

Does the J-Curve Phenomenon Exist in The Indonesia's Bilateral Trade Balances With Major Trading Countries?

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Abstract. *The purpose of this study is to analyze effects of the real exchange rate (RER) on the Indonesia's bilateral trade balance with its three major trading partners, namely: the US, China, and Japan, both in the short run and in the long run. This study also investigates the Marshall-Lerner Condition and the existence of the J-Curve on the Indonesia's bilateral trade balance for the period 1996:Q1 to 2011:Q4 using a Vector Error Correction Model (VECM). The study indicates that (i): in the long-run, RER has a positive impact in the long-run Indonesia's bilateral trade balance with China and Japan. On the other hand, RER has a negative impact on the Indonesia's bilateral trade balance with US; (ii) The Marshall-Lerner Condition and the J-Curve Phenomenon were only seen on the Indonesia's bilateral trade balance with China and Japan.*

Keywords: *J-Curve phenomenon, RER, trade balance, VECM*

JEL codes: *O14, L50, L52, O25, L60, L16, L26, F13, H87*

Introduction

Indonesia is a country that actively participates in the integration of economic and trade cooperation in bilateral, regional and international levels. The purpose of all of these cooperation is to improve the national welfare through increased trade volume, which indirectly can improve production efficiency, thereby increasing the competitiveness of the product. Related to bilateral trade, Indonesia has trade activities with many countries. Japan, the US, and China are some of the destination countries for Indonesia's exports with an average market share for 2005-2011 respectively of 18.92%, 9.85%, and 9.16%. For Indonesia, these countries are also as major markets in fulfilling the needs of imported goods. Percentage of imported goods from China, US, and Japan respectively are 12.65%, 10.72% and 6.61%.

Meanwhile, the exchange rate is one of the factors that affect a country's international trade activities. Indonesia has been imposing a free-floating exchange rate policy since August 14, 1997 or since the aftermath of the Asian crisis in 1997. With the implementation of the floating rate system, the determination of the exchange rate depends on market mechanisms that can create an unstable exchange rate. Theoretically, an increase in the real exchange rate means that the prices of domestic

goods are relatively cheaper than the price of foreign goods. This will increase the export transactions in the country, so it will increase the value of net exports (trade balance).

Studies on the effect of exchange rate on the trade balance have been undertaken previously by several researchers. Onafowora (2003) and Hausman (2005) have conducted this study in the case of Indonesia with main trading partners. In general, the Marshall-Lerner Condition and the J-Curve phenomenon always fulfilled in bilateral relations Indonesia's trade balance with its trading partners, except with Singapore and the United Kingdom. That is, depreciation of rupiah initially worsens the trade balance (at least for last 4 quarters) and then in the long term there will be an increase in the trade balance. But the fact in 2011, the bilateral trade balance with the US continued to decline, despite the depreciation of the rupiah.

This study aims to analyze short-term and long-term effects of the real exchange rate on the Indonesian bilateral trade balance with the three major trading partners (China, Japan, and the US), and to evaluate the Marshall-Lerner Condition and the J-Curve phenomenon. The rest of the paper will be organized as follows: section 2 will explain the data and research methodology, followed by presenting and discussing empirical results on section 3. Summary of the results and the policy implications will be provided in section 4.

Data and Methodology

Time series data in this study comes from the International Financial Statistics (IFS), UN Comtrade, and FX Sauder with the study period 1996:Q1 to 2011:Q4. The Vector Error Correction Model (VECM) was used in this study to answer the objectives of this research. This study used a similar model to Onafowora (2003) where the bilateral trade balance is a function of real domestic income (Y), real income of trading partners (Y*), and the bilateral real exchange rate (RER). However, the authors made some modification in conducted this study by introducing the interest rate (R) as a variable that also had a relationship with the trade balance.

The VEC model specification in this study is as follows (Siregar and Ward, 2000):

$$\Delta x_t = \sum_{i=1}^{k-1} \Gamma_i \Delta x_{t-i} + \mu_0 + \mu_1 t + \psi d_t + \alpha \beta' x_{t-1} + \varepsilon_t \quad (1)$$

where $x = (\frac{X}{M}, Y, Y^*, RER, R, R^*)^1$, X/M is ratio of exports to imports of Indonesia with each trading partners (Indonesia-US, Indonesia-China, and Indonesia-Japan), Y is Indonesia's real income (Indonesia); Y^* is real income of trading partners; RER is bilateral real exchange rate of Indonesia with each trading partners (an increase in RER means real depreciation of Rupiah against trading partner currencies); R is Indonesia's interest rate; R^* is foreign (trading partners) interest rate; t is time trend, d_t is global crisis dummy in 2008 (GCD = 0 for pre-crisis period and GCD=1 for post-crisis period); and e_t is error term. Elements of α and β , respectively, the loading and the cointegration matrices.

The trade balance is usually measured by the difference between the values of total exports and of total imports. In this study, the trade balance is expressed as the ratio of the value of total exports (X) to the value of total imports (M). The ratio X/M has been used in many studies of the relationship between the exchange rate with the balance of trade, such as in Bahmani-Oskoei and Brooks (1999), Bahmani-Oskoei and Kantipong (2001), and Onafowora (2003). This calculation is more favorable for several reasons.

¹ Except interest rates, all variables are in logarithmic form.

First, the ratio may allow researchers to use logarithms on trade balance data (Brada *et al.*, 1997). Second, the ratio of the trade balance can represent both real and nominal terms (Bahmani-Oskoe and Brooks, 1999). Third, the ratio is not sensitive to the unit of value (Bahmani-Oskoe and Alse, 1994). In other words, we are not concerned about whether the value of exports is higher or lower than the value of imports (Yasmina, 2012).

The theory states that the volume of exports and imports will increase with increases in domestic income, and vice versa. Thus, the hypothesis are coefficient of $Y < 0$ and coefficient of $Y^* > 0$. However, if the increase in income is due to increase in domestic production of import substitution goods, the imports will decrease with the increase in domestic income. Thus it is likely that coefficient of $Y > 0$ and coefficient of $Y^* < 0$. The effects of changes in the real exchange rate on the trade balance can be seen through the analysis of the fulfillment of the Marshall-Lerner Condition.

In the analysis of Marshall-Lerner Condition, a real depreciation will improve the balance of trade (coefficient of $RER > 0$), when the volume of exports and imports is elastic to the changes in the real exchange rate. If the RER increases, there will be an increase in the competitiveness that will make Indonesia to have more exports and fewer imports ("volume effect"). However, an increase in RER will also increase the value of imported goods ("import value effect") which will worsen the trade balance. Krugman and Obstfeld (2001) argue that in the short term, the import value effect will be dominant, while the volume effect is more predominant in the long run. Domestic interest rates has a positive effect on the trade balance while the interest rate of trading partner countries negatively affect the trade balance. The effect of dummy variables can be positive or negative.

Equation (1) describes not only the long-term relationship (cointegration equation) between the variables in the model of bilateral trade balance with each trading partner countries but also the short term relationship. We need to know the pattern of dynamic adjustment in the case of existence of the short-term shock to the system (especially shock in RER variable) to see if there is a J-Curve phenomenon in each model.

There are several steps in conducting the VECM analysis. First step is non-stationarity test for each variable by using the Augmented Dickey-Fuller (ADF) test. The second step is the determination of appropriate lag length by using the Akaike Information Criterion (AIC). Third, VAR stability testing by assessing roots of the characteristic polynomial. Fourth, cointegration test using the Johansen test that aims to detect long-term relationships between variables. After a number of cointegrated equation is known then the next step is analyses of Impulse Response Function (IRF) and Forecast Error Variance Decomposition (FEVD) in order to prove the J-Curve phenomenon in their respective bilateral relations.

Results and Discussion

Non-stationarity tests using the ADF test have been carried out and it is found that all variables are stationary at the first difference. The optimum lag length based on the AIC is 2 for models of Indonesia-US and Indonesia-China. But for the model of Indonesia-Japan, optimum lag length is 3. VAR stability testing for the three models also shows that the model is stable. The cointegration test was also conducted to see if there is a long-term relationship between variables. Based on trace statistic, all models are cointegrated, so that the VECM is the appropriate models.

a. Estimation Results of the VECM

The VECM estimation results (attached in Appendix 1) indicate that there is a positive relationship between the long-term exchange rate with the bilateral trade balance between Indonesia-China and Indonesia-Japan, where the real depreciation of the Rupiah will increase the volume of exports and reduce the volume of imports. In other words, the Marshall-Lerner Condition occurs in the case of bilateral relationship of Indonesia-China and Indonesia-Japan. In the model of Indonesia-China, the Marshall-Lerner Condition was also satisfied in the short term while in the Indonesia-Japan bilateral models, that condition was not fulfilled.

On the other hand, the estimation results on the model of bilateral Indonesia-US suggest that the Marshall-Lerner Condition was satisfied only in the short term. The low elasticity of Indonesia's exports to the US thought to be one cause of the Marshall-Lerner Condition does not happen in the long term. This can be seen from the small increase in exports to the US despite the relatively cheaper export prices.

Related to the influence of national income and the income of trading partner countries on the trade balance, the estimation results in Appendix 1 shows that the model of Indonesia's bilateral trade balance with the US and Japan are in accordance with the theory (domestic income has a negative effect and trading partners income have a positive effect). On the other hand, the estimated model of trade balance with China, domestic income has a positive effect and income of trading partners have the negative value. This occurs when an increase in Y and Y^* are the result of an increase in the productivity of the production capacity or the production of import substitutes.

Domestic discount rate variable in the long run has a positive impact on bilateral trade balance with each trading partner. This occurs because the increase in domestic interest rates will increase the cost of capital, so that investment demand will decline. If so then the trade balance will increase because it is a function of the difference between saving with investment.

But in the short term, the domestic discount rate variable is only significant in the bilateral model of Indonesia-China with negative effect. In this case, an increase in domestic interest rates actually leads to an increase in investment. This happens because Indonesia still considers investments as an important means for boosting the economic growth. This will push the real exchange rate to appreciate, and net exports will fall. In other words, the trade balance will deteriorate.

On the other hand, related to effect of discount rate variable of trading partners (R^*) in the long run, empirically that variable have a negative effect. But in the short term, only a discount rate of US and Japan that significantly affect the trade balance. However, each variable gives a different effect where discount rate of the US has a negative effect while Japan discount rate has a positive effect. This positive effect could happen because an increase in the discount rate would make the capital flow as foreign investors seek a higher returns. This capital flow is making the Yen appreciated. This will make the price of Japanese goods relatively more expensive and domestic goods prices in Indonesia are relatively cheaper. Thus the final results showed that the bilateral trade balance will improve.

Variable of global crisis dummy in 2008 (GCD) can only be included in the model of bilateral Indonesia-US. Due to the reason that inclusion of the dummy variable in two other models gave inconclusive results. In the model of bilateral Indonesia-US, the crisis dummy is statistically significant with negative effect on bilateral trade balance. The crisis in 2008 reduced the balance of bilateral trade between Indonesia and the US. The global crisis that initially hit the US made GDP of the US decreased, resulting the consumption of American peoples over imported goods (in this case of Indonesia) also

declined. Ultimately, this reduced the export of Indonesia to the US. In other words, Indonesia's bilateral trade balance with the US deteriorated.

b. Impulse Response Function (IRF) Analysis

Analysis of IRF conducted to analyze responses of the trade balance to one standard deviation shocks to the real exchange rate as well as to look at the presence of the J-Curve pattern for each model of bilateral trade balance. Appendix 2 shows the estimation results for the three models of bilateral IRFs. The J-Curve phenomenon were seen on the model of Indonesia-China and Indonesia-Japan. In accordance with the VECM results, the Marshall-Lerner Condition has been proven for both the bilateral models in the short term. As of the value effect will be more dominant than the volume effect. Thus, the trade balance will deteriorate first and then will improve along with the real depreciation of the currency.

In the model of bilateral trade balance between Indonesia and China, at the beginning of period RER shocks cause no decrease in the trade balance as the Marshall-Lerner Condition also was fulfilled in the short term. The trade balance improved when the rupiah depreciated immediately. However, this condition only bears up until the third quarter. On the other hand, bilateral model of Indonesia-China do not show a pattern of J-Curve in the long run. This happens because the Marshall-Lerner Condition is satisfied only in the short term and in the long run the RER will negatively affect the trade balance. This is indicated by the decrease in the balance of trade if there are shocks to the RER which starts from the 12th quarter.

c. Forecast Error Variance Decomposition (FEVD) Analysis

Contribution of shocks to variables in explaining variation of the bilateral trade balance of Indonesia can be seen from the results of the FEVD analysis. In the model of Indonesia-US, shocks to the real exchange rate have a very important role in determining the conditions of the trade balance. As for the model of Indonesia-China and Indonesia-Japan, shocks to the exchange rate are not the main factor that have important role in determining bilateral trade balance variations. So that, if governments pursue policies that can make the rupiah depreciated may be it was not effective because of small contribution of such shocks in influencing the movement of the bilateral trade balance. For more details, FEVD estimation results for each of the bilateral trade balance (Indonesia-US, Indonesia-China, and Indonesia-Japan) can be seen in Appendix 3.

Conclusion and Implication

a. Conclusion

By using the VECM analysis, we obtain the positive relationship between the real exchange rate and the balance of trade in bilateral relations between Indonesia-China and Indonesia-Japan in the long run. Meanwhile in the model of Indonesia-US, the real exchange rate has negative effect on the bilateral trade balance. In other words, in the long run, the Marshall-Lerner Condition only occurs in bilateral relations between Indonesia-China and Indonesia-Japan.

The results of IRF analysis show that the J-Curve phenomenon only seen in the bilateral relations between Indonesia-China and Indonesia-Japan. While the bilateral relations between Indonesia and the US, the J-Curve phenomenon was not proven. These results indicate that only the real depreciation of the Rupiah against the Yuan and the Yen that have positive impacts on bilateral trade balances of Indonesia.

Meanwhile, the rupiah real depreciation against the US dollar can not fix the bilateral trade balance between Indonesia and the US.

The FEVD results show that the real exchange rates have more important role only in the bilateral trade relations of Indonesia-US. Therefore, the government's policy to improve the performance of the trade balance should not necessarily be focused through policies that can make the Rupiah depreciated. The government policy should be more emphasised on other policies that support competitiveness such as an enhancement of productivity of the real sector, improvement of efficiency of production and distribution domestic systems, improving quality products, as well as creation of a more conducive business climate.

b. Policy Implications

The exchange rate has an important role in any economy of a country e.g. in the trade system of goods and services as well as in the financial markets. Related to the trade, of course the exchange rate or more specifically the real exchange rate affects exports and imports. It means, the real exchange rate also subsequently affect the trade balance. The stability of the exchange rate is very important to be maintained considering such extraordinary influence on some economic variables, especially on the trade balance. Theoretically, an increase in the real exchange rate means that the prices of domestic goods are relatively cheaper than the price of foreign goods. This will increase the export transactions in the country, so it will increase the value of net exports (trade balance).

Increased trading has increased foreign currency exposure to both exporting and importing firms, especially when trade is denominated in foreign currency. Increased foreign currency exposure and exchange rate volatility has made these firms vulnerable to risk. So that, to maintain the trade balance, an other policy strategy is focused on the covering the exchange rate exposure. The exchange rate risks can be minimized by using a hedging method. Hedging of the exchange rate is the other strategy for both stable exports and imports. Pritamani, *et al.* (2004) found that the average exposure for the unhedged importers is indeed higher than for hedged importers. The exchange rate exposure effects are additive for importers resulting in significantly positive total exposure and a greater need for hedging. The more stable imports are expected to reduce fluctuations in the trade balance. Even so, according to Export Development Canada study (2010), hedging also facilitate the pricing of products sold on export markets. Dohring (2008) also found that euro-area exporters have a hedging instruments to limit adverse impacts of the euro appreciation.

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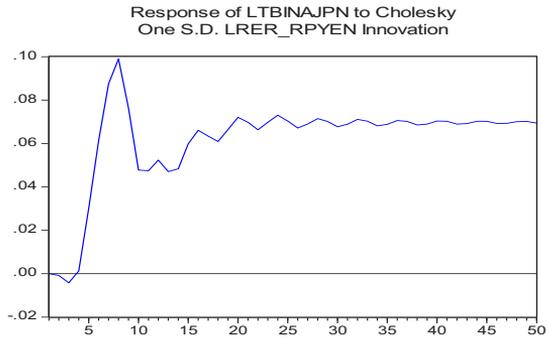
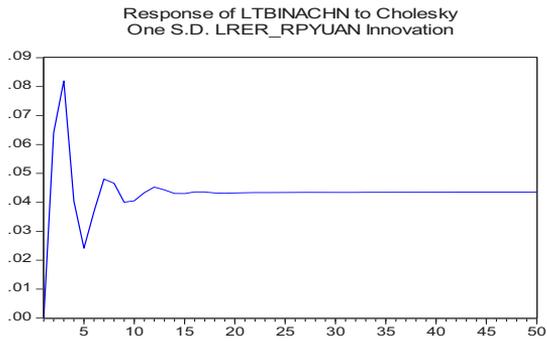
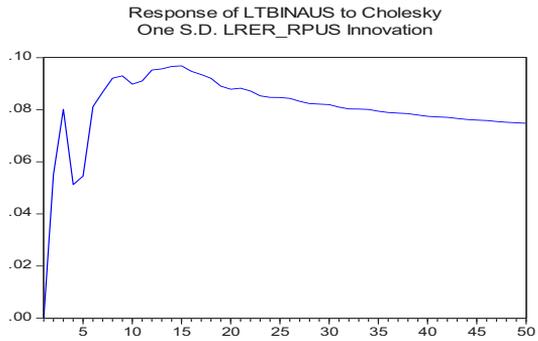
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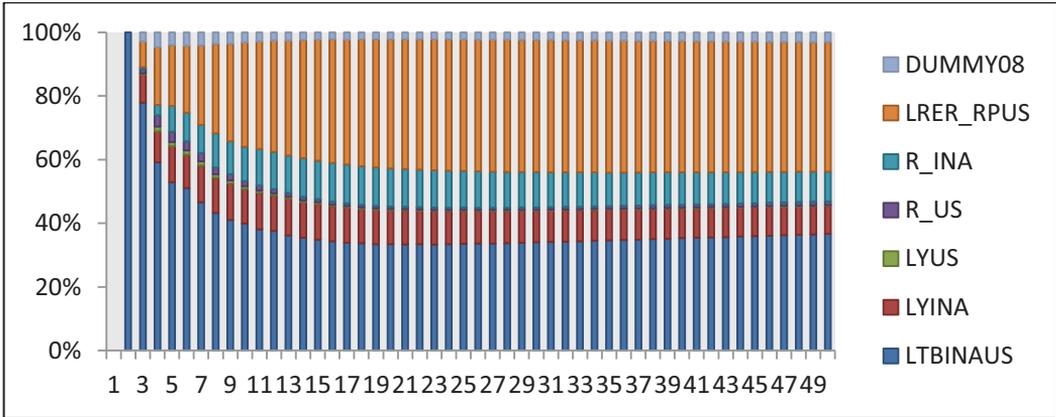
Appendix 1. Estimation Results of VECM

Model	Short Run			Long Run		
	Variables	Coefficient	t-statistic	Variables	Coefficient	t-statistic
Bilateral	R_US(-3)	-0.143472	-1.98543	TB _{INAUS}		1.000000
	RER_RPUS(-1)	1.230200	2.82105	Y _{INA}		1.000000
	Cointeq1	-0.926567	-2.23710	Y _{US}		1.000000
	Cointeq2	-3.311094	-1.97916	R_US (-1)	-0.01588	2.12514
	Cointeq3	5.753162	2.03406	R_INA (-1)	0.007063	8.32041
Indonesia- Amerika Serikat				LRER_RPUS(-1)	-0.76565	3.95521
				D ₂₀₀₈	-0.05552	4.79789
	YINA(-2)	2.116732	2.18765	TB _{INACHN}		1.000000
	R_INA (-1)	-0.020030	-2.73912	Y _{INA}		1.000000
	RER_RP YUAN(-2)	0.625038	2.17743	R_CHN(-1)	-0.11017	-7.06297
Indonesia- China	Cointeq1	-0.288808	-2.50124	R_INA(-1)	0.015358	-7.50615
	Cointeq2	3.356715	2.27666	YCHN(-1)	-1.75134	-40.4326
				RER_RP YUAN(-1)	0.121182	3.18526
	R_JPN(-2)	0.621051	2.08821	TB _{INAJPN}		1.000000
	LYJPN(-1)	-5.322381	-2.16223	Y _{INA}		1.000000
Indonesia- Jepang	Cointeq1	-0.232966	-3.17201	R_JPN		1.000000
	Cointeq2	-0.143486	-2.20148	R_INA(-1)	0.004916	-6.69293
	Cointeq3	-0.253215	-3.49373	YJPN(-1)	0.134011	-18.7791
				RER_RP YEN(-1)	0.131762	-4.86884

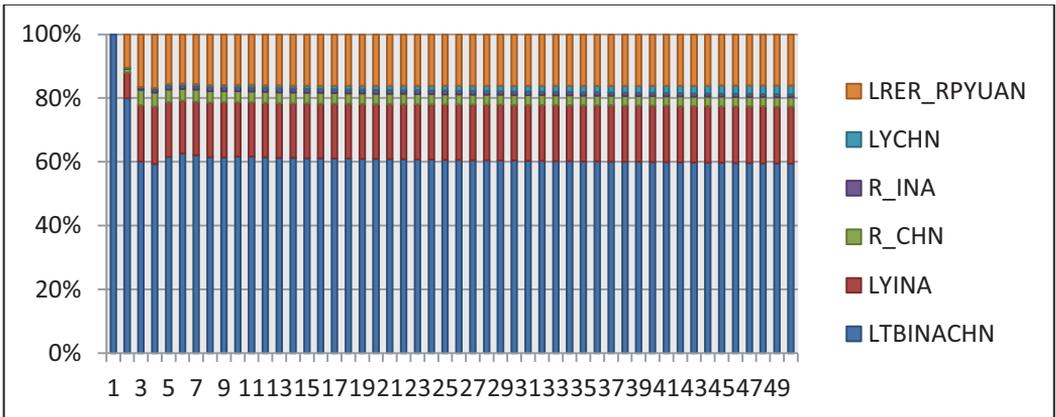
Appendix 2. Response of Indonesia Trade Balance to RER shock



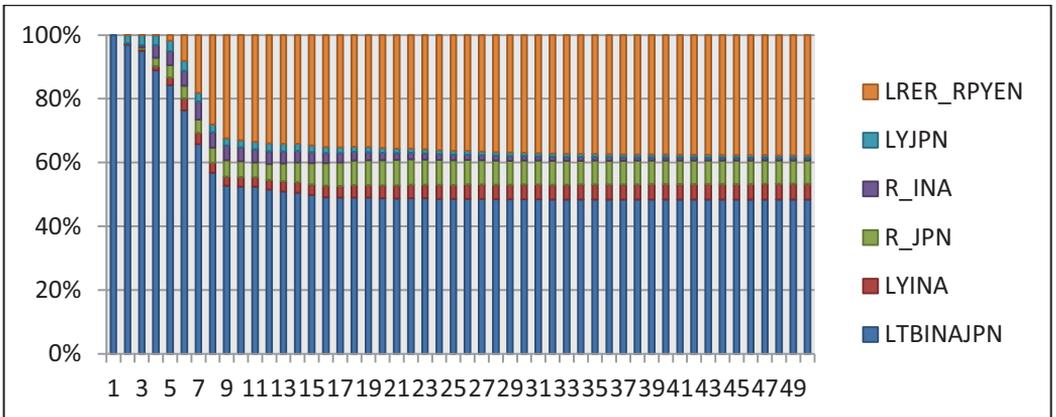
Appendix 3. Forecast Error Variance Decomposition (FEVD)



a. Indonesia-US



b. Indonesia-China



c. Indonesia-Japan