



An Analysis of Factors Affecting Indonesia's Foreign Exchange Reserve

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ABSTRACT

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Foreign exchange reserves is an economic variable that is very important to pay attention to. International trade is something that makes foreign exchange reserves important. Foreign exchange is calculated by a country as property or wealth in foreign currency. In this study, research related to factors that can affect the position of Indonesia's foreign exchange reserves will be carried out. The data used is obtained from the official website of Bank Indonesia on the publication page. The data obtained is then carried out in an empirical time series from 2010 to 2020 in the form of quarters or three months. This research uses Partial Adjustment Model analysis. The results of this study indicate that exports have a positive and significant effect in the short term and have a positive but not significant effect. Imports have a negative and significant effect in the short term, and have a negative and significant effect in the long term. then interest rates do not have a significant effect in the short term or long term. foreign debt has a positive and significant effect in the short term, but does not have a negative and insignificant effect in the long term.

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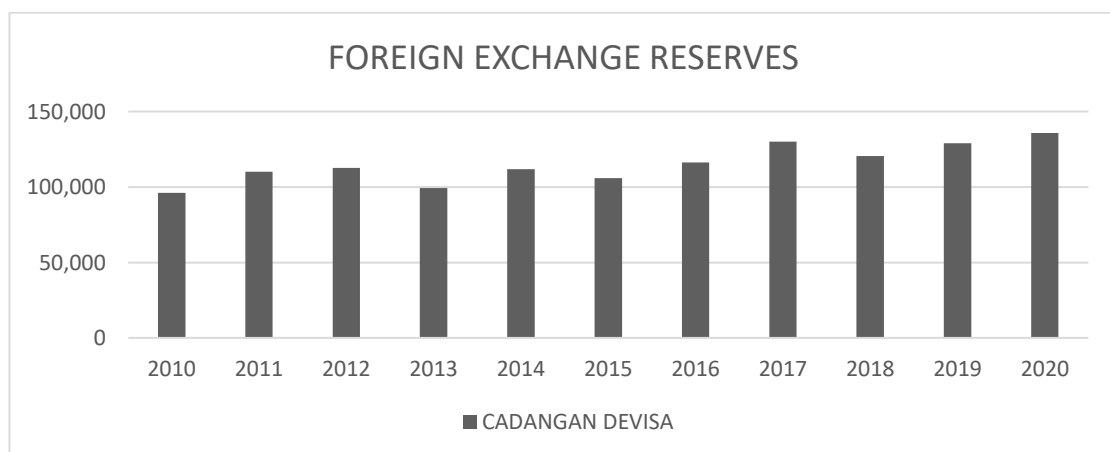
Introduction

Changes in Indonesia's foreign exchange reserves' position can be influenced by a variety of factors. The status of foreign exchange reserves might alter significantly as a result of exports and international trade. The position of Indonesia's foreign exchange reserves might then be affected by imports. The situation of Indonesia's foreign exchange reserves can also be affected by interest rates and foreign loans. External externalities have an impact on critical elements in foreign exchange management (Dabrowski, 2021). (Dabrowski 2021). In Keynesian, the theory put forward by Keynes in the journal (Astuty 2020). Foreign exchange reserves will flow when there is a support from national income, level of interest rates, and foreign exchange. This happens because foreign exchange reserves are closely related to international trade. Currently, trade is the key to a nation's ability to fight for wealth that will affect the wellbeing of its citizens. The income is of course obtained from the export of goods and services Furthermore, according to

Osigwe and Uzonwanne (2015), the management of domestic interest rates is highly correlated with the amount of foreign currency reserves, and macroeconomic conditions in the monetary sector have an impact on foreign exchange reserves. Research on foreign exchange reserves will produce a model of foreign exchange reserves that serves as an explanation of the internal factors that can be controlled, thus facilitating the control of foreign exchange reserves. With proper foreign exchange control, it will bring stability to the exchange rate and ultimately help stabilize domestic prices (Misztal, 2021).

The government must take into account the export sector's performance. The MEA (Asean Economic Community) has also been put into effect. The MEA is aimed to unite the diverse Southeast Asian economies which are the main market with a total population of 625 million people and have a GDP or Gross Domestic Product of US\$ 2.5 trillion in 2014. Sellier, 2016 in (Wardoyo 2019; Oktaviani 2015). When assessing present and future macroeconomic policy, foreign exchange reserves are crucial. A favorable trade balance is the objective of the evaluation. In countries that implement a fixed exchange rate system, of course, a qualified foreign exchange reserve is needed to support international economic turmoil, especially in terms of trade. Foreign exchange reserves are also seen as an indicator in determining the strength of a country's economy, especially in terms of its exports. (Arize and Malindretos 2012).

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Source: Bank Indonesia

Figure 1. Data on Foreign Exchange Reserve

From these data it can be concluded that the dynamics of Indonesia's foreign exchange reserves are very dynamic, in a positive trend or constructive direction. According to the data above, 2010 marked the position of foreign exchange reserves' lowest point in the previous 11

years. While they fluctuated in various years and peaked in 2020, foreign exchange reserves. Due to the epidemic, which made individuals more cautious in how they used their money, especially for consumption, that year, there was relatively little public consumption.

Indonesian foreign exchange is under a heavy pressure if exports are not able to support foreign exchange reserves. Imports and foreign exchange reserves are inversely connected. Importing in and of itself refers to purchasing products or services from sources outside a nation's borders, in this case, the State of Indonesia. When domestic production cannot satisfy the demand for these goods or services, imports are required. (2021 Priyagus). Therefore, imports will have a detrimental impact on foreign exchange reserves. The pressure on foreign exchange is deteriorating and is making it difficult to forecast when certain commodities will be available. The government is making an attempt to address the requirements of the domestic community through interest rates and international debt. There is a need for foreign exchange management, foreign exchange management depends on the accuracy of the factors that affect foreign exchange reserves. Management is also affected by foreign macroeconomic factors (Astuty 2020; Misztal 2021; Zhang et al. 2013).

Literature Review

According to Law no. 13 of 1968, foreign exchange reserves are state assets that are managed, regulated and controlled by the central bank. Foreign exchange as a whole is owned by an entity, individual, institution, and most importantly a national financial institution which is monetary a member of the national wealth (Krušković and Maričić 2015; Khalaf 2018). Foreign exchange reserves are crucial for preserving national economic stability in the face of both internal and external economic crises (Nikolova 2021; M. A. Rahim and Alam 2013; Zhang et al. 2013).

Foreign exchange reserves are deposits of the Central Bank and other monetary authorities. Foreign exchange reserves also have the meaning as foreign exchange assets set aside by Bank Indonesia as the largest monetary authority in Indonesia. Foreign exchange reserves are determined by the Balance of Payment (BOP) which is defined as the international balance of payments of a country that has exchange power against foreign assets and finance. Foreign exchange reserves occur when exports are greater than imports and capital outflows are smaller than capital inflows. The advantage of foreign exchange is that it can carry out international transactions or even higher international trade. Foreign exchange reserves play an important role in determining the value of the domestic currency, interest rates and inflation as well as economic growth (Krušković and Maričić 2015; Astuty 2020).

Currency liquidity reserves (IRFCL) or official reserve assets are defined as all foreign assets that are regulated by a monetary authority and can be used at any time to finance balance

of payments irregularities or for the purpose of financial stabilization by exerting pressure on the foreign exchange market or International Monetary Fund. The amount of a country's foreign exchange reserves depends on the performance of the balance of payments, current account balance and capital traffic balance (Afzalur Rahim and Minors 2003; M. Rahim, Armawaddin, and Ahmad 2019).

Theoretically, foreign exchange reserves are an asset that meets the criteria for a foreign asset: they must be liquid, denominated in a significant foreign currency, under the supervision of the appropriate monetary authority, and able to settle international transactions. The foreign exchange reserves used are in the form of monetary gold, special Withdrawal rights, reserve positions at the IMF, foreign exchange reserves and other claims (Straub 2020).

Method

This research uses quantitative descriptive research. Quantitative research is carried out with data based on numbers that are used as a reference for the problems to be studied. The data is obtained from the official website of Bank Indonesia on the publication page. The information on the publishing page was taken from the Bank Indonesia official website. The data used is of the sort known as time series data, or simply time series data. Data in a time series are in a chronological order. In this study, the time series data used are quarterly data from 2010 to 2020. So that the accumulated number of samples used is 44.

The analysis in this paper employs an econometric data analysis technique using a partial adjustment model (PAM). With this model, the researcher will conduct an estimation study on the relationship between the dependent variable and the independent variable in the equation that accommodates changes in the time difference (lag) (Priyagus 2021; Rachmat 2005; Raharjo 2014; Iskandar and Jamhari 2020). this model can perform adaptive expectations for the future with past experiences as a guide for predictions in the future. PAM is basically a rationalization of the koyk model developed by Mark Nerlove. The Kyok model is a simple method used to estimate the relationship between the dependent variable and the independent variable which in the equation accommodates the lag variable. (Gujarat and Porter 2009) The PAM model performs long-term estimation by correcting the dependent variable by converting the lag into a long-term variable (Priyagus 2021; Rachmat 2005) (Gujarat & Porter, 2009). The following are the Partial Adjustment Model's features (PAM).

$$Y_t = \delta\beta_0 + \delta\beta_1X1_t + \delta\beta_2X2_t + \delta\beta_3X3_t + \delta\beta_4X4_t + (1 - \delta)Y_{t-1} + \delta\varepsilon_t \quad 1$$

$$Y_t = \delta\beta_0 + \delta\beta_1X1_t + \delta\beta_2X2_t + \delta\beta_3X3_t + \delta\beta_4X4_t + \delta\varepsilon_t \quad 2$$

Where Y is the foreign exchange reserves; X1 is the export; X2 is the import; X3 is the foreign debt; X4 is the domestic interest rate; $\beta_1, \beta_2, \beta_3, \beta_4$ are the coefficient; β_0 constanta; δ sign for delta

(change); $(1-\delta) Y_{t-1}$ sign for the changes in foreign exchange reserves and ϵ_t is the error term. Equation (1) for the short term and (2) for the long term.

Result and Discussion

Normality Test

The function of the normality test is to determine whether or not the residual value is normally distributed. This test is carried out with the assumption of the Best Linear Unbias Estimator (BLUE) model. Blue regression is done classically by comparing the Jarque – Berra value with the Chi- value (Gujarat and Porter 2009; Gujarati 2004). If the Jarque-Berra value has a smaller value than Chi-Square, then the model is said to have escaped the abnormality or the data used is normally distributed. Insukindro, 2004 in (Eulia, Syaparuddin, and Parmadi 2021).

Probability Value	0.8998
Alpha	0.05

Source: data processed

From the calculation results above. The probability value generated from the normality test using the histogram normality test method is 0,8998. This value is greater than the specified alpha, which is 0.05. So, if it is concluded that the probability value has a value greater than alpha, that is $0.8998 > 0.05$. So, it can be concluded that the data used in this study is normally distributed.

Autocorrelation Test

The autocorrelation test aims to determine whether each variable in the model has a correlation with the confounding variable in a certain period with the confounding error in the previous period. Autocorrelation will occur in a variable k when the confounding error is a correlation period with the previous period. The following are the results of the autocorrelation test that has been carried out.

Chi-Square . Probability	0.3725
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Source: data processed

This autocorrelation test was carried out using the Breucsh – Geodfrey Serial Correlation LM Test method (Gujarat and Porter 2009) .The number generated from the test is 0.375. If the probability value is less than alpha (0.05), it can be concluded that the data used has an autocorrelation problem. The number generated from the data used in this study, has a value of 0.3725, which means that the number has a value greater than alpha (0.05). So, it can be concluded that the data used in this study are freed from the problem of autocorrelation.

Multicollinearity Test

This test was conducted to analyse the relationship between the independent variable and the dependent variable. whether the dependent variable generated from the independent variable. If so, the 44 variables will be affected by the multicollinearity problem because it has a very high correlation. The following are the results of the multicollinearity test that has been carried out.

Table 3. Multicollinearity Test

Variable	VIF Centered
Export	4.542001
Import	3.953332
SBI	2.056561
external debt	4.237429
foreign exchange	4.466239

Source: data processed

Multicollinearity test is done by finding the value of Variance Inflation Factors (VIF). In theory, a variable can be said to have multicollinearity problems if it has a VIF value > 10. In this study, the variables used are not affected by multicollinearity problems because they have a centred VIF value less than 10. Therefore, it can be concluded that the variables contained in the model are not correlated. very high beyond the provisions made.

Heteroscedasticity Test

Heteroscedasticity will occur when a disturbance variable has the same variable value to be observed. The way to determine a hetero or homo is by using the white heteroscedasticity test. The following table shows the results of the heteroscedasticity tests that have been carried out.

Table 4. Heteroscedasticity Test

Chi - Square Probability (20)	0.2094
Obs* R-Square	24.79430

Source: data processed

The heteroscedasticity test in this study was carried out using the white test method. In terms of the white test, it says that a data is not subject to heteroscedasticity problems if it has a probability value above alpha (> 0.05). In this study, the probability number has a value of 0.2094. This number has a value greater than alpha (0.05). It can be concluded that the data used in the model has homoscedasticity.

T-Test

The T-test in this study was carried out using the PAM model. The PAM model used in this study has two tests, a short-term and long-term test. The following is a T-test table in the long term and short term.

Table 5. Result of PAM

Variable	Coefficient	T-stat	T-Table	Probability	Significance
Export	0.002281	2.429334	1.671	0.0201	Significant
Import	-0.001399	-1.814647	1.671	0.0777	Significant
Indonesian					
Interest Rate	-114953.5	-1.377268	2.021	0.1767	Not significant
Foreign debt	0.064236	3.047844	1.671	0.0042	Significant
foreign exchange	0.552442	5.281498	1.671	0.0000	Significant
Long-term					
Export	0.001454	1.311862	1.671	0.1974	Not significant
Import	-0.001771	-1.916136	1.671	0.0629	Significant
SBI	22367.19	0.240629	2.021	0.8111	Not significant
external debt	-0.001595	-0.091767	1.671	0.9274	Not significant

Source: data processed

Export Against Foreign Exchange Reserves

Table 5 says that exports have a coefficient value of 0.002281 which is positive. This means that when a country's exports are assumed to increase by 1 thousand US dollars, it will increase Indonesia's foreign exchange reserves by 0.002281 million US dollars. The calculated export variable also has a t-statistic value of 2,429. if this figure is compared to the t-table which has a value of 1.671, the t-statistic value is still greater. Then the probability value obtained is 0.0201, compared to an alpha of 0.05, the number is still smaller.

In the long term, exports have a positive relationship of 0.001454. However, it does not have a significant effect on foreign exchange reserves. From the results of long-term calculations employed, the results of the t-count which have a value smaller than the t-table are 1.311862 <1.671. From the figures aforementioned, it can be concluded that the export variable used in this study has a positive relationship and a significant effect on Indonesia's foreign exchange reserves. This is in Adinda Marethasya Fortuna, Sri Muljaningsih, K. A. (2021).. From the four literatures they produced, it is stated that exports have a positive and significant influence on Indonesia's foreign exchange reserves.

Exports can affect foreign exchange reserves because exports will generate foreign currency from the results of international trade. The foreign currency obtained is of course adjusted to bilateral and multilateral agreements and cooperation between the two countries or within a group of regions. Exports that are greater than imports will also create a positive trade balance and will affect domestic finances. In the long term, this effect remains in effect since it can increase Indonesia's foreign exchange reserves even though the value is smaller than in the short term. The Effect of Imports on Indonesia's Foreign Exchange Reserves.

Imports of Foreign Exchange Reserves

Table 5 shows that imports have a coefficient value of -0.001399 which has a negative value. This means that when imports have an increase of one-unit or one thousand US dollars, Indonesia's foreign exchange reserves will decrease by -0.001399 million dollars. The import variable also has a t-statistical value of -1.814647 which when compared to the t-table value of 1.671, the t-statistic value is greater than the t-table value. The probability value obtained from the data regression in this model is 0.0777. This figure is smaller than alpha 0.1 (1%) but still greater than alpha 0.05 (5%). Therefore, it can be concluded that imports have a significant effect on Indonesia's foreign exchange reserves.

From the results of the long-term regression, the calculation of a negative coefficient value with a value of - 0.001771. If imports rise by one-unit, foreign exchange reserves will fall by 0.001771. Imports have a considerable impact on foreign exchange reserves over the long term. In the long term, imports have a significant effect on foreign exchange reserves. The output value is -1,916136. This figure is greater than the T-table obtained, which is 1.671. With these results, it is concluded that imports have a significant effect on Indonesia's foreign exchange reserves. From the value generated above, it can be concluded that the import variable in this study has a negative but not significant effect on Indonesia's foreign exchange reserves. This is not in accordance with the research hypothesis made. This result is in accordance with research conducted by Eulia, N., Syaparuddin, S., & Parmadi, P. (2021), who said that imports had a negative and significant effect on Indonesia's foreign exchange reserves.

Imports can be negatively related to foreign exchange reserves because the definition of import itself is buying goods from outside of the Indonesian customs area (Firdayetti, 2021). (McGuirk, Lenihan, and Hart 2015) Imports also have an impact on the quality of a country's natural resources which leads to production efficiency in the long term as long as imports increase the efficiency of capital goods through the production process. Therefore, the government must take the owned foreign exchange out to replace the money for purchases of imports by domestic consumers using rupiah. Their foreign exchange reserves will be impacted if imports occur too frequently. Imports of vital goods like food will be impacted when foreign exchange reserves are exhausted. It is well known that the required minimum of foreign exchange reserves, or three months' worth of imports, is governed by international standards. 2022 (Haryono). Imports continue to be detrimental in long term. The figures produced by the data's calculation result in a bigger value than the short term. Large imports will therefore put a strain on foreign exchange reserves needed for payments, particularly those of consumable items.

Interest Rate Against Indonesia's Foreign Exchange Reserves

Table 5 shows that the interest rate has a negative coefficient value with a value of -114953,5. It can be interpreted that when interest rates increase by 1 %, it will reduce foreign exchange reserves by -114953.5 thousand US dollars. The interest rate also has a t-statistic value of -1.377. If this figure is compared to the t - table which is 2.021, the value of t - table still has a greater value than t arithmetic or t - Statistics. The results also show that interest rates have a very high probability value above 0.05. Therefore, it is concluded that in the short term the negative relationship between interest rates and Indonesia's foreign exchange reserves will not have a significant effect on changes in Indonesia's foreign exchange reserves.

In the long term, interest rates have a positive relationship with a value of 22367.19. When interest rates increase by one unit, it will increase foreign exchange reserves by 22367.19. However, it does not have a significant effect on foreign exchange reserves because it has a value of t count < t table. The resulting number is $0.240629 < 2.021$. In the long term, interest rates have a positive but not significant value. Thus, a large increase in the determination of the benchmark interest rate by Bank Indonesia will not increase Indonesia's foreign exchange reserves. It can be concluded that the calculation results of the interest rate variable have a negative relationship and have no significant effect on Indonesia's foreign exchange reserves. This is in line with the hypothesis made in this research. These results are also in line with research conducted by Reny, & Agustina. (2014). In his research, it is stated that interest rates have a significant and negative effect on Indonesia's foreign exchange reserves.

Interest rates have a negative effect because if the interest rates are high, it will reduce domestic consumption and investment. This is caused by the increase of loan interest rates due to the increase in the standard interest rate. When credit interest rates increase, it will have an impact on consumption and even direct investment or the establishment of new business entities will be hampered. When this happens, it will obstruct the rate of exports, so that it will also slow down the growth of foreign exchange reserves. Domestic consumption will also be impacted, so that the number of investors will decrease because interest in consumption is decreasing. External factors can also affect the role of interest rates on foreign exchange reserves. Investment interest in more developed countries is quite high. Therefore, capital owners prefer to invest in other countries even though Indonesia offers high interest rates for returns.

In the long term, interest rates have a positive influence on Indonesia's foreign exchange reserves. This is due to the additional investment resulting in an increase in capital in the form of foreign currency. Investors from outside of Indonesia need time to learn about the economic conditions in Indonesia, so that in the long term, foreign investors start investing in Indonesia because they already know the economic conditions in Indonesia.

Foreign Debt Against Indonesia's Foreign Exchange Reserves

From the calculations that have been done (Table 5), it can be seen that foreign debt has a positive coefficient value of 0.0642. This can be interpreted that when foreign debt increases by one unit, it will increase foreign exchange reserves by 0.0642. This is supported by the t-statistic value of 3,04. This value is greater than the existing t-table value, which is 1.671. The data also has a probability value of 0.0042. This value is smaller than alpha 0.05.

In the long term, the coefficient value is negative with a value of -0.001595. This result means that when foreign debt increases by one unit, it will reduce foreign exchange reserves by -0.001595. However, this result is not significant with t-count of -0.091767 which is smaller than t-table which is 2.024. it can be drawn a conclusion that foreign debt has a positive and significant impact on Indonesia's foreign exchange reserves. This research is in line with the hypothesis made and research conducted by Dianita S, D., & Zuhroh, I. (2018).

As it is known, foreign debt will increase the number of foreign assets owned by Indonesia. This is because the currency given by the debtor to the creditor uses the currency of the debtor, or if according to the agreement, USD is the currency recognized in international trade. Thus, the amount of foreign exchange owned by Indonesia will increase in line with the increase in foreign debt carried out by the government. (Adinda Marethasya Fortuna, Sri Muljaningsih 2021) . In the long term, there is a difference in the effect between the long term and the short term. In the short term, the resulting effect is a positive influence. While in the long term, the resulting effect is negative. This can happen when foreign loans made at the beginning can increase foreign exchange reserves directly. However, in the long term, there is a maturity provision in which the borrower must pay the specified installments along with the interest on the loan. Such cases can reduce foreign exchange reserves controlled by a country. Payment of foreign loan installments is carried out using an agreed foreign currency. So that foreign currency reserves in Indonesia have decreased.

Foreign Exchange (-1) Toward Foreign Exchange Reserves

The PAM model can be said to be feasible to use if the coefficient value of $Y (-1)$ is less than 1 ($Y (-1) < 1$). Then the probability value generated must be less than alpha that is $0.00000 < 0.05$. With the research numbers produced above, the coefficient value is $0.552442 < 1$ and the probability value is $0.000 < 0.05$ so it can be interpreted that the partial model used has met the requested criteria. The coefficient value above has a value of 0.552442 then if it is subtracted by 1 then it gets the result of 0.44756. This figure means that the difference between the expected foreign exchange reserves and those that occur in the field of 44.75 % can be adjusted.

F-Test

The F-test is carried out with the aim of simultaneously testing or all of the independent variables used in the model on the dependent variable in the model. The F-test is done by

comparing the calculated F value with the F table value. If the calculated F value is greater than F table value, then H0 is accepted, meaning that all independent variables in the model affect the dependent variable in the model. However, if the calculated F value is smaller than the F table value, then H1 is accepted, meaning that the independent variable in the model, as a whole, has no effect on the dependent variable in the model.

Table 6. F-stat

F Statistics	62.78366	F - Table	2.61230
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Source: data processed

From the results of the study in the table, it can be seen that the (n) value of the F statistic obtained is 62.78366, while the F table value obtained is 2.61230. From these results, it can be concluded that the value of F Statistics has a greater value than the value of F table, with 62,78366 > 2,61230. This means that H0 is accepted because simultaneously or all of the independent variables in the model have an influence on the dependent variable in the model.

Coefficient Determination

The coefficient determination test or commonly called the R-Square test is aimed to test how well it can explain the independent toward the dependent variables within the model used.

Table 7. Coefficient Determination Test

Coefficient Determination Value (R ²) Short Term	0.8945 (89.45%)
The Coefficient Determination Value (R ²) Long-Term	0.1122 (11.22%)

Source: data processed

From the research results in Table 7, the coefficient determination obtained is 0.8945. It can be interpreted that 89.45 % of the independent variables in the model can affect the dependent variable in the model. While the remaining 10.55 % is influenced by independent variables outside the model used. While R² in the long term has a value of 0.1122 (11.22%). it means that 11,22 % of the independent variables in the model can explain the dependent variable in the model. While the remaining 88.78 % is explained by other independent variables outside of the model used.

Conclusion

A study about foreign exchange reserves is often conducted. Many studies do research foreign exchange reserve from multiple disciplines. This study estimates the effect of export, import, interest rate and foreign debt in Indonesia. The result that exports have a positive and significant influence. This relationship occurs because of the employment of international trade. But there is no effect on long term. Therefore, it is concluded that exports have an instant effect so that in the long run it does not have a significant effect. Other finding that the foreign debt has positive significant effect to the foreign exchange reserves, This positive relationship is caused by the currency used for lending and borrowing among countries. Therefore, when a country's foreign

loans increases, it will increase the foreign exchange reserves owned by that country. Foreign loans are usually made using US dollars, or according to the agreement, foreign loans are made in the currency of the debtor or the borrower or even using gold. There is no significant effect for the import and interest rate both in short-term and long-term. This current study suggests policymakers construct policies such as maintaining stability of macro conditions especially in export and foreign debt. It is because both variables has influence to the foreign exchange reserves.

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