exchange rate.

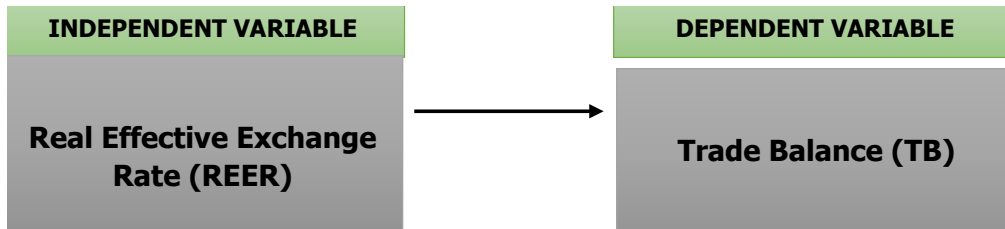| INDEPENDENT VARIABLE	DEPENDENT VARIABLE
Real Effective Exchange Rate (REER)	**Trade Balance (TB)**

Figure 6: Theoretical Framework

From the above theoretical framework in the Figure 6, the independent variable used in this study is real effective exchange rate (REER), while the dependent variable is trade balance (TB). The REER is chosen to be the independent variable to trade balance due to the vital role of affecting the level of trade of a country which is important to most every free market economy including Malaysia. And since the trade balance will basically include the exports and imports, the movements or condition of REER is probably needed in helping a country to assess its trade capabilities. Or in short, the existence of REER will determined the demand of imports and exports that will give an impact on a country's trade balance. Therefore, the following figure will help to demonstrate the likely impacts of REER changes on trade balance.
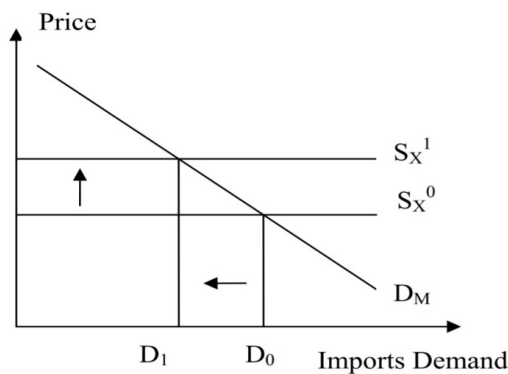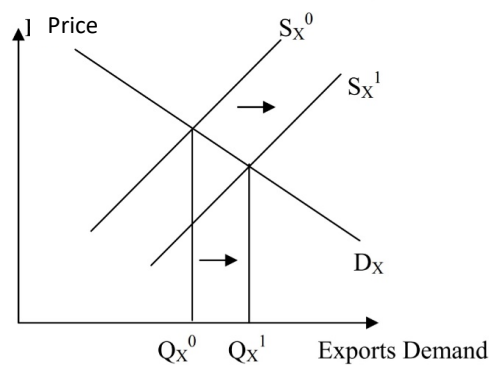
Figure 7(a)

Figure 7(b)

Figure 7: Imports and exports demand

As we can see in Figure 7(a), it shows that the imports demand is decreasing since there is an increase in imports price due to the increase in the REER. Whereas in Figure 7(b) shows that when the REER is increasing, the exports commodities will become cheaper to the importers and thus lead to an increase in exports. Hence, an increase in the real effective exchange rate is expected to improve the trade balance of a country.

Measurement of Variables

The dependent variable which is trade balance, is basically a component of the balance of payments current account and it is calculated by the total of exports value minus the total of imports value. While the independent variable which is the real effective exchange rate, is basically the weighted average of currency of a country in relation to an index of other major currencies where the weights are determined by comparing the relative trade balance of country's currency against each country within the index. In brief, trade balance is measured in Malaysian Ringgit, while real effective exchange rate (REER) is measured in index.

Model Specification

In order to conduct this research, an empirical model is formed as the equation below:

TB = F(REER) (2)

Where:

TB = Trade Balance,

REER = Real Effective Exchange Rate

This model is developed with a hypothesis that trade balance is a function of real effective exchange rate (REER). Therefore, this model can be converted into an econometric model which is a log-linear specification model, with the linear structure as below:

$$LTB_t = \alpha + \beta_1 LREER_t + \varepsilon_t \qquad (3)$$

Where:

LTB_t = logarithm of trade balance at time t,

$LREER_t$ = logarithm of real effective exchange rate at time t,

α = constant,

β_1 = coefficient,

ε_t = error term.

Estimation Methods

There are several estimation methods that has been used in this study to estimate the objectives which includes unit root testing, co-integration testing, error correction model (ECM), residual diagnostics, stability diagnostics and impulse response function. All of this model testing were done by EViews which is the worldwide leader in Windows-based econometric software to efficiently manage the economic data in any formats, statistical analysis and perform econometric, model stimulations or generate forecasts, and produce high quality tables and graph.

Unit Root Test

Firstly, unit root tests need to be conducted which includes the level and differenced forms of the variables. This test is necessary because all the variables need to be non-stationary in the co-integration tests. Stationary variables are described as variable that have coefficient mean, variance and covariance. To add, the variable will not contain theoretical information, and thus co-integration test cannot be conducted if a variable is found to be stationary (Adznan et al., 2018). There are two tests that are usually used for testing stationarity in most of the study which are Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. According to Dickey and Fuller (1979), ADF test conducts the autocorrelation only, while PP test conducts both autocorrelation and heteroskedasticity based on Phillips and Perron (1988).

The simple ADF unit root test is described as follows in equation (4).

$$y_t = \alpha y_{t-1} + x_t`\delta + \varepsilon_t \qquad (4)$$

where $\alpha = \rho - 1$. Enter lags of the order ρ in the equation, the ADF formulation allowed a higher autoregressive process. So when applying this test, the lag should be determined. The null and alternative hypothesis may be written generally as,

H$_0$: y = 1
H$_1$: y < 1 (5)

In this study, the null hypothesis y = 1 of unit root will be tested against the alternative hypothesis of y < 1. The test statistic which is larger than the critical value will cause the null hypothesis of y = 1 should not be rejected when the unit root exist and the variables are non-stationary. While the alternative hypothesis of y < 1 should be rejected when the variable is stationary and the time series does not represents unit root. The unit root test hypothesis of this study on ADF test can be formatted as below:

H$_0$: The variables contains unit root and is non-stationary.
H$_1$: The variables does not contains unit root and is stationary. (6)

While the ADF test regression includes lags of the first differences of y$_t$, the PP test involves fitting (1), and the results are used to calculate the test statistics. The PP test is tried to correct any serial correlation and heteroskedasticity in the error term, ε. The two advantages of using PP test compared to ADF test are PP test user does not have to specify a lag length for the regression test and is robust to general forms of heteroskedasticty in the error term, ε. The unit root test hypothesis on PP test can be formatted as below:

H$_0$: The variables contains unit root and is non-stationary.
H$_1$: The variables does not contains unit root and is stationary. (7)

Co-integration Test

Once all the variables are in the same order of integration or are non-stationary, the study proceeded on to test the long-run behaviour of economic variables, named co-integration test (Aziz, 2008). But before proceed in doing the co-integration test especially the Johansen co-integration test, it is crucial to perform the VAR order selection first, in order to determine to optimum number of lag for variables used in the study according to Adznan et al. (2018). As an assumption for this study, the data obtained two variables which are trade balance and real effective exchange rate (REER). After the variables are converted into the first difference, the variables are assumed to be stationary. So in brief, the Johansen co-integration test is used to examine the long run impact of real effective exchange rate (REER) on trade balance.

Error Correction Model

In general, the error correction model (ECT) has given to build the vector error correction model (VECM) that illustrates the short run and long run relationship among the variables. It is also indicates the causality among the variables and used to make a distinction of the exogenous and endogenous variables.

Residual Diagnostics

Residual diagnostics checking for the model when all regression is done. This will include the normality test, serial correlation test and heteroskedasticity test. In brief, residual diagnostics is need to be done in every empirical study as we need to know whether the model in the study is fit the observed value of the dependent variable.

Normality Test

The normality test in any statistics is done to show the normal distribution of the residuals. The purpose of this test is to show how well the data set is in the model through the normal distribution. Also, it is a way to compute whether the data set is normally distributed or not. This test will displays a histogram with the descriptive statistics of the residuals which include the Jarque-Bera statistic for testing the normality.

Serial Correlation Test

Serial correlation can be defined as the relationship between a variable and a lagged version of itself over different periods of time. Reroute often display serial correlation when a variable's level influences its future level (Benton, 2019). In most study, Breusch-Godfrey serial correlation LM test will be used. Based on this test, when the value of the variable serial correlation is measured as zero, there will be no correlation, and give a meaning that all variables is independent with one another.

Heteroskedasticity Test

Heteroskedasticity test is used to test the range heteroskedasticity specification in the residuals equation. In this study, Breusch-Pagan-Godfrey heteroskedasticity test will be used where it is a test of the null hypothesis of no heteroskedasticity against the unknown heteroskedasticty in general form. In brief, this test is used to identify heteroskedastic errors in regression analysis.

The null and alternative hypothesis of the heteroskedasticity test in general is formatted as follows:

H_0: No Heteroskedasticity
H_1: Heteroskedasticity exists   (8)

Stability Diagnostics

After done with the residual diagnostics, stability diagnostics will be performed. In this study, the cumulative sum of squares test (CUSUM) will be applied. According to Brown et al. (1975), the CUSUM test is used to examine variables consistency of the equation. In CUSUM test, there will be a plot of the CUSUM of square residuals together with two critical lines shown in a graph figure. In this test, the variable is instable if the CUSUM is at outside the region of the two critical lines. In addition, the null hypothesis cannot be rejected at the 5% level by the computed CUSUM squares in most study.

Impulse Response Test

In order to provide information about the short-term responses for the dependent variable which in this study is the trade balance, impulse response function is used. Or in brief, impulse response test is needed to show the existence of J-curve effect in this study. If J-curve phenomenon exist, then the response of the dependent variable will reflects a J-shape, indicating the independent variable to cause a worsening of the dependent variable and the only after several quarters, the improvements will occur.

EMPIRICAL RESULTS

Unit Root Test

In order to test the existence of unit root in the variables, which are the logarithm of trade balance and real effective exchange rate, the ADF and PP tests are carried out in this study. The variables are tested with intercept and trend at level and first difference. The Table 1 below shows the results of unit root test.

Table 1 Results of Unit Root Test

Variables	ADF Statistic	
	Level	First Difference
	Intercept & Trend	Intercept & Trend
LTB	-1.319988(12) **Prob.** 0.8776	-4.602813(11)*** **Prob.** 0.0017
LREER	-3.182085(1) **Prob.** 0.0931	-8.666668(0)*** **Prob.** 0.0000
Variables	PP Statistic	
	Level	First Difference
	Intercept & Trend	Intercept & Trend
LTB	-8.162113[6]*** **Prob.** 0.0000	-33.87230[18]*** **Prob.** 0.0001
LREER	-2.709782[1] **Prob.** 0.2347	-8.512209[6]*** **Prob.** 0.0000

Notes: Figures in ( ) and [ ] denote the lag length and bandwidth structures respectively.
*** indicates significance at the 1 per cent level.

According to the results for ADF and PP statistic test, it shows that the t-statistic of LTB and LREER is significance at the 1 percent level at first difference. Therefore, the

null hypothesis is rejected at 1% significance level where unit root test does not exist and the data is stationary for both variables. Even though the t-statistic of LTB is also significance at the 1 percent level at level, we still conclude that the monthly time series of LTB and LREER are integrated at order one, I(1) according to the unit root test results.

Co-integration Test

The result of Johansen co-integration test is shown in the Table 2 below. This test includes the trace statistic and maximum eigenvalue test. Based on the both test, there were one co-integration equation between the variables.

Table 2 Johansen Co-integration Result

Hypothesiezed No. of CE(s)	None*	At most 1
Trace Statistic	21.31735	0.651921
Critical Value 0.05	15.49471	3.841465
Probability	0.0059	0.4194
Max-Eigen Value	20.66542	0.651921
Critical Value 0.05	14.26460	3.841465
Probability	0.0043	0.4194

Trace and Max-Eigen value test indicates 1 and 1 co-integration respectively at the 0.05 level.
*denotes rejection of the hypothesis at the 0.05 level.

Based on the trace test result, there was one co-integrated equation at 5 percent significance level where the trace statistic value (21.31735) is more than the critical value of 15.49471 at 5 percent significance level. Therefore, the alternative hypothesis will be accepted while the null hypothesis will be rejected. According to this, there was long run relationship that integrated the variables.

While in maximum eigenvalue test, the null hypothesis is rejected at 5 percent level of significance since the maximum eigenvalue (20.66542) has exceed 5 percent level (14.26460) and that was statistically significant. Hence, there were co-integrations between the variables.

Thus, it confirms that there are long run relationship between trade balance and real effective exchange rate (REER) for both test. And the restricted VAR which was known as VECM can be run due to the existence of co-integration between the variable based on the maximum eigenvalue and the trace statistic. But before we continue into the VECM result in the next section, here is the explanation of the existence of Marshall-Lerner condition in this study based on the co-integrating equation below.

$$LTB_t = -0.069046 + (-0.026993)LREER_{t-i} + \varepsilon_t \quad (9)$$

So based on the equation (9) above, the elasticity of the trade balance with respect to the REER in the long run is negative. Hence, this indicates that a depreciation of the REER will improve the trade balance in long run. Since Malaysia has indirectly quotes the REER, this means that when the Malaysian ringgit (RM) has increase or appreciated by 1%, the trade balance will decrease or deteriorate by 2.7%. While, when the Malaysian ringgit has depreciated or decrease by 1%, there will be an increment or improvement in the balance of trade.

Therefore, the Marshall-Lerner condition (M-L) is satisfied as the REER is depreciated and will make an improvement towards the balance of trade in long run. This is supported by Yusoff (2009) and Andersson (2010) where they stated that the coefficient of the exchange rate provides evidence of the M-L condition if the exchange rate depreciation improves the trade balance in the long run.

Vector Error Correction Model (VECM) Result

According to the Max-Eigen statistic through the Johansen co-integration test, there were long run relationship between the variables. Hence, we can run VECM test to determine short run relationship. Therefore, based on the VECM, all the variables were converted into first difference automatically, and the model that the system created was as follows.

D(LTB) = C(1)*(LTB(-1) + 5.31751501028*LREER(-1) - 39.8012947867) + C(2)*D(LTB(-1)) + C(3)*D(LTB(-2)) + C(4)*D(LREER(-1)) + C(5)*D(LREER(-2)) + C(6)

From the model above, Wald test was run to know the existence of short run relationship between the variables. The null hypothesis for Wald test is shown in the table 3 below.

TABLE 3: Wald Test Null Hypothesis

Dependent Variable	Independent Variable	Null Hypothesis
D(LTB)	D(LREER)	C(4)=C(5)=0

To interpret the results of Wald test, we will focused on the p-value of the results. To reject the null hypothesis, the p-value must be less than 5 percent. Hence, the following table 4 is the result of Wald test.

TABLE 4: Wald test Result

Variable	Hypothesis	Value of Chi-square	p-value	Short Run Relationship
D(LREER)	C(4)=C(5)=0	0.433600	0.8051	No

Based on the Wald test result above in table 4, the real effective exchange rate (REER) does not give an impact towards trade balance in the short run. Or in brief, there is no short run relationship between the trade balance and the REER since the p-value is greater than 5 percent.

Serial Correlation Test

To analyse the result of this test, we will focused on the first part of the table that presents the two statistical tests which are the F-statistic and R-squared, as well as the probabilities that associated to these tests. So the table 5 below shows the results of serial correlation LM test with lagged 2. Based on the table, the probability of both tests is greater than the significance level of 5 per cent which is 34.93. Therefore, we accept the null hypothesis and we can conclude that there is no serial correlation on the model.

TABLE 5: Result of Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:			
Null hypothesis: No serial correlation at up to 2 lags			
F-statistic	0.997741	Prob. F(2,109)	0.3721
Obs*R-squared	2.103432	Prob. Chi-Square(2)	0.3493

Heteroskedasticity Test

To determine the heteroskedasticity test, we only focused on the upper part of the outcome which is the value of probability Chi-Square where it is in line with the Obs*R-squared. The number of 6 along with the probability is actually the explanatory variables. So according to the outcome in table 6, the p-value for observe R2 was 0.5870 which is greater than 5 per cent significance level. It means that we succeed to accept the null hypothesis which there is no heteroskedasticy in the model. Therefore, we can conclude that the regression of our model is good.

TABLE 6: Result of Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
Null hypothesis: Homoskedasticity			
F-statistic	0.761917	Prob. F(6,110)	0.6014
Obs*R-squared	4.668402	Prob. Chi-Square(6)	0.5870
Scaled explained SS	2.802217	Prob. Chi-Square(6)	0.8332

Normality Test

The normality test results can be shown in the following figure of normal distribution on residuals. According to the results based on Jarque-Bera, the p-value was 33.89 percent. Therefore, we are unable to reject the null hypothesis and conclude that the residual was normally distributed.
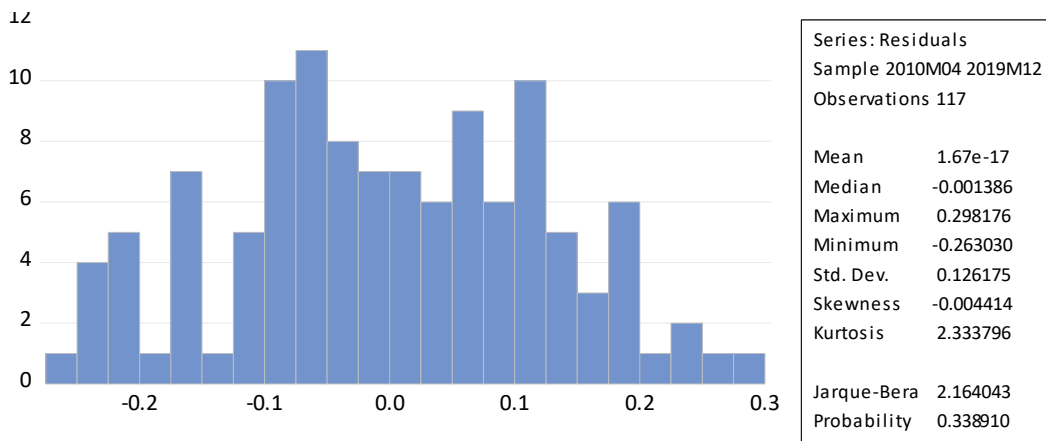
Series: Residuals	
Sample 2010M04 2019M12	
Observations 117	
Mean	1.67e-17
Median	-0.001386
Maximum	0.298176
Minimum	-0.263030
Std. Dev.	0.126175
Skewness	-0.004414
Kurtosis	2.333796
Jarque-Bera	2.164043
Probability	0.338910

Figure 8: Result of Normality Test

Stability Diagnostics Test

The stability diagnostics is performed based on the cumulative sum of squares test (CUSUM). The results is shown in the following figure 9 and 10.
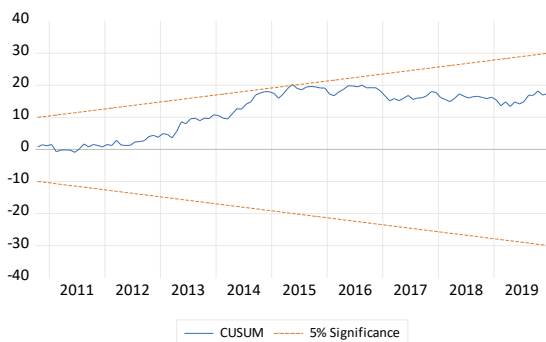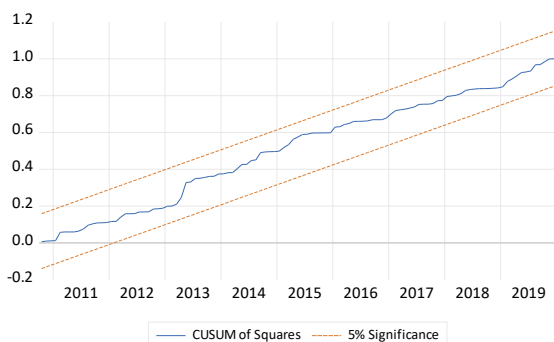

Figure 9: CUSUM Test

Figure 10: CUSUM of Squares Tests

According to both figures of CUSUM test, we can stated that the parameter or the variables in this study is stable since the cumulative sum moves inside the region defined by the two critical bounds of 5 per cent significance level. Therefore, we cannot reject the null hypothesis and we can establish that long run coefficients with short run dynamics is stable.

Impulse Response Test

Impulse response test is needed in this study because we want to discover the presence of J-curve phenomenon. In this test, J-curve phenomenon will holds in Malaysia when there is a J-shape in the impulse response test results. The J-shape is explaining the situation of depreciation effect, where the curve in the beginning of the graph will shows a worsened in the trade balance due to the depreciation and later will be improved when the curve is moving upward after several periods. Hence, the results is shown in the Figure 11 below.

From Figure 11, it is shows that there is a slow increment of the trade balance in the beginning due to depreciation. But after that, there is a slow improvement of the trade balance in the second quarter. And then, the shock has continuing effect permanently. Hence, based on the figure, the J-curve effect for the case of Malaysia is invalid since the impact does not follow the J-curve pattern.
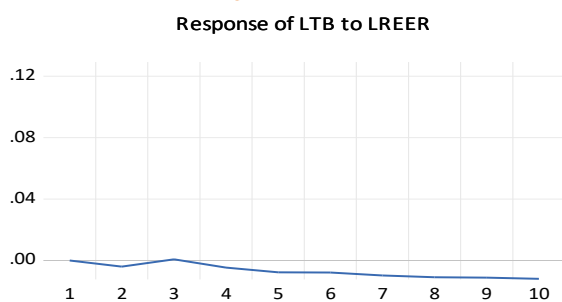
Response of LTB to One S.D. Innovations of LREER

Response of LTB to LREER

Figure 11 Impulse Response between variables

DISCUSSION

The results of this study revealed that there was positive relationship in the long run on the impact of real effective exchange rate (REER) on trade balance in Malaysia according to the Johansen co-integration test as expected from the past literature by many of the researchers in the years between 1994 and 2014. This explained that the trade balance of a country is depends on the changes of the REER. This includes Malaysia which is a country that run economic activities between domestic and outside community. This is because the positive export growth especially can bring a stable trade balance of a country as they need more source from foreign country to enhance an efficient production in helping the economic condition through international trade. Specifically, when the exchange rate falls, it implies that the currency is devalued compared to other countries. Hence, improvement of the Malaysia trade balance can be illustrated in such situation. A depreciation of the Malaysian Ringgit makes exports of Malaysia to be more competitive and bring to a stable current account where the firms within home country, which is Malaysia, can increase their sales. Due to this, the unemployment will be decreased and more people can get job especially in export industry.

In addition to the test, the theory of Marshall-Lerner (M-L) condition was satisfied where goes along with the studies of some researchers in the year between 1981 and 2014. The data contributes a clearer understanding of M-L condition since the trade balance is positively affected because of the currency depreciation where the imports price decreases and exports quantity increases. The reassure of M-L condition on this study can be explained by the individuals or firms in Malaysia itself. Since the price of imports is higher due to the depreciation, they will tend to import less and will attempt to substitute the domestic product with the abroad goods and leads to enhance trade balance. And in further understanding, individuals and firms in Malaysia will have more purchasing power on foreign goods.

However, despite of the stated results, real effective exchange rate does not necessarily improve the balance of trade due to the unexpected economic condition and because of the linkage between import and export markets. In further extends, depreciation may not improve the trade balance immediately because of following reasons. Firstly, higher incomes will be generated by the rise of the exports value and people tend to spend some of their income on import products. Secondly, purchases of imported non-durable goods and services will increase due to the rise of export demand and this will make the trade balance to deteriorate initially. Lastly, devaluation will leads to a higher investment due to the raise of profits and hence imported them for more investments.

But in the end, the devaluations of REER is highly important to improve the trade balance of Malaysia as a small and open economy. Thus, depreciation of currency is basically beneficial for Malaysia exports.

While in short run, the REER has no relationship with the balance of trade which has same results with the study in 2011, and shows no existence of J-curve phenomenon in current studies according to the impulse response test which is similar to some studies in 2001 and 2009. This is because the exporters

in home country which is Malaysia as a developing country will face lower export price since the imports and exports demand is fairly inelastic in the short run. This is supported by Krugman and Obstfeld (2000) where they stated that the trade deficit will be worse and trade balance will not be improved in the short run for the few quarters (probably three to six months) or in the initial depreciation, when the domestic currency is depreciated.

CONCLUSION

Real effective exchange rate (REER) has been an important factor in determining the trade balance in a country especially in an open economy country. Hence, this study aims to determine the impact of real effective exchange rate on trade balance in the case of Malaysia in long run and short run and also to examine the existence of J-curve phenomenon and Marshall-Lerner condition (M-L) in this study. The monthly data that used in this study is taken from the latest period which are from 2010 to 2019, and was collected from United States Census Bureau for trade balance and World Bank Global Economic Monitor for REER. The results obtained from empirical methods specifically using OLS method which employed in this study, revealed that there was a positive long run relationship on the impact of real effective exchange rate (REER) on trade balance in Malaysia and shows existence of Marshall-Lerner condition according to the Johansen co-integration test. While the results obtained from error correction model showed no short run relationships of the variables and clarified that the J-curve theory is not satisfied based on the impulse response test.

This results has further confirms the Marshall-Lerner condition where the existence of M-L condition in this study indicates that depreciation has improved the trade balance of Malaysia. Due to this, Malaysia government should take a thorough policy decision on monetary and exchange rate scope considering the importance of M-L condition validity in Malaysia as a developing country.

Therefore, the government of Malaysia should take a further concern on the internal supply side policy, which will expand the exportable and substitute goods production for import in order to improve the balance of trade of Malaysia in long term.

In addition to the results, there will be some implications to achieve the desired effect on the balance of trade. Hence, the government of Malaysia should also depends on policy that focus on the nominal exchange rate to aggregate price level (variables of real exchange rate). Simultaneously, the devaluation-based policies must be cooperated with stabilization policies since it is affected by the changes in nominal exchange rate. However, the import cost will be increased and import inflation will occur when the devaluation-based policies take place. Hence, the policy of imported-substituted goods productions should also be implemented where it will help the country to improve the balance of trade and the domestic income.

Take into the short run and J-curve results, there is no existence of J-curve effect in Malaysia balance of trade and not showing a positive relationship in short run. Therefore, to achieve the better results of J-curve phenomenon, further study is needed to established several coefficients on the methods in order to get better shape of J-curve and helps to determine the overall J-curve theory. Also, since the devaluation in short run will probably cause an inflation because of the higher cost of import goods, exchange rate policy should be taken a high concern by the government of Malaysia as this policy can be manipulated into a natural rate where it helps to stimulate exports and pushed up to reduce the inflationary pressure. This exchange rate manipulation is known as a type of monetary policy by many economists.

While in overall perspective, the trade balance of Malaysia is improved only in the long run when depreciation holds. Thus policy makers in Malaysia should implement suitable fiscal and monetary policy when Ringgit

Malaysia has been depreciated. To sum up, even though this research which includes the variables of real effective exchange rate and trade balance has fulfilled all the research objectives, further research of the optimal range and exchange rate in which appreciation and depreciation could be occurred on the exchange rate, needs to be investigated in order to get a thorough effect on J-curve phenomenon and Marshall-Lerner condition. And since this paper is limited to only these two theories, future research could include more trade theories using various advanced techniques or method with the latest Malaysia's or other countries' data.

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