Analysis of the Effect of Real Exchange Rate, Exports, and Imports on Indonesia's Trade Balance in 1990-2020

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ABSTRACT
This research aims to analyze the Marshall-Lerner condition in Indonesia's trade with its main currency trading partners. This study deployed the OLS approach to analyze the 1990-2020 data series; the estimation steps included classical assumption, model time, and regression coefficient tests. The results unveiled that the exchange rate, exports, and imports significantly affected Indonesia's trade balance. It is the first study at Universitas Muhammadiyah Surakarta to examine the effect of the export-import real exchange rate on Indonesia's trade balance from 1990 to 2020.

Keywords: *Real Exchange Rate, Export, Import, Trade Balance, OLS.*

1. INTRODUCTION

The trade balance deficit is often used as an indicator of the poor economy of a country. It is not entirely true because the trade balance does not have an ideal condition. To state the condition of the trade balance deficit as bad or good is highly relative to economic conditions, both domestic and international. As a country that adheres to an open economic system like Indonesia today, a country cannot be separated from international economic activities. The economic condition, especially international trade, can be known by looking at the trade balance. It is one of the instruments in the balance of payments displaying the export and import conditions. The data in the trade balance can reveal not only the condition but the export and import performance of a country.

The trade balance can determine several conditions. The first is a surplus condition. The trade balance is in surplus if a country's exports are greater than its imports. In contrast, the trade balance is in deficit when a country's imports are greater than its exports (Mankiw, 2009).

However, if the trade balance deficit condition occurs continuously, it must be considered because it can indicate poor economic conditions, especially in export performance. The condition of the trade balance in Indonesia in the 2009-2020 period is exhibited in Graph l.

Graph 1. Trade Balance in Million USD
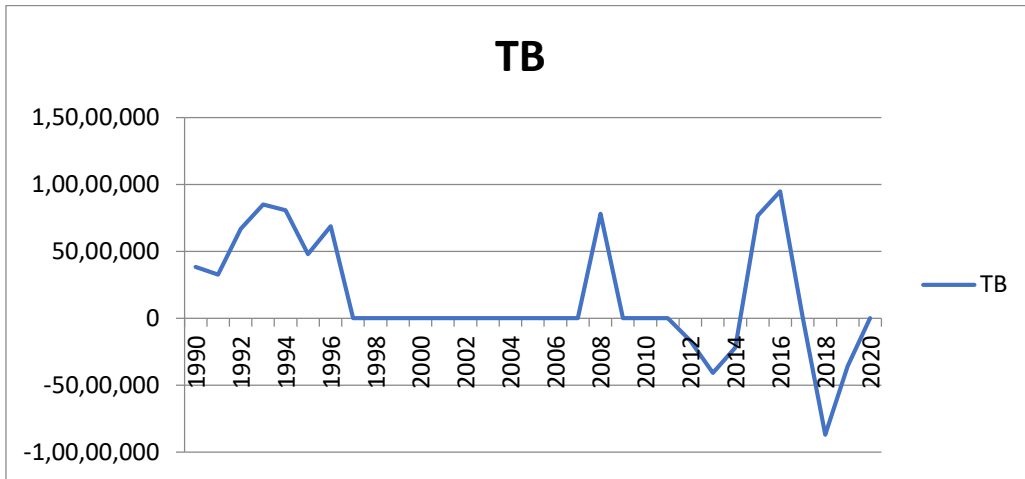
Source: Central Bureau of Statistics (2020)

From Graph 1, the level of trade balance in Indonesia during 2009-2018 experienced quite dynamic fluctuations. The highest trade balance occurred in 2016, amounting to 9,481 million USD, while the lowest deficit was in 2012, -1,669 million USD. Then from 2009 to 2011, there was a positive trend of 19,680, 22,115, and 26,061 million USD. The above graph displays the development of Indonesia's exports being greater than imports. However, this development did not last long since, at the end of 2012 until 2014, there was a negative trade balance trend of -1,669, -4,076, and -2,198 million USD, and the increase in the total value of Indonesia's exports since that year was lower than the increase in the total value of imports, causing the trade balance. In 2015-2017, Indonesia could restore its trade in a surplus position of 7,671, 9,533 and 11,842 million USD.

As demonstrated, 2012, 2013, 2014, and 2018 were not good years for Indonesia's international trade performance. The slowdown in the pace of exports and the decline in prices of Indonesia's main export commodities in the international market caused a significant decline in its exports. This condition caused Indonesia's trade balance deficit to occur for the first time since 1961. One of the causes of the trade balance deficit was pressure from the trade balance deficit in oil and gas commodities and the decline in export performance in several sectors due to weakening global demand (Ministry of Trade, 2019).

2. LITERATURE REVIEW

A. Effect of Exports and Imports on the Trade Balance

As discovered by (Wiryanti, 2015), exports had a negative effect on the trade balance with a regression coefficient of -0.168, meaning that the correlation between exports and Indonesia's trade balance in 2003-2013 was extremely weak and negative. Meanwhile, imports had a negative effect on the trade balance with a regression coefficient of -0.378, indicating that the correlation between imports and Indonesia's trade balance in 2003-2013 was excessively weak and negative.

B. Effect of Real Exchange Rate on the Trade Balance

The real exchange rate has significantly impacted Pakistan's trade balance (TB). This article suggests that the government adopt an exchange rate policy that leads to an increase in exports and a reduction in Pakistan's trade balance deficit.

Research from (Fitriana & Utomo, 2020) examined the effect of the exchange rate, inflation, foreign exchange reserves and BI rate on the trade balance in Indonesia in 1990-2018. The analytical method used in this study was multiple regression analysis with the OLS (Ordinary Least Squares) model. Based on the study results, particularly in the classical assumption test, the exchange rate and foreign exchange reserves significantly affected the trade balance.

Research from (Purba & Soebagiyo, 2020) analyzed the factors affecting the international trade balance in 1993-2018. This study applied the partial adjustment model (PAM) analysis technique. The results unveiled that the exchange rate and import tariff variables significantly affected Indonesia's international trade balance in 1993 - 2018.

3. RESEARCH METHODs

This study utilized secondary data in a time series over 30 years, namely from 1990-to 2020. The data were obtained from the World Bank, the Central Statistics Agency, and the Ministry of Finance. Data related to the trade balance were collected from the official website of BPS (www.bps.go.id), while data related to exchange rate, exports and imports were gathered from the official website of the World Bank (www.worldbank.org). Other information came from several scientific journals and textbooks.

This study observed the effect of the real exchange rate, exports, and imports on Indonesia's trade balance, using multiple regression analysis tools with the OLS (Ordinary Least Square) method with the estimator model of Ordinary Least Square (OLS) with the econometric model as the following:

$$TB_t = \beta_0 + \beta_1 LogKURS_t + \beta_2 LogEks_t + \beta_3 LogImp_t + \varepsilon_t$$

Description:

TB_t : Indonesia's Trade Balance (Million USD)
$KURS_t$: Rupiah exchange rate against USD (Rupiah)
EKS_t : Exports in Indonesia (Million USD)
iMP_t : Imports in Indonesia (Million USD)
ε_t : Error term (error factor)
β_0 : Constant
$\beta_1 \dots \beta_3$: Independent variable of the regression coefficient
t : year t

A mathematician first introduced the Ordinary Least Square (OLS) model from Germany, namely Carl Friedrich Gauss. The OLS method estimates a regression line by minimizing the sum of the squares of errors from each observation on the line (Kuncoro, 2003).

4. RESULTS AND DISCUSSION

4.1 Analysis Results

The data used in this study comprise time series, presented in Table 1. The classical assumption test covered multicollinearity, residual normality, autocorrelation, heteroscedasticity and specification or model linearity tests.

Table 1
Econometric Model Estimation Results

TB_t = -9926.4 + 1081.0 ln(KURS$_t$) −126.53 EKS$_t$ −133.58 IMP$_t$

(0.114)*   (0.040)*(0.143)*(0.084)

R^2 = 0.304; DW-Stat. = 2.057; F-Stat. = 2.336; Prob. F-Stat. = 0.112

Diagnostic Test

(1) Multicollinearity (VIF)
ln(TB) = 2.058; $KURS$ = 1.483; EKS = 42.918; IMP = 45.719

(2) Residual Normality
JB(2) = 4.900; Prob. JB(2) = 0.086

(3) Autocorrelation
χ^2(3) = 5.582; Prob. χ^2(3) = 0.133

(4) Heteroscedasticity
χ^2(8) = 13.174; Prob. χ^2(8) = 0.154

(5) Linearity
F(2.14) = 0.375; Prob. F(2.14) = 0.693

Source: BPS, processed. **Note**: *Significant at = 0.01; **Significant at = 0.05; ***Significant at = 0.10. The number in brackets is the empirical probability (p-value) t-statistic.

The diagnostic test revealed that the estimated model did not have any classical assumption test violation problems. All VIF values were < 10, so the estimated model was free from multicollinearity problems. The empirical probability values of Residual Normality, Autocorrelation, Heteroscedasticity, and Linearity tests, which were 0.086 (> 0.10), 0.133 (> 0.10), 0.154 (> 0.10), 0.693 (> 0.10), signify that the estimated model had a normal residual distribution, free from autocorrelation and heteroscedasticity problems, with exact model specifications (linear). In this study, the analytical method utilized OLS (Ordinary Least Square), and the data were time-series data from 1990-to 2020. This study discovered that exports and imports had a negative effect on Indonesia's trade balance both in the long and short term. This study also unveiled that the real exchange rate consumption had a negative and

significant effect on Indonesia's trade balance in both the long and short term. The value of the error correction model, negative and significant, indicates a correction of the variable movement in the long-term equilibrium. It implies the importance of the government to issue appropriate policies to address Indonesia's trade balance deficit, including maintaining exchange rate stability, controlling public consumption of imported goods, and attracting foreign direct investment (FDI).

4.1.1. Multicollinearity Test

The multicollinearity test deployed the VIF test. The multicollinearity VIF test occurred when the VIF value for the independent variable was > 10. The results of the multicollinearity test are displayed in Table 2.

Table 2. VIF Test Results

Variable	VIF	Criteria	Conclusion
TB	2.058	<10	Does not cause multicollinearity
KURS	1.483	<10	Does not cause multicollinearity
EKS	42.918	<10	Does not cause multicollinearity
IMP	45.719	<10	Does not cause multicollinearity

4.1.2. Residual Normality Test

The residual normality test utilized Jarque Bera (JB). H0 signifies a normal residual distribution, while HA indicates that the residual distribution is not normal. H0 is accepted if the p-value, probability, or empirical statistical significance of JB > 10; H0 is rejected if the p-value, probability, or empirical statistical significance of JB < 10. From Table 1, the p-value, probability, or empirical significance of JB is 0.086 (< 10), so H0 is rejected, meaning that the residual distribution was not normal.

4.1.3. Autocorrelation Test

The autocorrelation test was performed using Breusch Godfrey (BG). H0 of the BG test implies no autocorrelation in the model; HA indicates

autocorrelation in the model. H0 is accepted if the statistical significance is > 2, and H0 is rejected if the significance is < 2. Table 1 displays the p-value, probability, or empirical statistical significance of the two BG tests of 0.133 (> 0.10); H0 is accepted. In conclusion, there was no autocorrelation problem in the model.

4.1.4. Heteroscedasticity Test

The heteroscedasticity test utilized the White test. The H0 of the White test indicates no heteroscedasticity problem in the model, and HA has a problem of heteroscedasticity in the model. H0 is accepted if the p-value, probability or empirical statistical significance of the White test is > 2; H0 is rejected if the p-value, probability, or statistically significant empirical of the White test is < 2. From Table 1, the p-value, probability,

or empirical significance of the two White tests is 0.154 (> 0.10), so H0 is accepted. In other words, there was no heteroscedasticity in the model.

4.1.5. Model Specification Test (Linearity)

The accuracy of the specifications or the linearity of the model was tested using Ramsey's RESET test. H0 means the model specifications are exact or linear, while HA indicates that the model specifications are not precise or not linear. H0 is accepted if the p-value, probability, or empirical statistical significance of Ramsey's RESET is > 2. H0 is rejected the p-value, probability, or empirical statistical significance of Ramsey's RESET is < 2. The p-value, probability or empirical statistical significance of Ramsey's RESET test obtained a value of 0.693 (> 0.10), so H0 is accepted. In conclusion, the model's specifications used in the research were correct or linear.

5. RESEARCH CONTRIBUTION

The results of this study are expected to contribute as follows:

For academics, this research is expected to add insight and scientific development of academics, especially those interested in researching the economic growth index and be used as a basis for decision-making. For investors, this research is expected to add references beneficial for decision-making in investing. For future researchers, this research is expected to be a reference material and empirical evidence on the effect of the real exchange rate, exports and imports on the trade balance.

6. CONCLUSION

The following conclusions were drawn based on the discussion of regression analysis above. The regression model used in this study passed all classical assumption tests, including multicollinearity, residual normality, autocorrelation, heteroscedasticity and model specification tests. The goodness-of-fit test of the model proved the existence of the econometric model used in this study, with a determinant coefficient of R^2 of 0.304. The Indonesian trade balance variable can be explained by variations in the exchange rate, exports, and imports.

The results of hypothesis testing using the OLS regression model unveiled that the exchange rate, exports, and imports significantly affected Indonesia's trade balance. It follows the results conducted by Asnawi and Hasniati (2018), discovering that the exchange rate had a significant effect on the trade balance. The exchange rate is crucial in an open economy because it is determined by the balance between supply and demand in the market, given its large influence on the current

account and other macroeconomic variables. The exchange rate can be used to measure the economic condition. Stable growth in the value of the currency indicates that the country has a relatively good or stable economic condition. Changes in the exchange rate, both appreciation and depreciation, will affect the activities of exports and imports of goods in Indonesia. The US Dollar is still the currency that dominates global trade payments. If the Rupiah weakens against the US Dollar, the exporters will benefit because the price of exported goods is relatively cheaper than that of imported goods. Thus, the goods exported by Indonesia to destination countries will increase, and the trade balance will be in a surplus.

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