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The J-curve of Indonesia Trade Balance with His Trading Partners: Autoregressive Distributed Lag Method

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ABSTRACT

This study analyzes the impact of the real effective exchange rate (REER) on Indonesia's bilateral trade balance with its 14 most significant trading partners every month from 2005 to 2021. The ARDL (autoregressive distributed lag) technique is implemented here. This research aims to understand the causes and mechanisms behind the positive change in Indonesia's trade balance following the introduction of the J curve. This is a head-to-head phenomenon, as the J curve is related to the functioning of the transaction. So, trade characteristics (i.e., intervention in the exchange rate market) should be considered when determining how to restore a positive trade balance after an adjustment in the exchange rate. From 2005 to 2021, U.S.-Philippine commerce complied fully with Marshall-Lerner Act standards. As a result of the real exchange rate depreciation, the trade balance in Indonesia is forecast to improve. Indonesia's commercial ties with Singapore, Australia, the Netherlands, India, Japan, Germany, Korea, Malaysia, China, and Thailand do not satisfy this requirement because of the country's substantial reliance on imports, notably of raw resources. Significant effects on the J-curve phenomena may be seen at 1%, 5%, and 10% for Indonesia's trade balance with the US, Japan, Korea, Singapore, and Vietnam, respectively. Thus, if the rupiah were depreciated, the trade imbalance with Indonesia's top five trading partners would immediately decrease.

INTRODUCTION

According to conventional economic theory, there is a correlation between changes in a country's real exchange rate (appreciation or depreciation) and its trade balance. A declining currency rate would reduce overseas prices for a nation's exports, increasing foreign demand for its products. International consumers since such things would be relatively less expensive than their native counterparts. Likewise, depreciation increases the domestic costs of imports, making imports more expensive and reducing domestic demand for imports (Sidney S. Alexander, 1959). The expansion in exports emanating from the increase in foreign

demand, and the reduction in imports as a result of declining domestic demand \sare projected to lead to improvements in a country's trade balance. Persons transact with other persons, governments with other governments, and states with other sta-tes by an agreement between all parties (Pujoalwanto, 2014). Global economic fluctuations have a significant impact on the economic performance of emerging economies such as Indonesia via some avenues. Trade is one route that receives the most pressure (2020). Two parties engaged in a financial transaction whenever they transferred goods or services. Economic interactions include monetary compensation and the transfer of physical assets to exchange goods or services (Santosa, 2019). Therefore, it is fair to conclude that partaking in international trade necessitates a constant flow of temporary ownership of goods and services crossing state borders.

Indonesia is an active player in the integration of bilateral, regional, and global economic and commercial relations. All of these cooperative initiatives aim to increase national well-being through increased trade volume, which can indirectly improve manufacturing efficiency, hence increasing the product's competitiveness. In terms of bilateral trade, Indonesia conducts business with a variety of nations. Japan, the United States, and China are among the destinations for Indonesia's exports, with a 2005-2011 average market share of 18.92%, 9.85%, and 9.16%, respectively. In terms of imports, these countries are also crucial for Indonesia. China, the United States, and Japan each account for 12.65 percent, 10.72 percent, and 6.65 percent of overall imports, respectively. The trade balance is a metric that can be used to evaluate a nation's participation in international commerce.

As the years go by, Indonesia's economic condition becomes increasingly vulnerable due to the many shocks to external factors. External factors can be reflected in international trade (export and import values). Indonesia's trade activities with several main trading partners will experience a decline in 2021, including China, the United States, Japan and Australia. The following is data on Indonesia's trading partners in 2020.

Table 1. Balance of trade Between Indonesia and His Partner (million USD)

<i>Trade's Partner</i>	<i>Export</i>	<i>Import</i>
United States	18,594	8,417
Brazil	1,017	2,275
Netherlands	3,106	820
Germany	2,407	2,939
Spain	1,509	440
Philippines	5,892	556
Malaysian	7,985	6,992
Singapore	10,817	13,895
Thailand	5,086	6,289
Vietnam	4,937	2,983
Hongkong	2,003	4,015
India	10,350	3,595
Japan	13,472	11,001
South Korea	6,334	7,063
China	31,557	38,202
Taiwan	4,232	3,610
Australia	2,506	4,499
Afrika	2,912	1,667
Saudi Arabia	1,337	2,559

Source: Statistic Economic of Indonesia, Central Bank of Indonesia

Based on Table 1.1 above, it can be seen that four of Indonesia's main trading partners are for the oil and gas and non-oil and gas sectors. In the table above, it can also be seen that China is the largest based on the value of exports and imports. It is known that China is the leading export destination with a market share reaching 21.82 percent of Indonesia's total exports. China is still the largest country of origin for imports (raw and auxiliary materials), with a market share reaching 25.63 percent of all imports (Ministry of Trade, 2021). China's export and import performance in May 2020 plummeted due to the economic slowdown in countries worldwide due to the corona virus pandemic (covid-19). Because, In early December

2019, the city of Wuhan, China, was the first to detect COVID-19 (Ahmad Albar Tanjung, 2022). Japan and we also follow Husman (2007) Apart from China, Indonesia's trading partners. Types of mostly imported goods are raw/auxiliary materials by 74%, consumer goods by 9%, and capital goods 16.32%. The research gap where real exchanges in value deductions can not constantly improve the trade balance's performance - Lerner and the J-Curve phenomenon.

1. LITERATURE REVIEW

A record of the economic transactions carried out over the course of some time by citizens of a nation with a population distributed globally (Levi, 1996). On Tuesday, he predicted that the rupiah's value will rise on the Jakarta interbank spot market to IDR9,100 for one dollar. Domestic markets have seen less of an influence as a result of exports' success in expanding market targets to international markets (Sayef, Bakari; Mohamed, 2017). On Tuesday, he predicted the Rupiah would strengthen to IDR9,100 per dollar in the Jakarta interbank spot market. This was his prediction. The nation participating in international trade will have a trade balance that indicates the goods it imports. A nation's economic health, especially the health of a struggling economy, can also be gauged by looking at its trade balance. At least five lags influence the relationship between changes in exchange rates and their eventual effects on real commerce, according to Helen B. Junz and Rudolf R. Rhomberg (1973). They included various lags in their model to represent the dynamics of the exchange rate market and reflect the impact of replacement decisions of stocks and other resources employed in the manufacturing process.

However, the exchange rate is a factor in a country's ability to engage in international trade. Since August 14, 1997, or since the aftermath of the Asian crisis in 1997, Indonesia has enforced a free-floating currency rate regime. Introducing market-based processes to set the exchange rate (known as the "floating rate system") increases the possibility of currency fluctuations. When the real exchange rate rises, domestic product prices should fall relative to their foreign counterparts. As a result, the value of the country's net exports (trade balance) will rise due to a rise in export transactions. The goal of a country's exchange rate policy should be to keep the country's balance of payments in the black. Accordingly, a state would follow the predetermined Exchange rate policy direction. Keeping exports competitive and limiting imports are crucial to lowering the Running Deficit in Trade. According to some studies, the currency crisis (depreciation) has a negative effect on imports but a positive effect on exports since it reduces imports in the short term and increases exports in the long term.

Bahmani-Oskooee & Ratha (2008) and Bahmani-Oskooee et al (2017) present two recent examples of such systematic reviews (2010). These two works present tables that detail the critical aspects of every study in the literature and identify the nations where the theory has been tested at varying degrees of data aggregation. Our search for relevant literature for this research focused on studies that have included Indonesia in their analysis, and we found three such papers. Using aggregate trade data between each country and the rest of the world, (Bahmani-Oskooee & Alse, 1994) assessed the J-curve. They did this by employing the Engle-Granger technique to cointegration and error-correction models. They conducted unit root tests on data for Indonesia's trade balance and real effective exchange rate and found that while the former were both stationary, the latter was not. Therefore, Indonesia was omitted from the study since the order of integration of the two variables did not match. (Keho, 2021), (Lal & Lowinger, 2002) used Johansen's cointegration technique to investigate the long-term consequences of real depreciation using impulse-response analysis to track the J-curve effect in 7 different nations, Indonesia is one of them. To do this, they once again used global aggregate statistics on trade flows between countries. Specifically for Indonesia, findings corroborated the J-curve effect in the short run while showing no meaningful influence in the long run.

Onafowora (2003) employed bilateral trade data between pairs of countries to address the same two problems using the same two methodologies, namely Johansen's cointegration technique and the impulse response function. Japan and the United States were considered commercial partners for each Asian country. The long-term beneficial impact of real depreciation on bilateral trade balances was substantiated by the results for both the Indonesia-Japan and Indonesia-U.S. models.

This study filled a knowledge gap regarding the Marshall-Lerner condition and the J-Curve phenomena, both supported by a real exchange rate depreciation. Dissimilarities between the research's conclusions the research team wanted to learn how REER affected trade balance performance by analyzing its impact on exports and imports. Whether or whether the Marshall-Lerner condition and the J-Curve phenomenon apply to Indonesia's primary trading partners is also investigated. Theories of factual exchange rate determination that emphasize supply-side variables, such as productivity differences (Balassa, 1964; Samuelson, 1964), rely on a number of fundamental presumptions, including that the country is small, there is global capital mobility, both labor and capital are perfectly mobile across sectors of the economy, and there are constant returns to scale in these variables.

Demand factors may come into play if one or more of these requirements is not met. For instance, Froot and Rogoff (1991) discover that differences in government spending have extremely long-lasting consequences, even when factor mobility eventually makes them disappear. Both De Gregorio et al. (1994a, b) and De Gregorio and Wolf (1994), who also note that terms of trade shocks are significant empirical, come to the same result. The trade balance is defined as export demand minus import demand and is driven by two factors: the real exchange rate of the domestic currency relative to foreign currency exchange rates and domestic income. The actual exchange rate influences the trade balance because it reflects changes in the relative prices of domestic goods and services compared to those of foreign countries. The relationship between disposable income and the trade balance is mediated by domestic consumer spending.

On the other hand, a trade balance surplus will develop if a country uses more exports than imports. One of the factors that affect the balance of goods is exports and imports, and one of the factors that generally affect imports is the national income from countries since this factor will determine the insignificance of the consumption of an item. To get a general idea of the results of this study as well as in a theoretical analysis for a quick answer to the problem problem problem problem can be modeled in the following equations to data transformed into a natural logarithm (ln). The coefficient of exchange rates has a negative and significant impact on the trade balance.

Some studies suggest that a changeover in the exchange rate of a currency would influence a shift in the balance of commerce and output change. The change in real exchange values affects relatively low or more costly costs of products from other countries, so exchange rates are often used to increase competitiveness. Several papers are based on the idea that a relationship exists between cumulated current account deficits and long-run real exchange rate depreciation. (Obstfeld & Rogoff, 1995), for instance, find a significant correlation between trade-weighted fundamental exchange rate changes and changes in net foreign asset positions, and (Bayoumi et al., 1994) show that it matters whether the driving factor is monetary or fiscal policy.

The actual exchange rate effects on the balance of trade: comparable and the Marshall- Lerner condition (Boyd et al., 2001). The results of this study try to measure the impact of a real exchange value on the balance sheet of payments using a vector autoregressive vector lag (VARDL) of output and foreign, trade balance, and real exchange value. The research is for OCED countries. The result is the apparent effect of the j curve and the fulfillment of its long-term ml condition.

Research entitled Literacy of the Marshall-Lerner condition: A literature review. The author has estimated trade elasticity in 29 countries over the last decades. Using the ARDL cointegration method. From a full review, it can be taken as a result that many studies show fulfilled sleeping conditions Bahmani-Oskooee et al. (2017) with the name testing j curve phenomenon n in Vietnam: an auto show distributed lag (ARDL) approach. The study uses ARDL. The result of this study is that in the short term, the depreciation of exchange rates affects the drop in the trade balance, but in the long run, the depreciation of exchange rates affects the positive on the trade balance or the J-Curve (Phong et al., 2018). Some studies above suggest that a changeover in the exchange rate of a currency would influence a shift in the balance of commerce and output change. Some of the research described above has some variation in analytical methods, the state used as an object of study, and the results obtained. The change in real exchange values affects relatively low or more costly costs of products from other countries, so exchange rates are often used to increase competitiveness.

We demonstrate that most of the response to a devaluation happens over one year, with no J-curve effect, using quarterly data from 1980: I to 1989: IV. These findings imply that the exchange rate is now an efficient indirect tool for controlling trade due to the two-tier price system and other initiatives to liberalize the Chinese economy (Brada et al., 1997). This difference in the value of elasticity in the short and long term has led to the emergence of the concept of the J-curve or J-curve. This concept states that real depreciation/devaluation in the short term will worsen the trade balance, but in the long term, the trade balance will improve when the Marshall-Lerner conditions are met.

2. METHODOLOGY

The method of analysis is used to analyze how each variable affects the variables. Referring to the time avalanche model in this study are several analysis steps that involve testing station, cointegration bound testing, and the ARDL methods and classical assumptions. Testing methods with autoregressive distributed lag (ARDL) are dynamic test methods in economics. The ARDL test model combines autoregressive (ar) and myriad lag (dl). The advantage of using the ARDL test model is that data stations can vary, but no data is stationary on the second difference.

$$\Delta \text{LNBT}_t = \beta_0 + \beta_1 \text{LNGDP}_{\text{Indo}} + \beta_2 \text{LN GDP}_{j,t} + \beta_3 \text{LNRER}_{j,t} + \varepsilon_t$$

The ARDL model in the correct model of the equation is:

$$\text{BT} = \alpha_0 + \sum_{i=1}^n \alpha_1 i \Delta Y_{t-1} + \sum_{i=1}^n \alpha_2 i \Delta \log \text{GDP}_{\text{Indo}_{t-1}} + \sum_{i=1}^n \alpha_3 i \Delta \log \text{GDP}_{j,t-1} + \sum_{i=1}^n \alpha_4 i \Delta \log \text{RER}_{t-1} + \theta_1 Y_{t-1} + \theta_2 \text{LogGDP}_{\text{Indo}_{t-1}} + \theta_3 \text{Log GDP}_{j,t-1} + \theta_4 \text{Log RER}_{t-1} + u_t$$

Table 2. Variables Descriptions

<i>Variables</i>	<i>Description</i>	<i>Source</i>
BT	Indonesia's Trade Balance With Trading Partner j is the ratio of Indonesia's Exports to Country j over her imports from Country j.	The direction of Trade Statics of IMF
GDP-Indo	Index of Indonesia's real GDP	International Financial Statistics of IMF
GDP	Index of Real GDP of Partner j	International Financial Statistics of IMF
REXj	The bilateral real exchange rate between rupiah and the partner j's currency. It is defined as $(P_j \times \text{NEX}_j) / P_{\text{Indo}}$, where P_{Indo} is Indonesia's CPI, P_j is the trading partner's CPI, and NEX_j is the nominal bilateral exchange rate defined as the number of rupiahs per unit of partner fs currency. Thus, an increase in REX reflects the actual depreciation of the rupiah. When making this determination, we consulted the work of Darvas (2012), Sang Ho (2012), Chiu, Lee, and Sun (2010), Baak (2008), and Halicioglu (2009). (2008).	International Financial Statistics of IMF

This study estimates the ARDL model using the Akaike Info Criterion (AIC), with the conditions that it is not stationary at the level and not stationary at the level of integration, and the variables are cointegrated. The model is used to correct short-term imbalances towards the long term. Problems that are often found in time series are problems with data stationarity. This problem becomes essential considering the regression carried out under conditions containing a unit root (not stationary) will produce spurious regression, a condition where the regression results show a high coefficient of determination and are statistically meaningful. However, theoretically, there is no significant relationship. The reliability of the

time series says it is stationary if the average variance and cocktail are constant throughout the period time. Economists widely use methods of late to test data stations as the roottest unit. Tests in this study are done using this. Dicky Fuller's augmented computer testing model was introduced by Dickey and Fuller (, 1981). Showed the results of the root test unit using Dicky Fuller's augmented testing model. From the results of the root test units, all static variables are in the first difference.

Table 3. Result Cointegration

Trade's Partner	F-Statistic	Significance 5%		Result
		I0 Bound	I1 Bound	
USA	2,003	2,79	3,67	No Cointegration
Australia	4,416	2,79	3,67	Cointegration
Dutch	1,676	2,79	3,67	No Cointegration
India	6,428	2,79	3,67	Cointegration
German	2,016	2,79	3,67	No Cointegration
Korea	5,256	2,79	3,67	Cointegration
Malaysia	1,988	2,79	3,67	No Cointegration
Philipina	4,508	2,79	3,67	Cointegration
China	1,513	2,79	3,67	No Cointegration
Singapore	5,734	2,79	3,67	Cointegration
Thailand	3,276	2,79	3,67	No Cointegration
England	3,938	2,79	3,67	Cointegration
Vietnam	2,140	2,79	3,67	No Cointegration
Japan	6,508	2,79	3,67	Cointegration

Source: Author is Finding

3. RESEARCH RESULTS

From the table above, it is known that for trading partners Australia, Inggris and Japan, there is a stable long-term relationship between Indonesia's bilateral trade balance variables. For America and Japan, the F-stat value is below the lower bound and upper bounds for a significance level of 10%, 5%, and 1%. This means that there is no long-term relationship between the variables. In addition to diagnostic tests, stability or parameter consistency tests were carried out on the best model using the CUSUM and CUSUMQ tests in this study. The results show that all parameters of the estimation results are structurally stable between the United States and Australia trading partners during the analysis period so that they can be used for forecasting and policy analysis, the CUSUM and CUSUMQ plots indicate this is within the 5% critical bounds interval. Meanwhile, all trading partners except India, Singapore, Inggris, and Vietnam are less stable between times during the analysisperiod so that they can be used for forecasting and policy analysis, this is shown from the CUSUMQ plot which is out of the 5% critical bounds interval (figure 2).

The long-term response describes a stable exchange rate and trade balance state. When a stable long-term response is met in specific short-term dynamics the system is in a new equilibrium. This happened to Indonesia and its trading partner Australia. According to (Bahmani-Oskooee & Wang, 2006), whatever the model and data used in this related research, the short-term effect of exchange rate depreciation on the trade balance does not follow a certain pattern, so the results will be different for each country. In this paper, discusses the depreciation of the exchange rate on the bilateral trade balance between Indonesia and its four trading partners. In selecting the best model based on AIC. Then the F-bounds testing was carried out again to determine the cointegration relationship between variables from Indonesia's bilateral trade balance with four trading partners. The results of the F Bounds Testing for Australia and China have an upper critical value of 1%, meaning that these two countries have a long-term relationship while the United States and Japan have a value below the upper critical value. This means that H0 is rejected, which means that there is no stable long-term (cointegrated) relationship between the research variables.

3.1 Results and Discussion of ARDL (*Autoregressive Distributed Lags*) model estimation

The low performance of the trade balance can lead to the use of an external approach as a policy to increase the competitiveness of a country. There are two aspects of the trade balance reaction to changes in exchange rates, namely short-term and long-term responses. It explains the stable condition between the new exchange rate price level and the trade balance in the long run. When a stable long-term response is met after going through certain short-term dynamics, the system is in a new equilibrium (Stucka, 2004). Through the types of models and data used for this study, the short-term effect of exchange rate depreciation on the trade balance has a different pattern so that each trading partner also has different results (country-specific) (Bahmani-Oskooee & Ratha, 2008). If you follow the J-curve hypothesis proposed by (Wilson, 2001) then the J-curve is defined as a short-term negative effect combined with a long-term positive effect. So to find out whether or not there is a J-curve effect, information is needed on the long-term effect of real exchange rate depreciation on Indonesia's bilateral trade balance with its four trading partners.

Table 4. Estimated Long Run Coefficients of Bilateral Trade Balance Model

<i>Country</i>	<i>LN_GDP_{Indo}</i>	<i>LN_REER</i>	<i>LN_GDP_j</i>	<i>C</i>
USA	0,14	-0,11	-0,11	-0,17
Australia	0,036	0,565	-0,006	-4,27
Dutch	0,034	5,103	-0,11	-21,03
India	-0,04	0,04	0,08	-0,37
Japan	0,45***	0,127	-0,07	-14,14**
German	0,079	1,889	0,101	-14,12
Korea	0,355***	0,280**	-0,173*	-8,56
Malaysia	0,21	0,075	0,094	-10,72
Philipina	0,09	-0,73***	0,211**	-5,84
China	0,06	0,02	-0,05	-0,91
Singapore	-0,02	0,088	0,09***	-2,94
Thailand	0,06	-0,04	-0,003	-2,41
England	0,125	0,206	0,004	-4,18
Vietnam	0,69**	0,68	0,121	-35,96*

Add : (***) 1% significance level, (**) 5% significance level, (*) for 10% significance.

To confirm the J-curve hypothesis in Indonesia during the study period, the sign of the coefficient on the real effective exchange rate ($\ln(\text{REER})$) should be positive in the short run. Empirical results from the short run linear model, as presented in table 4 showed that the coefficient of the real effective exchange rate was also negative in the short-run linear model and is significant at the 1 percent level. In this study, using the ARDL bounds testing approach to examine the J-curve effect. The results of this study found that the Marshall Lerner condition occurs in trading partners who have a negative sign on the REER coefficient ($\alpha_1 < 0$) (Bawa et al., 2018) (Kyophilavong et al., 2013). Marshall Lerner's condition occurs in trading partners of the United States, the Philippines ($\alpha < 5\%$) and Thailand. Short-term at Table 5 exchange rates on the trade balance are found in Indonesia's bilateral trading countries with 14 trading partners. Depreciation of the real exchange rate will increase the trade balance and show the J-curve in the short term by acquiring a positive and significant coefficient value. The results of the study show that the real exchange rate coefficient is positive ($\alpha_1 > 0$). This can be seen in the trading partners of the United States, Japan, Korea, Singapore, and Vietnam. Each significant at $\alpha < 1\%$, 5% , and 10% .

CONCLUSION

Empirical studies have distinguished between the short-run and long-run effects of devaluation or depreciation on a country's trade balance. It is suggested that a country's trade balance will suffer in the short term as a result of currency devaluation/depreciation and will only improve in the long-term, resulting in the J-curve phenomenon. This short-term response is attributed to the occurrence of considerable lags prior to the growth in exports and contraction in imports that are typically accompanied by currency depreciation or devaluation, as well as the occurrence of a currency contract period. This study examined the linear ARDL bounds testing approach to cointegration and analysed quarterly data from 2005 to 2021 to determine if the J-curve phenomena exists in Indonesia

The study revealed that the model variables displayed varying degrees of stationarity. The bound tests revealed that the variables were cointegrated in the linear models, since the computed F-and t-statistics exceeded the upper bound critical values at the 1% significance level. The empirical results of the long-run linear model indicated that a real depreciation would improve Indonesia's trade balance through an increase in exports and a decrease in imports, essentially following Marshall – Lerner's hypotheses. The long ARDL model result revealed that the influence of real exchange rate fluctuations on Indonesia's trade balance is symmetric, with real depreciation playing a substantial role while real appreciation has no effect. It also suggested that an increase in foreign money tends to worsen Indonesia's trade balance, whereas an increase in domestic income significantly impacts Indonesia's trade balance over the long term. The short-term research found that the J-curve phenomenon does not exist in Indonesia, since the exchange rate coefficient remained negative and statistically significant. In both the short-run and the long-run, a depreciation of the Indonesia leads to an improvement in Indonesia's trade balance, as seen by these findings, which confirm previous research evaluating the J-curve hypothesis.

For 2005 to 2021, overall the Marshall-Lerner conditions were fulfilled in United States and Philippines trade relations. This means that the real exchange rate depreciation will improve Indonesia's trade balance. This condition is not fulfilled in trade relations with Singapore, Australia, Netherlands, India, Japan, Germany, Korea, Malaysia, China, and Thailand due to the low elasticity of imports due to Indonesia's high dependence on imports, especially in the form of raw materials for production.

The J-curve phenomenon is met from the dynamic adjustment of Indonesia's trade balance with United States, Japan, Korea, Singapore, and Vietnam trading partners. Each significant at $\alpha < 1\%$, 5% , and 10% . Therefore, a real depreciation will immediately improve Indonesia's trade balance with its five trading partners.

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