

## The Role Mediation of Export and Foreign Debt in Influences Exchanges Rate on Foreign Exchange Reserves: Evidence from Indonesian

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### Abstract

The purpose of this study is to examine and analyze the role of export and foreign debt mediation in the effect of exchange rate on foreign exchange reserves. And test and analyze the effect of exchange rate on exports, foreign debt and foreign exchange reserves and the effect of exports and foreign debt on foreign exchange reserves in Indonesia in 1999-2015. The type of research data is secondary data sourced from Bank Indonesian and Central Bureau of Statistics. Data analysis with path analysis using AMOS 18.0. The results of the analysis and discussion concluded that in the period of 1999-2015, export and foreign debt play a role mediate the effect of exchange rate on foreign exchange reserves in Indonesia. The significance test results conclude that the effect mediation of export and foreign debt is significant on foreign exchange reserves. Other results conclude that exchange rate has significant effect on export, foreign debt and foreign exchange reserves. Export and foreign debt have a significant effect on foreign exchange reserves in Indonesia.

**Keywords:** *Exchange Rate, Export, Foreign Debt, Foreign Exchange Reserves, Multiple Variable Models*

**JEL Classification:** F10, C30

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## INTRODUCTION

Based concept foreign exchange reserves of International Reserves and Foreign Currency Liquidity (IRFCL) can be seen two important functions of foreign exchange reserves, namely to finance the balance of payments imbalance and to maintain monetary stability. In connection with the balance of payments, foreign exchange reserves are usually used to finance imports and pay off foreign liabilities, while in its function to maintain monetary stability is to maintain the exchange rate of the currency. The size of the accumulation of foreign exchange reserves of a country is usually determined by trading activities (exports and imports) as well as the country's capital flows. Meanwhile, the adequacy of foreign exchange reserves is determined by the large import demand and the exchange rate system used (Gandhi, 2006).

Although theoretically there is no definite indication in determining the extent of the adequacy of foreign exchange reserves, according to (Gandhi, 2006) the determination of the level of adequacy is generally influenced by the characteristics of monetary policy associated with (1) the exchange rate regime;

(2) the openness of a country's economy; and (3) foreign debt policy adopted by a country. In relation to the purpose of managing foreign exchange point 1 to 3, this research is conducted to analyze how the exchange rate effect on foreign exchange reserves are mediated by exports and foreign debt.

Foreign exchange reserves represent the amount of foreign exchange in a country, both government and private. The amount of foreign exchange reserves is very dependent on the progress of the balance of payments, or the current account balance plus the balance of capital traffic balance. Several factors that influence the position of foreign exchange reserves are net exports, foreign debt, foreign investment and portfolio investment (Eggleston et al., 2001). The Mundell Fleming model concludes that net exports are influenced by the economy, foreign economy and exchange rates (Dornbusch & Fischer, 2008).

Based on the results of empirical studies from some previous researchers who used as a reference in this study, it appears that the model built of relationship between variable by previous researchers, only test the direct influence of one or several independent variables to the dependent variable. (Agustina & Reny, 2014) concludes that exports and exchange rates affect Indonesia's foreign exchange reserves. (Warisma, 2015) finds exchange rate fluctuations and exports have a positive relationship with Indonesia's foreign exchange reserves. (Rochman, 2009) exchange rate, foreign debt and Export have significant effect on the Foreign Exchange Reserves. (Moslares & Ekanayake, 2018) conclude exports have a positive effect on the level of foreign economic activity but negatively on relative prices and real exchange rates.

Based on theoretical and empirical studies, the researcher is interested to reconstruct the research model by placing the export and foreign debt variable as the mediation variable. Further the role of mediation testing using path analysis with AMOS program 18.0. In this study we will examine the role of export variable mediation and foreign debt in the relationship exchange rate to foreign exchange reserves. In addition, the partial and simultaneous test of influence of exchange rate, export and foreign debt variables on foreign exchange reserves. In the research of the exchange rate on foreign exchange reserves in Indonesia in the period 1995-2015.

In this research, several hypotheses are proposed related to the relation between exchange rate variable to foreign exchange reserve either directly or through export and foreign debt and the relationship between foreign debt and export to foreign exchange reserves. The first hypothesis proposed is the exchange rate effect on export supported by the results of research. The first hypothesis proposed by the exchange rate is influenced by exports. (Mankiw, 2013) states that the real exchange rate of a country will affect the macroeconomic conditions of a country, especially with net exports or trade balance. Net exports are a function of exchange rates. In this study the exchange rate is expressed in the direct term (IDR to the dollar) so that the relationship exchange rate with the export in the Mundell-Flemming model depicted in the Investment-Saving curve is a positive coefficient. This hypothesis supported by the results of the study (Khan, 2013); (Moslares & Ekanayake, 2018), (Fang & Lu, 2011), (Guillou, 2008), (Rochman, 2009), (Juniantara & Budhi, 2005), (Rochman, 2009) and (Ginting, 2013) which concludes that exchange rates have a significant effect on exports.

The second hypothesis proposed is the exchange rate effect on foreign debt supported by the results of research (Basdevant & De Wet, 2000) mentions one of the problems in developing countries is the possibility of an unstable relationship between exchange rate regime and foreign debt. An economy can have an exchange rate that a change from time to time depending on what exchange rate regime is set. A bad exchange rate regime can exacerbate the sustainability of a country's foreign debt and the exchange rate of the country itself. The second hypothesis is also supported by the results of the study (Bashir Ahmad Fida, 2012), (Bunescu, 2014), (Adhiambo & Nairobi, 2015) which concluded that the exchange rate had a significant effect on external debt.

The third hypothesis proposed is the exchange rate effect on foreign exchange reserves supported by the assertion that foreign exchange reserves have an important impact on the position of a country's exchange rate. The increase in reserves in the balance of payments provides a stimulus to make the rupiah appreciate. The exchange rate relation to foreign exchange reserves is the more foreign exchange or foreign exchange owned by the government and the population of a country hence the greater the country's ability to perform international economic and financial transactions and the stronger the value of the currency. In addition, with the increasing exchange rate of the country's own currency, indicates that the stronger the economy of the country concerned, so as to obtain more foreign exchange (Mishkin, 2000). The third hypothesis is also supported by the results of the study (Adhiambo & Nairobi, 2015), (Khan, 2013), (Fang & Lu, 2011), (Chinweobo Emmanuel, 2013) which concluded that the exchange rate had an effect on foreign exchange reserves.

The fourth hypothesis proposed is the export effect on foreign exchange reserves supported by the results of research (Pinem, 2009); (Juniantara & Budhi, 2005), (Agustina & Reny, 2014) indicate that exports affect Indonesia's foreign exchange reserves, according to (Eggleston et al., 2001) and (Rochman, 2009), (Putri, 2017), exports have a positive effect on Indonesia's foreign exchange reserves. In the model of Mundell Fleming (Dornbusch & Fischer, 2008) it is concluded that net exports are influenced by the economy, foreign economy and exchange rate. The export relation to foreign exchange reserves is in exporting a country will get a value of money in foreign currency or commonly referred to as foreign exchange so that if the export level decreases, it will be followed by decreasing of foreign exchange reserves (Agustina & Reny, 2014). According to the theory of mercantilism to develop the national economy and economic development, the amount of exports must be greater than the amount of imports. If exports are bigger than imports, it will increase foreign exchange reserves. Meanwhile, according to David Hume if a country surplus trade balance (export > import), it will happen the flow of gold that causes the money supply increased, which means it will increase foreign exchange reserves.

The fifth hypothesis proposed is that foreign debt affects foreign exchange reserves supported by a statement (Todaro & C Smith, 2008) that external debt is an external source of finance (whether in the form of grants or loans) has an important role in the effort to supplement domestic resource shortages in order to accelerate growth foreign exchange, saving and covering the budget deficit. Foreign loans in the form of money, can directly add to foreign exchange. This loan can be used to pay all financing abroad. Although there is an obligation to return, but money obtained from abroad will still increase the country's foreign

exchange. The fifth hypothesis is also supported by the results of the study (Lygina, Zainuri, & Priyono, 2013), (Santana & Adiyadnya, 2017), (Putra & Indrajaya, 2011), (Rochman, 2009), and (Wiguna, 2016) which concluded that foreign debt had a significant effect on foreign exchange reserves.

## METHOD

This research is explosive associative research. According (Sugiyono, 2018), explosive associative research is a study that explains the relationship between dependent variables with independent variables. In this study the dependent variable is the foreign exchange reserves and the independent variables are exports, foreign debt, foreign investment and rupiah exchange rate. The type of data used in this study is secondary data. Secondary data is data obtained indirectly or the results of publications from various agencies, organizations, and companies. Observation period of this research data is 1999-2015.

This is study using period of observation from 1999-2015 because in that period of anomaly relatively smaller data like monetary crisis of 1998. The data used in this research are: Foreign Exchange Reserves Data, Export Data, Foreign Debt Data, Exchange Rate Data (Middle Rate). The data used in this study comes from Bank Indonesia (BI) and the Central Bureau of Statistics.

## Development of Flowcharts and Lane Diagram Conversions into Statistical Equations

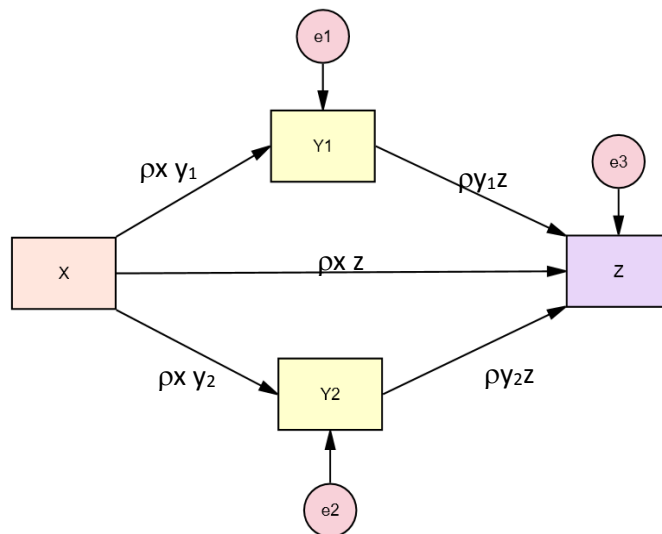


Figure 1 Complete Path Diagram  
Source: Development by Author (2018)

### Information:

- X = Exchange rate
- Y<sub>1</sub> = Export
- Y<sub>2</sub> = Foreign debt
- Z = Foreign exchange reserves
- e<sub>1</sub> = another factor that affects Y<sub>1</sub> other than X
- e<sub>2</sub> = another factor that affects Y<sub>2</sub> other than X
- e<sub>3</sub> = another factor that affects Z other than X, Y<sub>1</sub> and Y<sub>2</sub>

$\rho_{xy_1}$  = Path X to  $Y_1$   
 $\rho_{xy_2}$  = Path X to  $Y_2$   
 $\rho_{xz}$  = Path X to Z  
 $\rho_{zy_1}$  = Path  $Y_1$  to Z  
 $\rho_{zy_2}$  = Path  $Y_2$  to Z

The statistical equation of the complete flow chart above illustrating the structural relationship between the independent variables and the dependent variable is:

$$y_1 = \beta_0 + \beta_1 x + e_1 \quad (1)$$

$$y_2 = \beta_0 + \beta_1 x + e_2 \quad (2)$$

$$z = \beta_0 + \beta_1 x + \beta_2 y_1 + \beta_3 y_2 + e_3 \quad (3)$$

### Evaluate classical assumptions

Chin Li (1975) and Harun Al Rasjid (1997) that the assumptions that must be met in the model test using path analysis are:

1. Direct Effect  $x \rightarrow z = (\rho_{zx})^2$
2. Direct Effect  $y_1 \rightarrow z = (\rho_{zy_1})^2$
3. Direct Effect  $y_2 \rightarrow z = (\rho_{zy_2})^2$
4. Indirect Effect  $x \rightarrow z = (\rho_{zy_1} \cdot \rho_{zx} \cdot r_{y_1x}) + (\rho_{zx} \cdot \rho_{zy_2} \cdot r_{y_2x}) + [(\rho_{zy_1})^2 + (\rho_{zy_1} \cdot \rho_{zx} \cdot r_{y_1x}) + (\rho_{zy_2} \cdot \rho_{zy_1} \cdot r_{y_2y_1})] + [(\rho_{zy_2} \cdot \rho_{zy_1} \cdot r_{y_2y_1}) + (\rho_{zx} \cdot \rho_{zy_2} \cdot r_{y_2x})]$
5. Simultaneous effects  $\rightarrow R^2_{(xyz)} = [(\rho_{zx})^2 + (\rho_{zy_1} \cdot \rho_{zx} \cdot r_{y_1x}) + (\rho_{zx} \cdot \rho_{zy_2} \cdot r_{y_2x}) + [(\rho_{zy_2})^2 + (\rho_{zy_1} \cdot \rho_{zx} \cdot r_{y_1x}) + (\rho_{zy_2} \cdot \rho_{zy_1} \cdot r_{y_2y_1})] + [(\rho_{zy_2})^2 + (\rho_{zy_2} \cdot \rho_{zy_1} \cdot r_{y_2y_1}) + (\rho_{zx} \cdot \rho_{zy_2} \cdot r_{y_2x})]$
6. The effects of other factors on exogenous variables is calculated by the formula  $1 - R^2$

### Direct Effect Test

Test of direct influence between variable is done by using F test and t test. F test is a simultaneous influence test of two or more independent variables to the dependent variable. The criterion is that if the p value is less than the alpha value (5%), then there is a simultaneous influence of the independent variable to the dependent variable. Furthermore t test is partial test independent variable to dependent variable with other independent variable assumption constant. The criterion is that if the p value is less than the alpha value (5%), then there is a significant partial influence of the independent variable on the dependent.

### Indirect Effect Test

The indirect effect / influence of mediation test is the development of the test conducted by (Sobel, 2013) and (Baron & Kenny, 1986). Based on Figure 1, the test steps of indirect influence / influence of mediation are:

1. Determine the direct effect of exchange rate on foreign exchange reserves



Figure 2 The Direct Effect of Exchange Rate on Exchange Foreign Reserves  
Source: Development of the Sobel Model (2013) and Baron & Kenny (1986)

2. Determine the direct influence of variable mediation (exports and foreign debt) on foreign exchange reserves

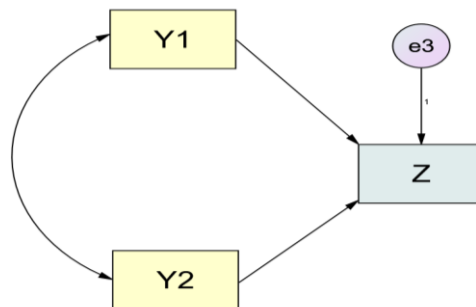


Figure 3 The Direct Effect of Export And Foreign Debt on Exchange Foreign Reserves  
Source: Development of the Sobel Model (2013) and Baron & Kenny (1986)

3. Determine the direct effect of exchange rate, exports and foreign debt on foreign exchange reserves

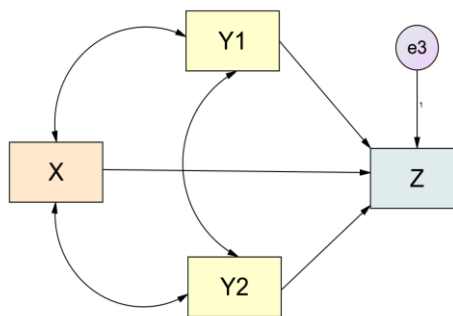


Figure 4 The Direct Effect of Exchange Rate, Export And Foreign Debt on Exchange Foreign Reserves  
Source: Development of the Sobel Model (2013) and Baron & Kenny (1986)

4. Proof of the role mediation variable of export and foreign debt in the effect of exchange rate on foreign exchange reserves is done by using criteria:
  - a. If the significance of the direct exchange rate (point 1) and the direct influence of exports and foreign debt (point 2) on foreign exchange reserves is less than the alpha value (5%) and the point 1 regression coefficient is less than point 2 and the exchange rate against foreign exchange reserves (point 3) is not significant, then exports and foreign debt acts as a complete mediation variable.

- b. If the significance of the direct exchange rate (point 1) and the direct influence of exports and foreign debt (point 2) on foreign exchange reserves are significant (less than the alpha 5%) and total effect point 1 less than point 2, then exports and foreign debt serve as partial mediation variables.

## RESULT AND ANALYSIS

To test the direct effect of rupiah exchange rate on foreign exchange reserves and indirect influence through exports and foreign debt used path analysis using AMOS 18.0 software shown in figure.

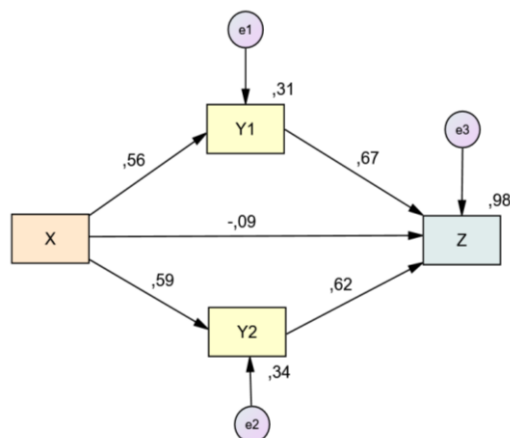


Figure 5 Results of Complete Path Diagram Analysis  
Source: Author Calculation from (Bank Indonesia, 2016)

The results of the path model analysis complete (Figure 5) using AMOS 18.0 program shown in Table 1.

Table 1 Estimation of Influence between Variables

The Effect between Variables	Regression Weight Standardized	Regression Weight	C.R.	P
Y1 <--- X	0.56	0.89	2.90	0.004
Y2 <--- X	0.59	1.75	2.69	0.007
Z <--- Y2	0.62	-0.27	-1.72	0.086
Z <--- Y1	0.67	0.62	14.13	***
Z <--- X	-0.09	1.20	12.93	***

$S_{statistics(0.05,2,15)}(X \text{ dan } Y2) = 105.644$ ;  $F_{statistics(0.05,2,15)}(X \text{ dan } Y1) = 85.235$

$F_{statistics(0.05,3,14)}(X, Y1, \text{ and } Y2) = 305.752$ ;  $F_{table(0.05,2,15)} = 3.287$ ;  $F_{table(0.05,3,14)} = 3.344$

Note: \*\*\* = Significant at level 1%; C.R = Critical Ratio; P= Probability value

X = Exchange Rate; Y1 = Export; Y2 = Foreign Debt; Z = Foreign Exchange Reserves

Source: Author Calculation from Indonesia's Central Bank (2016)

Based on the path diagram (Figure 5) and Table 1, it can be prepared an equation that states the influence of independent variables on the dependent variable as follows:

$$Y1 = 0.59 X + e_1 \quad (4)$$

$$Y2 = 0.56 X + e_2 \quad (5)$$

$$Z = -0.094 X + 0.67 Y_1 + 0.62 Y_2 + e_3 \quad (6)$$

As the focus of attention in this study is the parameter  $\rho$  (regression coefficient) whose magnitude must be calculated and tested in such a way using Path Analysis.

### The Effects of Exchange Rate on Export

Based on the results of AMOS program preparation 18.0 Table 1, the effect of Exchange rate to Export obtained value of  $\rho_{y1x} = 0.59$ , so that mathematically can be expressed in the following equation:

$$Y_1 = 0.59 X + e_1 \quad (7)$$

Further testing is done for the coefficient which aims to test the significance of Exchange rate effect on Export. To get a decision about the hypothesis that has been proposed, then used the test criterion, in this case is  $P < 0.05$ , that is by comparing the value of  $P = 0.004$  with  $\alpha = 0.05$ . Based on the calculation results obtained P value of 0.004 and the value of  $\alpha = 0.05$ . with a chance of making a mistake in making a decision of alpha (5%) and free degrees  $n - k - 1 = 17 - 1 - 1 = 15$ . Because the value of P is smaller than the value of  $\alpha = 0.05$ . then  $H_0$  is rejected and accepts  $H_1$ . So it can be concluded that with a confidence level of 95% stated there is exchange rate variables has a significant effect on export.

Table 2 Direct Effect of of Exchange Rate on Export

Independent Variable	Type of Effect	Intervening Variable	The effects on Export ( $Y_1$ )
Exchange rate (X)	Direct Effect	-	$(0.59)^2 = 0.313 \approx 31.3\%$

Source: Author Calculation from Indonesia's Central Bank (2016)

The magnitude of the effect of exchange rate on exports is 31.3% with the direction of positive influence. This means that the higher the IDR exchange rate against the US dollar, the higher the value of Indonesian exports. The significance of the effect of exchange rate on exports is in line with the descriptive analysis as shown in Figure 5.

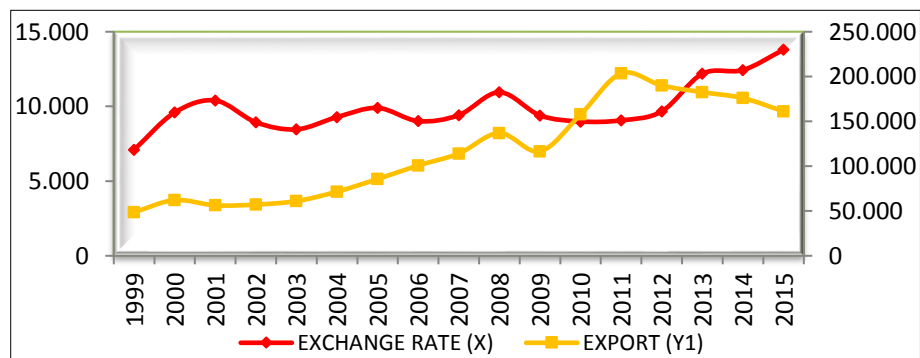


Figure 6 Correlation Exchange Rate and Exports  
Source: Author Calculation from Indonesia's Central Bank

Figure 6, in the period 1999-2015, the exchange rate tended to increase

and was directly proportional to the export trend which tended to rise. This phenomenon is in line with the results of research that prove that the exchange rate has a significant influence on export. These results are in line with the study (Moslares & Ekanayake, 2018), (Fang & Lu, 2011), (Guillou, 2008), (Rochman, 2009), (Juniantara & Budhi, 2005), (Rochman, 2009) which concludes that exchange rates have a significant effect on exports.

### The Effects of Exchange Rate on Foreign Debt

Based on the results of AMOS program preparation 18.0 Table 1, then the effect of exchange rate to foreign debt obtained value of value  $\rho_{y2x} = 0.59$ , so that mathematically can be expressed in the following equation:

$$Y_2 = 0.59 X + e_2 \quad (8)$$

Further testing is conducted for the coefficient which aims to test the meaningfulness of exchange rate effect on foreign debt. To get a decision about the hypothesis that has been proposed, then used the test criterion, in this case is P value  $< 0.05$ , that is by comparing of P value = 0.007 with  $\alpha = 0.05$ . Based on the calculation results obtained P value of 0.007 and  $\alpha = 0.05$  with a chance of making a mistake in making a decision of alpha (5%) and free degrees  $n-k-1 = 17-1-1 = 15$ . Because the value of P is smaller than the value of  $\alpha=0.05$  then  $H_0$  is rejected and accepts  $H_1$ . So it can be concluded that with a confidence level of 95% stated there is exchange rate variable has significant effect on foreign debt.

Table 3 Direct Effect of Exchange Rate on Foreign Debt

Independent Variable	Type of Effect	Intervening Variable	The effects on Foreign debt ( $Y_2$ )
Exchange rate (X)	Direct Effect	-	$(0.59)^2 = 0.345 \approx 34.5\%$

Source: Author Calculation from Indonesia's Central Bank (2016)

The magnitude of the effect of exchange rate on foreign debt is 34.5% with the direction of positive influence. This means that the higher the IDR exchange rate against the US dollar, the higher the value of foreign debt. The significance of the exchange rate to foreign debt is in line with the descriptive analysis as shown in Figure 6

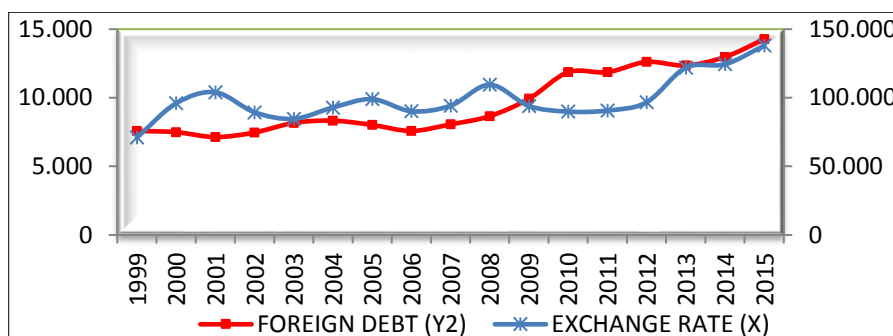


Figure 7, Correlation Exchange Rate and Foreign Debt

Source: Author Calculation from Indonesia's Central Bank (2016)

Figure 7, in the period 1999-2015, the exchange rate tends to increase and is directly proportional to the trend of foreign debt which tends to rise. This phenomenon is relevant to the results of research that influence the significant

exchange rate on foreign debt. This phenomenon is in line with the results of research that prove that the exchange rate has a significant influence on foreign debt value. These results are in line with the study (Bashir Ahmad Fida, 2012), (Bunescu, 2014), (Adhiambo & Nairobi, 2015) which concluded that the exchange rate had a significant effect on external debt.

**The Effects of Exchange rate on Foreign Exchange Reserves**

Based on the results of the AMOS program preparation 18.0 Table 1, the effect of Exchange rate on Foreign exchange reserves obtained by the value of  $\rho_{zx} = -0.09$ , so mathematically can be expressed in the following equation:

$$Z = -0.09 X + e_3 \quad (9)$$

Further testing for coefficients which aims to test the significance of Exchange rate effects on Foreign exchange reserves. To get a decision about the hypothesis that has been proposed, then used the test criterion, in this case is  $P < 0.05$ , that is by comparing the value of  $P = 0.086$  with  $\alpha = 0.05$ . Based on the calculation results obtained P value of 0.086 and the value of  $\alpha = 0.05$  with a chance of making a mistake in making a decision of alpha (5%) and free degrees  $n-k-1 = 17-1-1 = 15$ . Because the value of P is bigger than the value of  $\alpha = 0.05$ . then H1 is rejected and accepts Ho. So it can be concluded that with a confidence level of 95% stated exchange rate variables has not significant effect on foreign exchange reserves.

Table 4 Direct Effect of Exchange rate on Foreign exchange reserves

Independent Variable	Type of Effect	Intervening Variable	The effects on Foreign exchange reserves (Z)
Exchange rate (X)	Direct Effect	-	$(-0.09)^2 = 0.009 \approx 0.9\%$

Source: Author Calculation from Indonesia’s Central Bank (2016)

The magnitude of the effect of exchange rate on foreign exchange reserves is 1.2% with the direction of negative influence. This means that the higher the rupiah exchange rate, the lower the value of foreign exchange reserves. The significance of the exchange rate to foreign exchange reserves is in line with the descriptive analysis as shown in Figure 7.

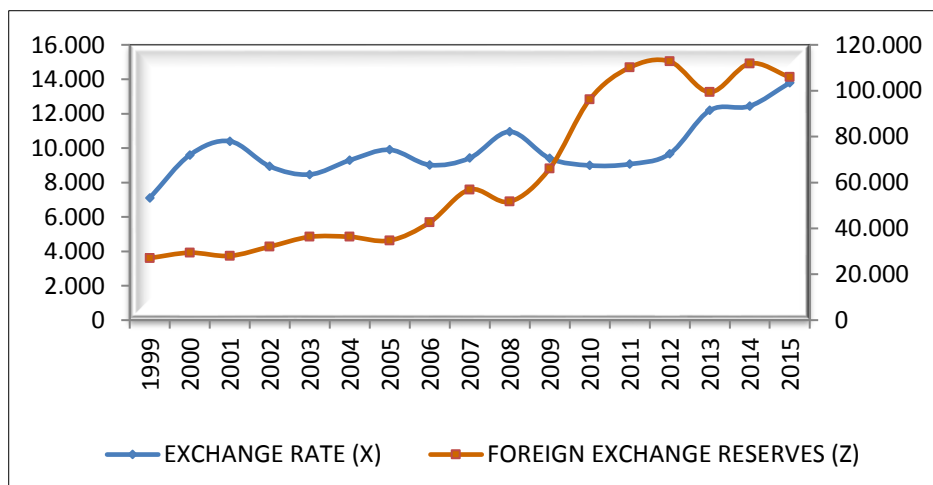


Figure 8 Correlation Exchange Rate and Foreign Exchange Reserves

Source: Author Calculation from Indonesia’s Central Bank (2016)

Figure 8, in the period 1999-2015, the exchange rate tended to increase and inversely proportional to the trend of foreign exchange reserves which tended to fluctuate and decline. This phenomenon is relevant to the results of the study even though the effect of the exchange rate is not significant at the level of 5% and is significant at the level of 10%. These results are in line with the study (Adhiambo & Nairobi, 2015), (Khan, 2013), (Fang & Lu, 2011), (Chinweobo Emmanuel, 2013) which concluded that the exchange rate had an effect on foreign exchange reserves

### The Effects of Export on Foreign Exchange Reserves

Based on the results of AMOS program preparation 18.0 Table 1, the effect of Export to Foreign exchange reserves obtained value of  $\rho_{zy1} = 0.67$ , so that mathematically can be expressed in the following equation:

$$Z = 0.67 Y_1 + e_3(10)$$

Further testing is conducted for the coefficient which aims to test the significance of the effect of Export on Foreign exchange reserves. To get a decision about the hypothesis that has been proposed, then used the test criterion, in this case is  $P < 0.05$ , that is by comparing the value of  $P = ***$  (close to zero) with  $\alpha = 0.05$ . Based on the calculation results obtained P value of  $***$  (close to zero) and the value of  $\alpha = 0.05$ . with a chance of making a mistake in making a decision of alpha (5%) and free degrees  $n-k-1 = 17-1-1 = 15$ . Because the value of P is smaller than the value of  $\alpha = 0.05$ . then  $H_0$  is rejected and accepts  $H_1$ . So it can be concluded that with a confidence level of 95% stated there is export variables has significant effect on foreign exchange reserves.

Table 5 Direct Effect of Export on Foreign exchange reserves

Independent Variable	Type of Influence	Intervening Variable	The effects on Foreign exchange reserves (Z)
Export (Y <sub>1</sub> )	Type of Effect	-	$(0.67)^2 = 0.444 \approx 44.4\%$

Source: Author Calculation from Indonesia's Central Bank (2016)

The magnitude of the effect of exports on foreign exchange reserves is 44.4% with the direction of positive influence. This means that the higher the value of exports, the higher the value of foreign exchange reserves. The significance effect of exports to foreign exchange reserves is in line with descriptive analysis as shown in Figure 8.

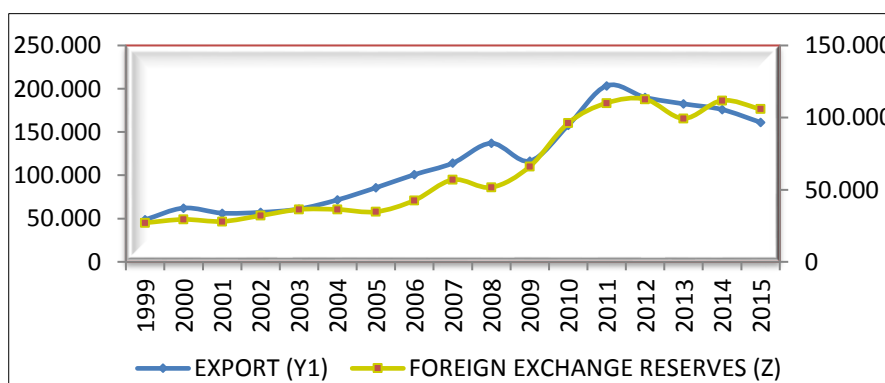


Figure 9 Correlation Export and Foreign Exchange Reserves

Source: Author Calculation from Indonesia's Central Bank (2016)

Figure 9, in the period 1999-2015, the export tends to increase and is directly proportional to the trend of foreign exchange reserves which tends to rise. This phenomenon is relevant to the results of research that influence the significant exchange rate on foreign debt. These results are in line with the study (Santana & Adiyadnya, 2017), (Rochman, 2009), (Putri, 2017), (Pinem, 2009), (Juniantara & Budhi, 2005), (Agustina & Reny, 2014), (Santana & Adiyadnya, 2017), indicate that exports affect foreign exchange reserves, according to (Eggleston et al., 2001) and Benny (2013), exports have a positive effect on foreign exchange reserves.

### The Effects of Foreign Debt on Foreign Exchange Reserves

Based on the results of AMOS program preparation 18.0 Table 1, then the influence of Foreign debt to Foreign exchange reserves obtained value  $\rho_{zy2} = 0.62$ , so that mathematically can be expressed in the following equation:

$$Z = 0.62 Y_2 + e_3 \quad (11)$$

Further testing is conducted for the coefficient which aims to test the significance of the influence of foreign debt to foreign exchange reserves. To get a decision about the hypothesis that has been proposed, then used the test criterion, in this case is P value  $< 0.05$ , that is by comparing the value of  $P = ***$  (close to zero) with  $\alpha = 0.05$ . Based on the calculation results obtained P value of  $***$  (close to zero) and the value of  $\alpha = 0.05$  with a chance of making a mistake in making a decision of alpha (5%) and free degrees  $n-k-1 = 17-1-1 = 15$ . Because the value of P is smaller than the value of  $\alpha = 0.05$ . then  $H_0$  is rejected and accepts  $H_1$ . So it can be concluded that with a confidence level of 95% stated there is foreign debt has significant effect to foreign exchange reserves.

Table 6 The Effects of Foreign Debt on Foreign Exchange Reserves

Independent Variable	Type of Effect	Intervening Variable	The effects on Foreign exchange reserves (Z)
Foreign debt ( $Y_2$ )	Direct Effect	-	$(0.62)^2 = 0.389 \approx 38.9\%$

Source: Author Calculation from Indonesia's Central Bank (2016)

The magnitude of the effect of foreign debt on foreign exchange reserves is 38.9% with the direction of positive influence. This means that the higher the foreign debt, the higher the value of foreign exchange reserves. The significance of the effect of foreign debt on foreign exchange reserves is in line with the descriptive analysis as shown in Figure 9.

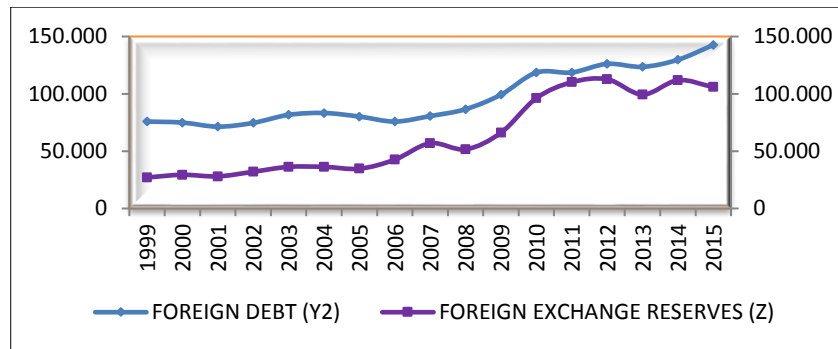


Figure 10 Correlation of Foreign Debt with Foreign Exchange Reserves  
 Source: Author Calculation from Indonesia’s Central Bank (2016)

Figure 10, in the period 1999-2015, the foreign debt tends to increase and is directly proportional to the trend of foreign exchange reserves which tends to rise. This phenomenon is relevant to the results of research that influence the significant foreign debt on foreign exchange reserves. These results are in line with the study (Lygina et al., 2013), (Santana & Adiyadnya, 2017), (Putra & Indrajaya, 2011), (Rochman, 2009), and (Wiguna, 2016) which concluded that foreign debt had a significant effect on foreign exchange reserves.

**The Simultaneous Effects Exchange Rate, Export, and Foreign Debt on Foreign Exchange Reserves**

Based on the results of the AMOS program Table 1, the effect of Exchange rate, and Foreign debt and Export on Foreign Exchange Reserves obtained value of  $\rho_{zx} = -0.09$ ,  $\rho_{zy1} = 0.67$ ,  $\rho_{zy2} = 0.62$ , so mathematically can be expressed in the following equation:

$$Z = -0.09 X + 0.67 Y1 + 0.62 Y2 + e_3 \quad (12)$$

Furthermore, the significance test of exchange rate and export effect on foreign exchange reserves is tested. To get a decision about the hypothesis that has been proposed, then used the test criteria, in this case is the Fit model test, which reference to the standard that is determined with the fit model test results. Based on the calculation results obtained F-stats of 305.752 and F-table with the value of  $\alpha = 0.05$ . with the chance of making a mistake in alpha (5%) decision making and the degree of freedom  $v1 = k = 3$  and the degrees of freedom  $v2 = n - k - 1 = 17 - 3 - 1 = 13$  by 3.411. So it can be concluded that with a confidence level of 95% stated at least two of the three variables exchange rate, foreign debt or export has significant effect to foreign exchange reserves.

Table 7 Effect of Exchange Rates on Foreign Exchange Reserves through Exports and Foreign Debt

Independent Variable	Type of Effect	Intervening Variable	The effects on Foreign exchange reserves (Z)
Exchange rate (X)	Direct Effect	-	$(-0.09)^2 = 0.08$
	Indirect Effect	Export (Y <sub>1</sub> )	$(0.56) \times (0.67) = 0.375$
	Indirect Effect	Foreign debt (Y <sub>2</sub> )	$(0.59) \times (0.62) = 0.366$
Totall Effect			0.821

Source: Author Calculation from Indonesia’s Central Bank (2016)

The magnitude of the effect of exchange rate, export and foreign debt on foreign exchange reserves is 82.1%. This means that the higher the rupiah exchange rate, the higher the value of foreign exchange reserves. The significance of the exchange rate, export and foreign debt on foreign exchange reserves is in line with the descriptive analysis as shown in Figure 10.

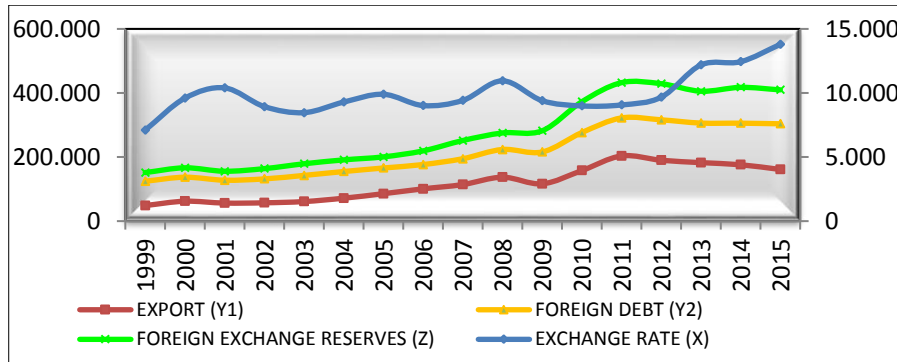


Figure 11 Correlation of Exchange Rate, Expot, Foreign Debt and Foreign Exchange Reserves

Source: Author Calculation from Indonesia’s Central Bank (2016)

Figure 10, These results are in line with the study (Rochman, 2009), (Sayoga & Tan, 2017) and (Wiguna, 2016) who found that the exchange rate, exports, and foreign debt had a significant impact on foreign exchange reserves.

**The Role of Mediation of Exports and Foreign Debts in the Effect of Exchange Rate on Foreign Reserve Reserves**

To find out whether the export and foreign debt variables act as mediation variables, then the causal step test according to Baron and Keny (1986) as follows:

1. The test result of direct influence of exchange rate variable to foreign exchange reserves (Model 1) using AMOS 18.0 program shown in figure 11.



Figure 12 Result of direct effects of exchange rate on exchange foreign reserves models

Source: Author Calculation from Indonesia’s Central Bank (2016)

2. Result of test of direct influence of export and foreign debt to foreign exchange reserve (Model 2) by using AMOS 18.0 program shown in figure 12.

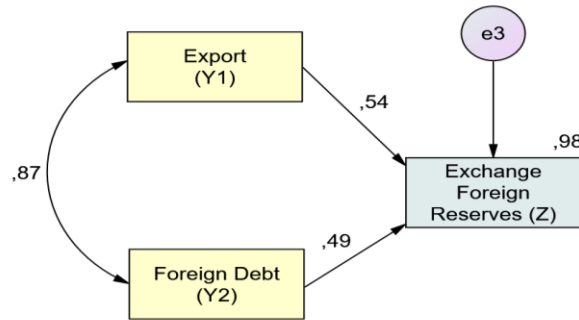


Figure 13 Result of Direct Effects of Export and Foreign Debt On Exchange Foreign Reserves Models

Source: Author Calculation from Indonesia’s Central Bank (2016)

3. The test results of the direct effect of exchange rate, export and foreign debt on foreign exchange reserves (Model 3) using AMOS 18.0 shown in figure 13.

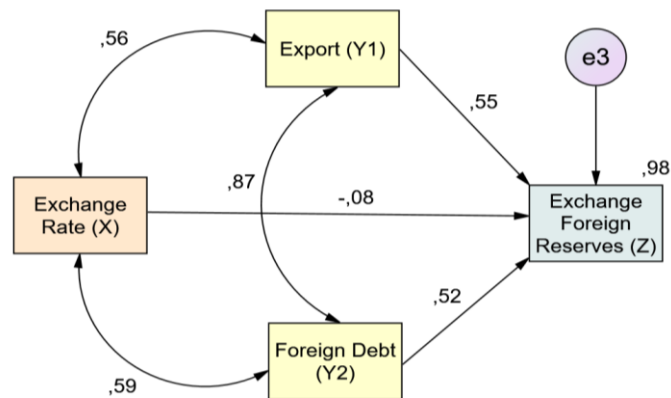


Figure 14 Result of direct effects of exchange rate, export and foreign debt on exchange foreign reserves models

Source: Author Calculation from Indonesia’s Central Bank (2016):

Based on figure 11, 12 and 13, then the estimated value and standard error shown in Table 8.

Table 8 Output Direct Effect Testing

	Estimate	Standard Error	Critical Ratio	P-value
<b>1. Models 1</b>				
Z <--- X	1.873	0.741	2.527	0.012
<b>2. Models 2</b>				
Z <--- Y1	0.601	0.083	7.257	****
Z <--- Y2	1.124	0.172	6.552	****
<b>3. Models 3</b>				
Z <--- Y1	0.618	0.075	8.237	****
Z <--- Y2	1.199	0.159	7.535	****
Z <--- X	-0.274	0.141	-1.940	0.052

\*\*\* = Significant at level 1%

Source: Author Calculation from Indonesia’s Central Bank (2016)

Based on Table 8, the effect of exchange rate on foreign exchange reserves (model 1) is significant at the 5% level, then the export and foreign debt test results against foreign exchange reserves (model 2) are significant. The value of export and foreign debt significance to foreign exchange reserves (model 3) is increasing compared to the same effect in model 2. However, the significance value of exchange rate influences on foreign exchange reserves changes from significance (model 1) to insignificant (model 3). Referring to the mediation role test of (Baron & Kenny, 1986), it can be concluded that export and foreign debt variables play a role in mediating the effect of exchange rate on foreign exchange reserves in Indonesia in the period 1999-2015.

Furthermore, to find out partially the significant level of export and foreign debt mediation influence used test Sobel and the test results are seen (Figure 14) and (Figure 15; Table 9).

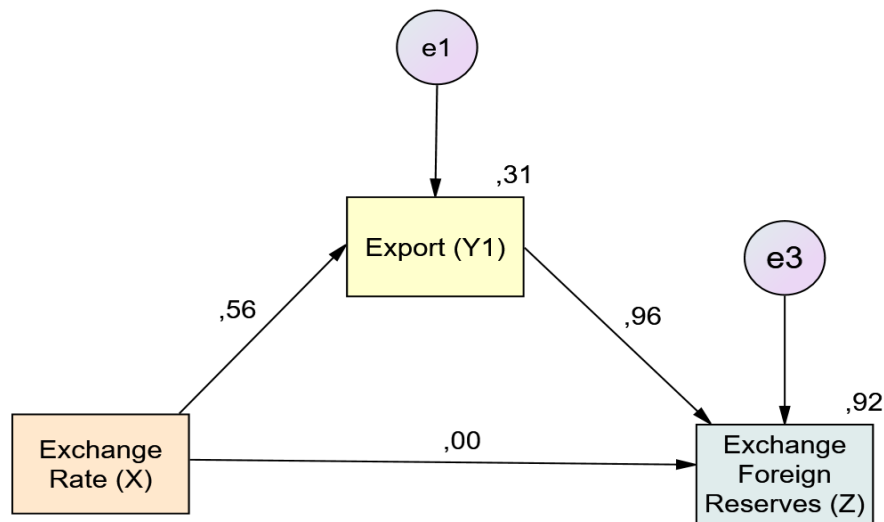


Figure 15 Test results of export mediation role model  
 Source: Author Calculation from Indonesia’s Central Bank (2016)

Table 9 Estimation of export mediation role model

	Estimate	Standard Error	Critical Ratio	P-value
Z <--- Y1	1.750	0.650	2.694	****
Z <--- Y2	1.078	0.093	11.555	****
Z <--- X	-0.014	0.292	-0.470	0.962

Source: Author Calculation from Indonesia’s Central Bank (2016)

Based on Figure 15 and Table 9, the test results of the significance of the role of foreign debt mediation in the effect of exchange rate on foreign exchange reserves are shown in Figure 16.

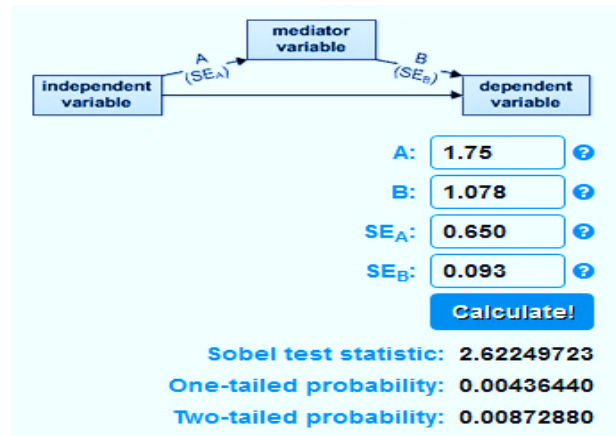


Figure 16 Sobel Test Results the Role Mediate Export  
Source: Author Calculation from Indonesia's Central Bank (2016)

Based on Figure 16, the probability value of both one-tailed and two-tailed tests of significance of the mediating role of export shows a value smaller than the alpha value of 5%, so it can be concluded that the export variable plays a role in mediating the effect of exchange rates on foreign exchange reserves in Indonesia. 1999-2015 periods. The results of this study prove that to increase Indonesia's foreign exchange reserves can be done by increasing the value of exports, implications for increasing the value of exports play an important role in maintaining and increasing Indonesia's foreign exchange reserves in the future.

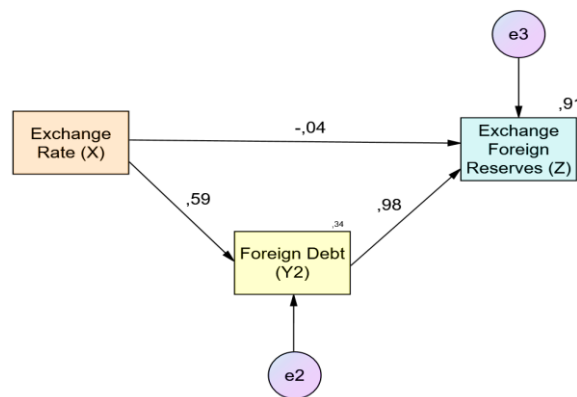


Figure 17 Result Test of Role Mediation of Foreign Debt  
Source: Author Calculation from Indonesia's Central Bank (2016)

Table 10. Estimated Model of Foreign Debt Mediation Role

	Estimate	Standard Error	Critical Ratio	P-value
Z <--- Y1	0.888	0.306	2.898	0.004
Z <--- Y2	2.265	0.212	10.666	****
Z <--- X	-0.138	0.321	-0.429	0.668

Source: Author Calculation from Indonesia's Central Bank (2016)

Based on Figure 17 and Table 10, the test results of the significance of the role of foreign debt mediation in the effect of exchange rate on foreign exchange reserves are shown in Figure 17.

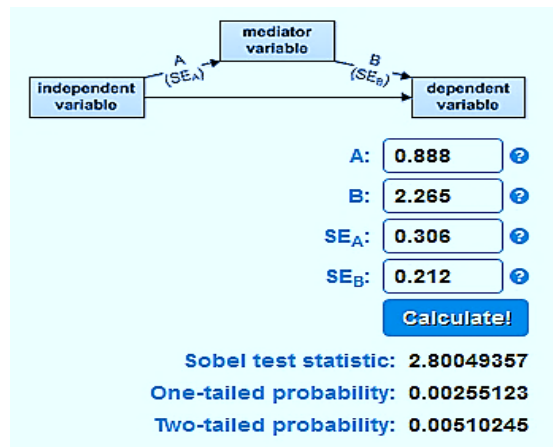


Figure 18 Sobel Test Results of the Role Mediation of Foreign Debt  
 Source: Author Calculation from Indonesia's Central Bank (2016)

Based on Figure 18, both one-tailed and two-tailed probability values of the significance test of the role of foreign debt mediation show a smaller value than the 5% alpha value, so it can be concluded that the export variable serves to mediate the effect of exchange rate on foreign exchange reserves in Indonesia the period of 1999-2015. The results of this study prove that to increase Indonesia's foreign exchange reserves can be done by increasing the value of foreign debt, implications for the management and utilization of effective and efficient foreign debt play an important role in maintaining and increasing Indonesia's foreign exchange reserves in the future.

## CONCLUSION

The results of the analysis and discussion concluded that in the period of 1999-2015, export and foreign debt play a role mediate the effect of exchange rate on foreign exchange reserves in Indonesia. The significance test results conclude that the effect mediation of export and foreign debt is significant on foreign exchange reserves. Other results conclude that exchange rate has significant effect on export, foreign debt and foreign exchange reserves. Export and foreign debt have a significant effect on foreign exchange reserves in Indonesia.

The government needs to develop exports because the excess of exports compared to imports will benefit the government with the increase of foreign exchange reserves. To produce a good model for predicting future foreign exchange reserves, it is advisable to add observation periods and variables in the model, such as interest rates, imports, national income and credits.

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