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Trade Balance and J-Curve Phenomenon in Malaysia

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ABSTRACT

This paper examines the effects of real exchange rate changes on the trade balance of Malaysia and her trading partners (Japan, Singapore, United Kingdom, and United State of America). The response of the trade balance through time then forms the famous J Shape. Using yearly data from 1970-2003 and co integration analysis, we found that there is avidence of J-curve at least in the cases of USA and Japan.

Key words: J-Curve; trade balance; cointegration

ABSTRAK

Makalah ini mengkaji kesan perubahan kadar pertukaran benar terhadap imbangan dagangan Malaysia dan rakan dagangannya (Jepun, Singapore, United Kingdom dan Amerika Syarikat). Tindak balas imbangan dagangan terhadap masa kemudianya membentuk keluk-J. Berdasarkan data tahunan daripada 1970-2003 dan analisis kointegrasi, dapatan kajian kewujudan keluk-J dalam kes Amerika Syarikat dan Jepun.

Kata kunci: Keluk-J; imbangan dagangan; kointegrasi

INTRODUCTION

Trade balance is a statement of a country's trade in goods and services. It covers trades in products such as raw materials, manufactured goods, and agricultural goods, as well as travel and transportation (services). In definition, trade balance is the difference between the value of goods and services a country exports and its imports. When a country's exports

exceed its imports, it is said to have a trade surplus and the trade balance is said to be positive. If imports exceed exports, the country has a trade deficit and its trade balance is said to be negative.

Exchange rate is the amount of unit of local currency divided with a unit of foreign currency, so that the increase in exchange rate means a decrease in local currency value. Under the fixed exchange rate regimes, demand and supply of foreign exchange still gives the picture of free transaction in balance of payment. However, there is no hint of force in demand and supply for exchange rate decision, it is replaced by fixed (peg) exchange rate policy on certain level, decided by the differences in the foreign exchange market for buying and selling of assets, and classified into different currency. Under the fixed exchange rate rule, fixed exchange rate system is said to have played a role in controlling the international financial system from the end of World War II until 1971, which has also been known as Bretton Wood System. Central banks are responsible on all these changes to ensure that the currency value is relative to US dollar, as such all currencies have been re valued, including Malaysia.

There are a lot of theories concerning the effect of the decrease in currency in trade balance. Krueger (1983) through elasticity and exchange rate approach proposed that complete business trade in the time when currency value is reduced or depreciate may control the changes in trade balance on a short term basis. This is the beginning of a decline in current trade balance's 'contract period' before export(s) and import(s) become consistent in quantity. However, the effect of this decrease in this currency value is not being supported on the trade balance, and thus, this is the phenomenon or the existence of J curve.

Junz and Rhomberg (1973) believed and agreed that the trade balance has to decline first, however, after going through a certain period, it will start to show an improvement. They found that there are at least five lags in the process between the change in exchange rate and the final effect on real trade: a lag in accepting situation changes, a decision to change, the real change, delivery period, inventory and material exchange and production.

J-Curve is an image formed into an alphabet "J" shape to explain the performance of a trade balance of a certain country after the currency value is decreased. Direct effect from this decrease is the increase in imports costs and reduction of exports prices, making the current account to be worse or less in value. Nevertheless, the total in exports increase caused by the decrease in exports price, while the total in imports decrease because of pricing increases. Current account balance should be improved from

deficit to surplus. As in most of the other economic researches, this theory tries to influent by stating both environment law and normative belief, where both have proven to have their own set of strengths.

J-Curve theory predicts that the depreciation in local currency value will devaluate local imports prices, showing or making large gap between the total in trade and the depreciation in currency value, thus the trade balance is made to be negative before improvement is made.

Williamson (1983) showed that the increase in imports price caused by the decrease of currency, could contribute to a high domestic prices for non-trade goods. As a whole, in terms of inflation: increasing the effective real exchange rate, will relatively and potentially increase trade relation. Based on monetary method and exchange rate, the decrease in currency value (depreciation) reduces real money supply, where the result would be a surplus in domestic demand on monetary. This will, in turn shows an increase in trade balance. Therefore, if the elasticity of exports and import rose, equivalent of quantity to change effective price and improved trade balance.

In reducing the currency value, according to the theory, it may give an effect to trade balance that is: the decrease in real current exchange value and the direct effect on domestic absorbance. First channel emphasizes on the decrease in real currency value to a real exchange note effect (relative price) and this will improve the competition. This will improve the trade balance, *ceteris paribus*. The second channel is connected to the absorbance effect upon decreasing the currency value. Real currency depreciation have the tendency to improve real trade balance (or current account) in long term basis, but this is the reaction of trade balance to the changes in real exchange rate, followed by a slope/title J' to the right side.

THE LITERATURE

A few previous research had studied the relation between trades balance and fixed exchange rates and effect on its influence by J-Curve phenomena. Among them studied by Koray and McMillin (1999) recognized exchange rate and trade balance react to innovation of financial policy for United State of America (USA) in the period of 1973 until 1993. Their empirical research showed the effect of financial policy, which overlapped, would make a low relation between nominal and real exchange rate.

Ahmad Zubaidi (2001) studied the prime factor of economy that influenced bilateral trade balance between Malaysia and Thailand with USA and Japan. The VAR model had been used for quarterly data from 1980 to 1996. The resulted of Johansen had showed stable long-term relation

between trades with three macro variables: exchange rate, domestic income, and side income.

This research showed:

1. Effective real exchange rate is the important variable in trade balancing equation and decrease in currency value develop the relation with both economic countries in a long term.
2. Other important variable in determining trade balancing is domestic, income and side income and
3. This decision also shows there's no J-Curve effect from the current exchange and coinciding to trade balancing.

Wilson (2000), study the relation between real trade balance and exchange rate for bilateral trade between Korea, USA and Japan quarterly data in the period of 1970 until 1996. By using partial equilibrium model introduced by Rose and Janet (1989), Wilson realize when the account taken from non-stationary data, real exchange rate does not give any significant effect on bilateral trade by taking USA and Japan. But when used log level for ordinary least square (OLS) test, significant relation affect results when Korea get to trade with USA.

Wilson and Tat (2001) study the connection between real trade balance and real exchange rate for bilateral trade made by Singapore and America. They are using quarterly data in the period of 1970 until 1996 using partial model of Rose and Yellen (1989). Their research proposed real current exchange is not significant in influencing bilateral trades between Singapore and America. And with this can proved previous research had a weak connection between exchange rate changes with changes in export and import price. They also realized that there is small influence by J-Curve phenomenon.

Lal and Lowinger (2002), realized there is a connection between short term and long-term effect between Nominal Effective exchange rate (NEER) and trade balancing. They utilised quarterly data for the period of 1985 and 1998 to see the short term and long term relation to measure the trade balancing between those five Asian countries.

Bahmani-Oskooee and Goswani (2003) experiment the J-Curve hypothesis using bilateral trade quarterly data between Japan and it nine major trade partners for the period of 1973 until 1998. They realize, when aggregate data be used there is no such relation between J-Curve in short term and the relation between trade balancing an effective exchange rate is not significant for long term. But, when bilateral trade data being used, they realized there is J-Curve relation between Japan and German also

Japan and Italy. They also realize the decrease in Yen give a long-term effect to Canada, UK and USA.

Bahmani-Oskooee and Tatchawa Kontipang (2001) concentrate on J-Curve phenomena research between Thailand and its trade partners includes Germany, Japan, Singapore, UK and USA. Quarterly data used in this research from the period of 1973 (I) – 1997 (IV) and also used co-integration analysis. Their research showed that there's and evidence of J-Curve phenomenon existence in USA and Japan case.

Wilson (2001) studied the relationship between real trade balancing and real exchange rate for two ways trading in goods transaction among Singapore, Korea and Malaysia; and USA with Japan. His research used quarterly data for the period of 19970 till 1996 and partial model by Rose and Yellen (1989). This research showed real exchange rate does not significant on real trade balancing and also Malaysia and Singapore does not assure the proven of J-Curve formed. For Korea there is tiny effect on J-Curve by the connection between Japan and USA. Besides, maybe for Korea this effect covered by less export price in foreign currency but there is no prove that import will drop in the future as long-term lag on real exchange rate increment which is strongly needed to support J-Curve interpretation.

Conclusion from previous research above with considered the research about Malaysia, there's a few research stated that decrease in currency value would improve trade balance for a long term. The other half of study found the existence of J-Curve with the data that researcher used. But, there is also a result where J-Curve does not exist in their research.

DATA AND METHODOLOGY

The data used in this paper is in yearly time series, from 1970 to 2003. The data that is used in analysis is the Gross Domestic Product (GDP) for Malaysia, GDP for Malaysian trade partners, total exports of Malaysian domestic products to trading partner, total Malaysian imports from the trading partner and Malaysian exchange rate with the trading partners. GDP data for exports and imports are taken from the *Direction of Trade Statistics* (CD-ROM), while the exchange rate data is taken from Bank Negara Malaysia (of various years).

The model adopted in this paper is relying on previous literature. Thus, following Bahmani-Oskooee and Brooks (1999), we employ the following model.

$$\ln TB_{i,t} = \alpha_1 + \alpha_2 \ln Y_{j,t} + \alpha_3 \ln Y_{i,t} + \alpha_4 \ln REX_{i,t} + \varepsilon_t \quad (1)$$

where TB_i is the bilateral trade balance defined as the ratio of Malaysian exports to country i over her imports from country i; Y_j refers to Malaysia's income (GDP); Y_i refers to the income of the trading partner i, and REX refers to bilateral exchange rate between Ringgit Malaysia (RM) and the currency of the trading partner i. Based on variable definition above, we would expect estimates of $\alpha_2 > 0$; $\alpha_3 < 0$; and $\alpha_4 > 0$ if real depreciation will improve the trade balance.

Equation (1) refers to a long-term relationship between variables of the trade balance model. To test the short-term effect, for real depreciation or J-Curve phenomenon, we need to add to include the short-term effect's dynamic characteristics into equation (1). In econometric literature, specifying equation (1) in terms of Error Correction Model (ECM) format can do this dynamic nature. Thus, by using method used by Pesaran and Shin (1995) and Pesaran et. al (1996) and a modified equation (1), the resulted model in Autoregressive Distributed Lag (ADL) form is as shown below;

$$\begin{aligned}\Delta \ln TB_i = {} & \alpha_1 + \sum_{k=1}^{n} \alpha_2 \Delta \ln TB_{i,t-k} + \sum_{k=0}^{n} \alpha_3 \Delta \ln Y_{i,t-k} + \sum_{k=0}^{n} \alpha_4 \Delta \ln Y_{i,t-k} \\ & + \sum_{k=0}^{n} \alpha_5 \Delta \ln REX_{i,t-k} + \alpha_6 \ln TB_{i,t-k} + \alpha_7 \ln Y_{i,t-k} \\ & + \alpha_8 \ln Y_{i,t-k} + \alpha_9 \ln REX_{i,t-k} + \mu_t . \end{aligned} \quad (2)$$

In the equation above, short-term effect on real depreciation is shown by the sign and significance of coefficient α_5 while long-term effect is shown by sign and significance of coefficient α_9. Negative values obtain for the first few estimates of α_5 followed with positive value proved the existence of J-Curve phenomenon.

There are two steps in estimating equation (2). First by making sure that time series in equation (2) are fixed at the same degree $I(d)$, and this can be recognized through Augmented Dickey Fuller (ADF) test (1979);

$$\Delta Z_t = \delta_0 + \delta_1 Z_{t-1} + \delta_2 T + \delta_3 \Sigma \Delta Z_{t-1} + \varepsilon \quad (3)$$

where Z refers to variables used in equation (2) and the null hypothesis are $\delta_1 = 0$, which means the existing of unit root in time series and Δ refers to first difference. To test this hypothesis, t statistic value or τ (tau) from δ_1 will be compared with the critical value counted by MacKinnon through Monte Carlo Simulation (MacKinnon 1991).

The co-integration test is applied to show that the relationship between time series variables in level form as in equation (2) is exits. Johansen's co-integration test (1991,1995) is used in this paper to ensure the long term relationship exist between the time series in models.

$$\Delta x_t = \Pi x_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta x_{t-1} + By_t + u_t \tag{4}$$

where;

$$\Pi = \sum_{i=1}^{p} A_i - I \qquad \Gamma_i = -\sum_{j=i+1}^{p} A_j$$

or $G_i = -(I - A_i)$, and $P = -(I - A_j)$. This specification model makes it able to recognize short-term and long-term adjustment, which brings to changes in X_t where X_t refers to variable matrix examined (trade balance, Malaysian GDP, trading partner's GDP and exchange rate). This adjustment is showed by matrix Π. Basic rank for Π shows a linearly independent between GDP and government expenditure. Formal test for a number of variables that co-integrate are through eigenvalue test for matrix Π. There are three possible results. If stage (1) for Π is r, and Π is full rank, this means there is matrix column where $r = d$ linearly independent, and this shows variable for matrix is $I(0)$. The second possibility is when the rank for Π is equal to zero. This shows that there is no co-integration exist between variables in X_t. Usually, this situation is modeled as VAR for variables in first difference but without the assumption that long-term relationship exist. The third possibility is when Π shows reduced rank which means that there is $r = (d-1)$ co-integration vector. If the third possibility existed, then Π can be segregated into two vectors namely α and β as in $\Pi = \alpha\beta'$ where α refers to short-term adjustment to a stable long-term relation and β refers to a long-term matrix coefficient. The number of co-integration relations can be estimated through two tests by Johansen (1988), which are the Trace Test and Maximum Eigenvalue Test;

$$\lambda_{\text{trace}} = -T \sum_{i=r+1}^{k} \log(1 - \lambda_i), \tag{5}$$

$$\lambda_{\max} = -T \log(1 - \lambda_i) \tag{6}$$

where λ_{trace} refers to trace statistic, $\lambda_{\max}$ refers to maximize eigenvalue statistics, r refers to ranking for co-integration vector, T refers to the number of independent observation, λ_i refers to eigenvalue for i ranking

and $r = 0,1, \ldots\ldots k\text{-}1$. The hypotheses on whether co-integration vector exists or not are shown as below;

$$H_0 = r = 0, \quad r = <1 \ldots\ldots r = <k$$
$$H_1 = r = 0, \quad r = >1 \ldots\ldots r = >k$$

where H_0 refers to non-existing co-integration vector while H_1 shows existing co-integration.

EMPIRICAL RESULTS

To see a long-term relationship between exchange rates and trade balance between Malaysia and its trading partners (Japan, Singapore, United Kingdom and United States of America), a unit root test or stationary time series data is applied to the variables in equation (2). This test is to ensure that time series data have the same degree of stationarity. The test results of Augmented Dickey-Fuller (1979) unit root test is shown as in Table 1.

ADF test shows that for each time series, the unit root exists on level form and stationary on first difference on at least 5% level of significance, or stationarity on I (1) form. Since time series are not stationary in the level form but of stationary on first difference, so it is possible that long-term relationship may exist between these time series, and in this case it refers to time series in equation (2), which are trade balance, Malaysian GDP, trading partner GDP and trading partner exchange rate.

Long-term relationship that exists between times series at the same level is known as cointegration. This means, time series in the system form a common trend or forming a long-term relationship and this can be shown via error correction variables.

Based on Table 2, by using Johansen methodology (1991, 1995) in testing cointegration between time series, it was found that at least one cointegration vector exists between the four time series, that are trade balance, GDP for Malaysia, GDP for trading partner and exchange rate between Malaysian Ringgit and trading partners' currency. This means that in a long-run, a meaningful relationship between time series exists, that this relation is authentic and that time series form common trend in a long-run.

Table 3 shows an estimated result for equation (2) by using Auto Regressive Distributed Lag (ADL) function. As stated by Bahmani-Oskooee and Goswami (2003), J-Curve phenomenon exists if coefficient of α_5 (as

TABLE 1. The result of Dickey-Fuller Unit Root Tests (1979) on GDP, exchange rate and trade balance

Country	Time Series	Level	First Difference
Malaysia	GDP	–2.687514	–4.789488**
Japan	GDP	–2.188123	–4.403381**
	Exchange Rate	–2.794134	–4.895827**
	Trade Balance	–1.836951	–4.293483**
Singapore	GDP	–1.597507	–2.852138*
	Exchange Rate	–2.245503	–6.427957**
	Trade Balance	–1.965075	–7.925411**
United Kingdom	GDP	–2.163630	–3.821277*
	Exchange Rate	–2.208609	–5.057736**
	Trade Balance	–0.931264	–6.702132**
United States of America	GDP	–0.784995	–4.815150**
	Exchange Rate	–0.816370	–5.444490**
	Trade Balance	–2.673994	–5.314110**

Note:
* Significant at 5% level
** Significant at 1% level
Critical value refers to Table 1 that tabulated by MacKinnon through Monte Carlo simulation.

TABLE 2. Co-integration Test Statistic between GDP, Exchange Rate and Trade Balance

Cointegration	λ_{trace}	Critical Value (5% level)	Critical Value (1% level)
Japan			
$H_0 : r = 0$			
$H_A : r \geq 1$	65.591**	47.21	54.46
$H_0 : r \leq 1$			
$H_A : r \geq 2$	33.605*	29.68	35.65
$H_0 : r \leq 2$			
$H_A : r \geq 3$	9.99	15.41	20.04
$H_0 : r \leq 3$			
$H_A : r \geq 4$	0.893	3.79	6.65

(*cont.*)

TABLE 2. *continued.*

Cointegration	λ_{trace}	Critical Value (5% level)	Critical Value (1% level)
Singapore			
$H_0 : r = 0$			
$H_A : r \geq 1$	48.649*	47.21	54.46
$H_0 : r \leq 1$			
$H_A : r \geq 2$	25.023	29.68	35.65
$H_0 : r \leq 2$			
$H_A : r \geq 3$	7.379	15.41	20.04
$H_0 : r \leq 3$			
$H_A : r \geq 4$	1.036	3.79	6.65
United Kingdom			
$H_0 : r = 0$			
$H_A : r \geq 1$	54.088*	47.21	54.46
$H_0 : r \leq 1$			
$H_A : r \geq 2$	20.133	29.68	35.65
$H_0 : r \leq 2$			
$H_A : r \geq 3$	8.360	15.41	20.04
$H_0 : r \leq 3$			
$H_A : r \geq 4$	0.079	3.79	6.65
USA			
$H_0 : r = 0$			
$H_A : r \geq 1$	52.717*	47.21	54.46
$H_0 : r \leq 1$			
$H_A : r \geq 2$	17.585	29.68	35.65
$H_0 : r \leq 2$			
$H_A : r \geq 3$	4.680	15.41	20.04
$H_0 : r \leq 3$			
$H_A : r \geq 4$	0.007	3.79	6.65

Note:
* Hypothesis deduction on 5% level
** Hypothesis deduction on 1% level
Critical value gain from Osterwald – Lenum (1992), "A Note with Quartiles of the Asymptotic Distribution of the Maximum Likelihood Co-integration Rank Test Statistics" in Oxford Bulletin of Economics and Statistics, 54, 461-475.
Hypothesis test;
$H_0 = r = 0$; does not exist co-integration
$H_1 = r \leq 1, r \leq 2, ; r \leq 3$ co-integration exist

Δ ln REX_{t-i}) shows negative value first, which then followed by positive value. Since this research is using a very limited observation, which comprise of 30 years period only (1971-2001), the lag period that can be used is only for five years. This will definitely restrain the existence of J-Curve in this research. However, researchers note this situation, and as

TABLE 3. Error correction model estimation for exchange rate coefficient between Malaysia and trading partners

	Japan	Singapore	United Kingdom	United States of America
$\Delta \ln REX_{t-1}$	–0.15334	–0.524518	0.144495	–1.070645
	(–0.191474)	(–1.097865)	(0.364260)	(–1.517084)
$\Delta \ln REX_{t-2}$	–0.682407	–0.426462	–0.133218	–0.352451
	(–0.645909)	(–0.964053)	(–0.368880)	(–0.534098)
$\Delta \ln REX_{t-3}$	–1.613957	–0.843352*	0.143849	–0.037613
	(–1.017209)	(–1.877276)	(0.411322)	(–0.083970)
$\Delta \ln REX_{t-4}$	–1.416944	–1.009416	–1.115745	–0.285052
	(–0.690319)	(–3.005226)**	(–3.383472)**	(0.483308)
$\Delta \ln REX_{t-5}$	–0.722754	1.698397	0.310565	1.157596
	(–0.482500)	(2.000906)*	(0.747141)	(1.037816)
EC_{t-1}	0.223440	–0.793074	–0.985796	–2.110004
	(0.287927)	(–0.997823)	(–2.413964)*	(–2.199511)*
R^2	0.883998	0.973359	0.986147	0.981422
D-W	1.897165	3.461034	3.419803	3.054467

Note:
EC_{t-1} refers to error correction for the model
* Significant at 5% level
** Significant at 1% level

such, future research relating with forming J-Curve will have to use quarterly data, which will produce a lot of observation and possibly a more satisfied results will be produced.

As shown in Table 3, in using this very limited observation, it was found that J-Curve phenomenon between Malaysia with Japan and United Kingdom does not exist. This can be seen where α_5 shows it is always a negative value for Japan, meanwhile United Kingdom's α_5 shows alternate positive and negative value. For Singapore and United States cases, we can say that J-Curve phenomenon almost exists. This can be seen where a_5 illustrated negative value in the early stages, which is in the first year lag to the fourth year lag, and then showed positive value for the fifth year lag period.

That the decrease in exchange rate over time will improve the trade balance as shown in J-Curve phenomenon and it is relevant for the case of Malaysia's trade with United States and Singapore. However, for Malaysia's trade with Japan and United Kingdom, there is no evidence that the

decrease in exchange rate will improve the trade balance over time.

CONCLUSION

The objective of this paper is to examine the short-term and long-term effect of real exchange rate change on the real trade balance for Malaysia and her bilateral trade partners (Japan, Singapore, United Kingdom, and United State of America). By using a cointegration vector error correction framework that treats all the variables in the model as potentially endogenous, cointegration analysis indicated that there is a long term steady relationship between real trade balance, real exchange rate, real domestic income, and real foreign income.

Our research period used limited observation, which included a period of 33 years (1970-2003), however, lag that can be used was only 5 years. It affects the existence of J-Curve phenomenon in this research. There was no J-Curve phenomenon indicated between Malaysia with Japan and UK. However, for Singapore and USA cases, research found an almost existing formation at J-Curve phenomenon.

This research depicts that the decrease in Malaysian currency on Malaysia's trade for trade cases with USA and Japan through time will improve Malaysia's trade balance, as suggested in the forming of J-Curve. However, for Malaysia's trade case with Japan and United Kingdom, it was found that the decrease in Malaysian currency did not show any sign of J-Curve existence formed.In conclusion, based on early objective, this research can explain the trade balance relation by exchange rate for Malaysia, that is, the decrease in exchange rate will be able to fix the trade balance in a long term.

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