The Impact of Macroeconomic Indicators on Indonesia's Foreign Exchange Reserve Position

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Abstract
A country's foreign exchange reserves are its foreign currency savings that can be utilized to finance international transactions. The purpose of this study is to determine how macroeconomic indicators (exports, imports, exchange rates, inflation rates, and foreign debt) influence Indonesia's foreign currency reserves. The researchers used secondary data in the form of monthly time series, as well as quantitative analysis using multiple linear regression. The model that was used was the Vector Error Correction Model (VECM). According to the research, future exports and external debt have a positive impact on Indonesia's foreign exchange reserves. Indonesia's foreign exchange reserves are negatively impacted by imports and predicted inflation rates, whereas the rupiah exchange rate has no effect. In the model, there is a short-run to long-run equilibrium relationship. The IRF results show that shocks from other independent variables have little effect on foreign exchange reserves and that the foreign exchange reserves variable contributes the most to the shocks that occur.

How to Cite: Rahmawati S., Suriani S. (2022). The Impact of Macroeconomic Indicators on Indonesia's Foreign Exchange Reserve Position, 23(1), 19-30. doi:https://doi.org/10.23917/jep. v23i1.17673

1. Introduction

One of the certainties for monetary and macroeconomic stability in a country is a country with sufficient foreign exchange reserves (Tambunan, 2001:158). According to Azeem and Khurshid (2019), a country's foreign exchange reserves act as a buffer against current account weaknesses. Because foreign exchange reserves are one source of funds for a country that would subsequently be used to finance international transactions, they are regarded as the most important indicator of the country's economic strength, particularly in the export and import industries (Azar and Aboukhodor, 2017).

The main key so that a country can avoid a crisis is a reserve position, especially for countries that adhere to an open economic system because they are involved in international trade in goods and services as well as financial assets, where capital flows from abroad are very vulnerable to shocks from other countries called the Contagion Effect (Wikanti, 2011).

Mendoza (2004) argues that most Asian countries increase their foreign exchange reserves after the Asian financial crisis, namely as a form of guarantee for the country is facing a crisis. Countries with high foreign exchange reserves will easily avoid the contagion effect of the crisis compared to countries with low foreign exchange reserves. When foreign exchange reserves fall and continue to deteriorate, there will be a rush of foreign exchange. This situation leads the supply

of foreign exchange to be reduced, causing imports to be hampered and the currency's credibility to deteriorate.

Indonesia's foreign exchange reserves exceed international adequacy standards and are considered very safe. However, Indonesia is still very dependent on other countries as seen from the higher import value than exports in recent years, and foreign debt that continues to increase every year. When a country's imports are higher than its exports, it indicates a high need for foreign currency, which makes the domestic currency weaken and causes inflation, and will affect the economy of a country. Maulina (2020) states that the high import is caused by economic players choosing to consume products from other countries, due to the high prices of domestic products that affect domestic demand.

In addition to imports which are greater than exports, if the debt is not used for productive activities, it is possible that the state will not be able to pay its obligations in the future and hamper economic growth. Therefore, it is necessary to maintain the stability of reserves to reduce the

level of economic vulnerability in Indonesia. The following briefly describes the development of exports, imports, exchange rates, inflation rates, foreign debt, and Indonesia's foreign exchange reserves from 2010 to 2019:

Based on Table 1, all variables fluctuate except foreign debt which continues to increase every year and the variable exchange rates which have an increasing trend. In 2018, Indonesia's imports grew by 20.15%, while exports were only 6.65%, resulting in a trade balance deficit of US$8.57 billion and foreign exchange reserves decreasing by US$9.542 billion, this is the largest deficit since 1975. The deficit This was due to poor trade performance which affected the exchange rates, and an increase in private external debt.

The payment of maturing government foreign debt and attempts to stabilize currency rates amidst global financial market turmoil produced a drop in foreign exchange reserves in 2018. Exports and foreign debt have a positive and considerable effect on foreign exchange reserves, according to Antoni *et al.* (2019) and Andriyani *et al.* (2020).

Table 1. Exports, Imports, Exchange Rates, Inflation Rates, Foreign Debt and Foreign Exchange Reserves 2010-2019
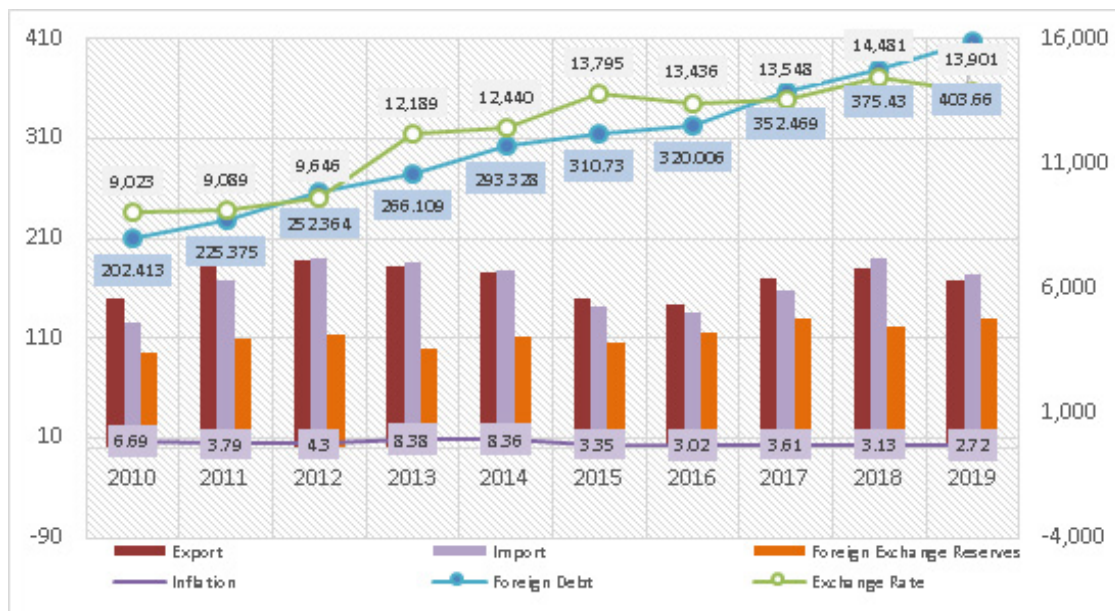
Source: Bank Indonesia (BI) and CEICDATA

The increase or decrease in foreign exchange reserves is sometimes not in line with the increase or decrease in exports and imports. Just as the decline in net exports in 2014 should have caused a decrease in foreign exchange reserves, foreign exchange reserves in 2014 increased when foreign debt increased. This event also occurred in 2019, when foreign exchange reserves increased by US$ 8,529 billion, but the trade balance was in deficit of US$ 5 billion, this indicates that there are other factors besides exports that add to Indonesia's foreign exchange reserves.

The lack of foreign exchange reserves, if it cannot be supported by high exports, will make foreign debt an option to meet the country's foreign exchange needs. This will cause a trade-off, where foreign exchange reserves are saved while foreign debt will be more serious (Tambunan, 2001:28-29).

The level of vulnerability of the national economy apart from foreign exchange reserves can also be seen in the amount of foreign debt and dependence on imports. In the debt overhang theory, the accumulation of debt in the long term will be greater than the ability to repay the country's debt, and the cost of interest on debt is expected to be high, which will eventually hamper economic growth. Although exports also play more of a role in foreign exchange reserves, a high increase in imports will reduce the effective income from exports, so that income from foreign exchange reserves will decrease. Therefore, this study uses the VECM model, in addition to looking at the effect of the independent variable on the dependent variable, also to see the relationship between the short-term toward long-term balance, as well as looking at the IRF and FEVD between variables.

Therefore, foreign exchange reserves are an important indicator to achieve monetary stability and Indonesia's macro economy which is used to finance imports, development, and foreign obligations, and maintain the stability of the rupiah exchange rate. The Indonesian economy should be maintained and continue to be stable. It is important to know "The Influence of Macroeconomic Indicators on the Position of Indonesia's Foreign Exchange Reserves" to know

the effect of the independent variables (exports, imports, exchange rates, inflation rates, and foreign debt) on the dependent variable, the short-term to long-term equilibrium relationship, looking at the response of the dependent variable to shocks in the independent variable and seeing how much the independent variable contributes to the dependent variable.

The rest of the next section of the paper is the research method which contains the type of research and the model chosen in processing the data, then the results and research containing the findings of the empirical results carried out related to the selected model, the last are conclusions and suggestions.

2. Research Method

The type of data used in this study is secondary *time-series* monthly data on Exports, Imports, Rupiah Exchange Rate, Inflation Rate, Foreign Debt, and Foreign Exchange Reserves for 2010-2019, which were obtained from the website of Bank Indonesia and CEICDATA. The analysis used is quantitative analysis, using the multiple linear regression method, namely to determine the effect of independent variables on variables using the *Ordinary Least Square* (OLS) regression method. The analysis model used is VECM (*Vector Error Correction Model*), where this model is a derivative of the VAR model, namely a non-structural model or a non-theoretical model. So there is no need to distinguish between endogenous and exogenous variables because all variables are included in the model. VECM is very useful which to estimate the short term effect for both variables and the long-run effect of the *time series* data. The following is the general equation for the VECM model (Usman *et al*, 2017):

$$\Delta_{yt} = C + \Pi Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-1} + \varepsilon_t$$

Which is, Δ is the differencing operator ($\Delta yt = yt - yt\text{-}1$), c is the intercept vector of size n × 1, Π *The cointegration coefficient matrix (ECT) is n × a. Π= $\alpha\beta'$, α*, is the long-run adjustment vector, β is *the cointegration vector* (long-term parameter), Γi is the coefficient of the i-th independent variable

matrix of size n x n for every *i 1, 2, ..., p-1,* and ε_t is a residual vector of *n x 1*.

3. Results And Discussion
3.1 Stationarity Test

Stationary testing on each time series data is a general requirement that must be done so that the regression results can have a good impact on the model. The results of the stationary test using the ADF test with constants and trends can be seen in Table 2.

All data in this study are stationary at *first difference*, according to the results of the *unit root test*. Exports, imports, exchange rates, inflation rates, foreign debt, and foreign exchange reserves all have a value greater than the *McKinnon*

critical value with a *probability* of 5%, according to the results of ADF t-statistics. Meanwhile, every research data at the stage *level* has an ADF t-statistic *value* that is less than the *McKinnon critical value* at a 5% *probability*, indicating that all data are not stationary at the stage *level*.

The following Table 3 are the results of the optimum lag test. Optimum lag testing is carried out to eliminate autocorrelation problems in the VAR system which will be useful when conducting VAR stability analysis. Optimum lag selection can be seen through criteria from *Akaike Information Criterion* (AIC), *Schwarz Information Criterion* (SIC), *Likelihood Ratio* (LR) *Hannan, and Quinn Information* (HQIC), dan *Final Prediction Error* (FPE).

Table 2. Unit Root Test Results

Variable	Level			First Difference		
	ADF	Critical value	P-value	ADF	Critical value	P-value
Export (X)	-3.276394	-3.448348	0.0753	-20.48786	-3.448348	0.0000
Import (M)	-2.393027	-3.448681	0.3812	-13.81188	-3.448681	0.0000
Rupiah Exchange Rate (Kurs)	-1.732860	-3.448021	0.7305	-11.91927	-3.448348	0.0000
Inflation Rate (Inf)	-3.212010	-3.448348	0.0871	-8.216688	-3.448681	0.0000
Foreign Debt (ULN)	-3.140848	-3.448021	0.1018	-11.76911	-3.448348	0.0000
Foreign Exchange Reserves (Cadev)	-3.045387	-3.448348	0.1246	-9.135187	-3.448348	0.0000

Source: Processed data (2021)

3.2 Optimum Lag Test

Table 3. Optimum Lag Test Result

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-8577.455	NA	1.49e+59	153.2760	153.4216	153.3351
1	-7875.600	1315.977	1.02e+54	141.3857	142.4052*	141.7993*
2	-7828.817	82.70637	8.46e+53*	141.1932*	143.0864	141.9613
3	-7798.817	49.82137	9.54e+53	141.3003	144.0673	142.4230
4	-7762.048	57.12321*	9.66e+53	141.2866	144.9274	142.7638
5	-7738.486	34.08006	1.26e+54	141.5087	146.0233	143.3404
6	-7711.560	36.06169	1.58e+54	141.6707	147.0592	143.8570
7	-7679.173	39.90573	1.85e+54	141.7352	147.9975	144.2760
8	-7644.176	39.37182	2.15e+54	141.7531	148.8892	144.6485

Source: Data processed Eviews 10

Table 4. Stability Test Results of Root Modulus Model

Root	Modulus
0.999849	0.999849
0.912737 - 0.045869i	0.913889
0.912737 + 0.045869i	0.913889
0.800858	0.800858
0.705697	0.705697
0.658793	0.658793
-0.433556 - 0.175310i	0.467658
-0.433556 + 0.175310i	0.467658
0.298635	0.298635
-0.216124	0.216124
-0.108369	0.108369
0.083630	0.083630

Source: Processed data (2021)

Table 5. Cointegration Test Results

Hypothesized No. Of CE(s)	Eigenvalue	Statistic	Critical Value	Prob
Trace Statistic				
None *	0.573131	319.3514	95.75366	0.0000
At most 1 *	0.484130	220.6031	69.81889	0.0000
At most 2 *	0.348796	143.8225	47.85613	0.0000
At most 3 *	0.287627	94.06643	29.79707	0.0000
At most 4 *	0.244489	54.72460	15.49471	0.0000
At most 5 *	0.174200	22.20275	3.841466	0.0000
Maximum Eigenvalue				
None *	0.573131	98.74831	40.07757	0.0000
At most 1 *	0.484130	76.78051	33.87687	0.0000
At most 2 *	0.348796	49.75611	27.58434	0.0000
At most 3 *	0.287627	39.34183	21.13162	0.0001
At most 4 *	0.244489	32.52184	14.26460	0.0000
At most 5 *	0.174200	22.20275	3.841466	0.0000

Source: Processed data (2021)

Based on Table 3 above, the optimum lag length lies in the lag that has the most stars recommended on the available lag criteria or choosing the criterion that has the smallest value. The results show that the LR criteria are in the 4th lag, the FPE and AIC criteria are in the 2nd lag, and the SC and HQ criteria are in the 1st lag. The optimum lag length that is most recommended in the VAR model is the length of the 1st and 2nd lags. Thus, the authors choose the 2nd lag as the optimum lag length based on the results of the FPE and AIC criteria that will be used in this study, because it has the highest number of stars and also has the smallest *criterion value*.

3.3 Model Stability Test

After testing the optimum lag length, the estimation results of the VAR equation must be tested for stability first so that the IRF and FEVC results become valid. The results of testing the

stability of the VAR model can be seen in Table 4. Based on the test results in Table 4, the modulus value of each root has a value of less than one (<1), which is in the value 0.999849 to 0.083630. A modulus value that is less than one indicates that the VAR estimation results meet stable conditions so that when testing the IRF and FEVD estimates in the long term, valid results will be obtaine.

3.4 Cointegration Test

In this study, the author uses *Johansen's cointegration test method* to see the *long-term balance* (cointegration) relationship between variables in the study, the following results are obtained in Table 5. The findings of the trace statistics and maximum eigenvalues of the six equations have a statistical value more than the *critical value* at the 5% confidence *level*, as shown in Table 5, and the prob value of the six equations above is less than 5%. As a result, it may be concluded that the variables utilized are cointegrated or that the variables of foreign exchange reserves, exports, imports, exchange rates, inflation rates, and foreign debt in Indonesia have a long-term balance connection.

3.5 VECM Model Regression

The results of the VEC model using OLS in Table 6 above show that only the variables DX, DINF, DULN, and ECTCADEV are significant at the 5% probability level, while DM is significant at the 10% probability level. That means only these variables have a significant effect on Indonesia's foreign exchange reserve, while DKURS does not. The estimation results using the OLS regression method will show the following effects in Table 6. Exports in the future, as well as the previous one and two months, had a positive impact on foreign exchange reserves, but it was only exported in the future that had a major impact on Indonesia's foreign exchange reserves from 2010 to 2019. This suggests that a one-unit rise in future exports will result in a 0.7901-unit increase in Indonesia's foreign exchange reserves. Export activities can stimulate local demand, allowing for the construction of major industrial units to compete with more industrialized countries (Rochman, 2014).

Table 6. Results of OLS Model VECM

Variable	Coefficient	t- statistics	Prob.
Dependent Variable: DCADEV			
C	-60336.43	-0.149548	0.8814
DCADEV(-1)	0.083690	0.813477	0.4179
DCADEV(-2)	0.126558	1.248692	0.2148
DX	0.790184	2.337682	0.0214
DX(-1)	0.454714	1.066021	0.2890
DX(-2)	0.378898	1.055146	0.2940
DM	-0.470229	-1.795254	0.0757
DM(-1)	-0.411512	-1.390091	0.1677
DM(-2)	-0.311710	-1.202422	0.2321
DKURS	-474.5975	-0.469078	0.6401
DKURS(-1)	-1422.787	-1.405567	0.1630
DKURS(-2)	-1473.348	-1.461990	0.1469
DINF	-963675.1	-2.363262	0.0201
DINF(-1)	74644.12	0.177263	0.8597
DINF(-2)	474390.6	1.125302	0.2632
DULN	0.510930	6.327220	0.0000
DULN(-1)	-0.022980	-0.230094	0.8185
DULN(-2)	-0.160695	-1.584717	0.1163
ECTCADEV(-1)	-0.110734	-2.514210	0.0136

Source: Processed data (2021)

The positive effect indicates that increasing exports (selling items to foreign nations) will boost Indonesia's state income in foreign currency, which will then be held as foreign exchange reserves. This study supports the findings of Andriyani *et al.* (2020) and Indriany *et al.* (2021), all of which found that exports have a positive and significant impact on Indonesia's foreign exchange reserves. This could imply that Indonesia should pay attention to factors that have a positive impact on foreign exchange reserves, such as exports, taxes, and capital inflows, as well as limit imports of items that can be produced domestically. So that the country's foreign exchange reserves can grow. The expansion of foreign exchange reserves helps to reduce the budget deficit. Indonesia has thus far relied only on debt to finance its budget deficit.

Imports in the future, as well as one and two months earlier, showed a negative effect, but only imports in the future had a probability value of less than 10% (significant) on Indonesia's foreign

exchange reserves in 2010-2019, which was -0.4702. This means that an increase in imports in the future by one unit will reduce Indonesia's foreign exchange reserves by 0.4702 units. A negative effect indicates that high imports will deplete savings in the form of reserves to finance imports due to high demand for foreign products. This research is in line with the research of Benny (2013), Chowdhury *et al* (2014), and Indriany *et al* (2021). The increase in imports causing a trade balance deficit has a negative impact on foreign exchange reserves, where reserves are depleted to finance increased imports and other obligations while income from exports is unable to meet import expenditures. Juniantara and Budhi (2012) also said that imports depend on the level of the country's national income, if the national income is higher while the ability to produce certain products is low, imports will continue to increase.

According to these findings, Indonesia can evaluate every imported good because imports can reduce foreign exchange reserves. The government is expected to restrict imports of goods that can be produced domestically, as well as imports of raw materials from other countries, and to use more domestic raw materials in the manufacturing process. So that it can improve and maximize the production process, thereby reducing state expenditures while increasing foreign exchange reserves due to increased net exports.

Not only do imports have a negative impact on Indonesia's foreign exchange reserves, but so do exchange rates in the future as well as one and two months earlier. In contrast to previous studies, the results of this research for the exchange rate have no effect on foreign exchange reserves. The negative effect indicates that rupiah appreciation can increase Indonesia's foreign exchange reserves, as Chowdhury (2014), Antoni *et al* (2019), Andriyani (2021), and Rahmatun & Suriani (2022) have found the effect is significant on foreign exchange reserves. When the rupiah exchange rate strengthens and is supported by a stable economy, it will encourage the interest of domestic and foreign investors to invest in the domestic financial market, so that later it will

cause a surplus in the current account balance and have an impact on foreign exchange reserves. The strengthening of the domestic currency will strengthen the Indonesian economy so that reserves will increase and vice versa. This study demonstrates that the monetary authority, primarily the central bank, must maintain price stability through the domestic currency in order to sustain the rupiah exchange rate. If the rupiah currency weakens, the size of Indonesia's expanding loans will be returned in the future.

While the inflation variable in the future has a negative and significant effect on Indonesia's foreign exchange reserves in 2010-2019, which is -963675.1. So it can be concluded that an increase in inflation will cause a decrease in the amount of Indonesia's foreign exchange reserves in 2010-2019 by 963675.1 units. When inflation increases, it will cause price fluctuations in the domestic market, and production costs will increase in line with the increase in the price of goods in the domestic market which can trigger producers to reduce their production. The decline in production causes the export of goods to decrease so that the income obtained will be lower than before and less stored in the form of foreign exchange reserves. This research is in line with Sutarjo *et al* (2021) where inflation has a significant and negative effect on foreign exchange reserves. Meanwhile, inflation in the previous one and two months had a positive but not significant effect on Indonesia's foreign exchange reserves from 2010-to 2019. As a result, the government can control the inflation rate by paying attention to monetary changes such as maintaining the community's money supply, interest rates, and stabilizing the rupiah exchange rate. The government must also keep the trade balance, foreign debt, production rigidity, and foreign exchange rates stable, as these can cause price fluctuations in the domestic market.

Finally, the future foreign debt variable has a positive and significant influence on Indonesia's foreign exchange reserves of 0.5109 in 2010-2019. This means that a one-unit increase in future foreign debt will increase Indonesia's foreign exchange reserves by 0.5109 units. Because the majority of foreign debt is used to

cover the current account deficit and pay debt instalments, foreign debt indirectly promotes foreign exchange reserves (Premawari *et al*, 2019). The findings of this study are consistent with the findings of Indriany (2021) and Rahim *et al* (2019). Foreign loan funds are increasingly being used, encouraging an increase in foreign exchange reserves. An increase in debt does not always increase foreign exchange reserves. Additional foreign loans will increase Indonesia's accumulated debt, which will be repaid with debt instalments and interest. Meanwhile, foreign debt in the previous one and two months had a negative but not statistically significant impact on Indonesia's foreign exchange reserves from 2010 to 2019. In this instance, the government must lower the budget deficit so that the state's foreign debt does not expand to cover the budget deficit. This is accomplished by growing net exports to eliminate the current account deficit and increasing foreign exchange reserves from non-debt sources that can be used for state savings. As a result, the government must continue to be able to maintain a position of foreign exchange reserves above international adequacy norms, and state expenditure must not be dominated by foreign debt.

The estimation results show that the ECT value for the Indonesian foreign exchange reserve model is significant at the 5% level (0.0136 < 0.05) and shows a negative sign of -0.1107. The negative ECT *coefficient* parameter indicates that the model in the short term is below its *long-term*

equilibrium so that the process of adjusting the short-term balance to the long-term direction is moving upwards and if there is a deviation it will be corrected by 0.1107 units.

3.6 Classical Regression Assumption Test

Multiple linear regression analysis using the OLS method must meet the classical assumption test so that the regression results are free from *autocorrelation, multicollinearity, heteroscedasticity*, and normal distribution problems. Here is the results *autocorrelation* test with *Breusch-Godfrey*, the *heteroscedasticity* test using *Glejser*, the *multicollinearity* test using *Variance Inflation Factors (VIF),* and the last classic assumption test is the *normality* test.

Based on Table 7, the Chi-Square prob results of the autocorrelation test and results of the heteroscedasticity test are greater than 5%, so the VECM model regression is free from autocorrelation problems and heteroscedasticity problems. The results of the multicollinearity test in Table 7 using lag 2 also show the VIF value < 10, which means there is no multicollinearity problem in the VECM equation regression. And the last test with a Jarque-Bera value of 3.4919 and a prob value of 0.1745 which is greater than alpha 5 or 10%, it can be concluded that the data is normally distributed. It is concluded that the entire series of classical assumption tests that have been carried out indicate that the VECM regression using OLS produces the Best Linear Unbiased Estimator (BLUE).

Table 7. Classical Regression Assumption Test Results

Classic Assumption Test	Prob. Chi-Square	VIF	Jarque-Bera	Prob
Autocorrelation Test Results	0.2778	-	-	-
Heteroskedasticity Test Results	0.6956	-	-	-
Multicollinearity Test Results	-	> 10	-	-
Normality Test Results	-	-	3.491029	0.174555

Source: Processed data (2021)

Table 10. Granger Causality Test Results

Null Hypothesis	Obs	F-Statistic	Prob
INF does not Granger Cause CADEV	118	0.05783	0.9438
CADEV does not Granger Cause INF		2.77250	0.0668
M does not Granger Cause X	118	2.24043	0.1111
X does not Granger Cause M		5.73341	0.0043
KURS does not Granger Cause X	118	4.98857	0.0084
X does not Granger Cause KURS		0.86033	0.4258
ULN does not Granger Cause X	118	4.19620	0.0175
X does not Granger Cause ULN		0.04355	0.9574
INF does not Granger Cause M	118	1.36231	0.2602
M does not Granger Cause INF		0.08322	0.9202
ULN does not Granger Cause M	118	3.10769	0.0485
M does not Granger Cause ULN		0.35545	0.7016
ULN does not Granger Cause INF	118	2.57511	0.0806
INF does not Granger Cause ULN		0.06618	0.9360

Source: Processed data (2021)

3.7 Causality Test

Causality testing is carried out to determine the reciprocal or causal relationship possessed by the research variables, by looking at the probability value with a significance level of 10%. The results of the causality test in Table (10) showed there are only 6 equations that have a one-way causality relationship and also there is no two-way causality between research variables. While the independent variable of the study that has a causal relationship to Indonesia's foreign exchange reserves is the inflation variable, the relationship given is a one-way causality relationship. while the other independent variables do not have a one-way or two-way causal relationship with Indonesia's foreign exchange reserves.

Other dependent variables such as imports are also influenced by the export variable, but the given relationship/influence only applies in one direction, not in two directions. In addition to imports, the exchange rate variable also has a one-way causality relationship with the export variable, while exports do not have a causal relationship with the exchange rate variable. Furthermore, the foreign debt variable has a one-way causal relationship to the variables of exports, imports, and inflation, but not vice versa.

3.8 Impulse Response Function (IRF)

The analysis used to see the shock response of the export, import, rupiah exchange rate, inflation rate, foreign debt, and foreign exchange reserves to the foreign exchange reserves variable in this study uses IRF analysis so that it can be seen how long the shock effect is experienced by the variable foreign exchange reserves. The vertical line shows the magnitude of the response given when the shock occurs, while the *horizontal* line shows the period or how long the response is given when the shock occurs (Batubara and Saskara, 2015). The following are the results of the IRF:
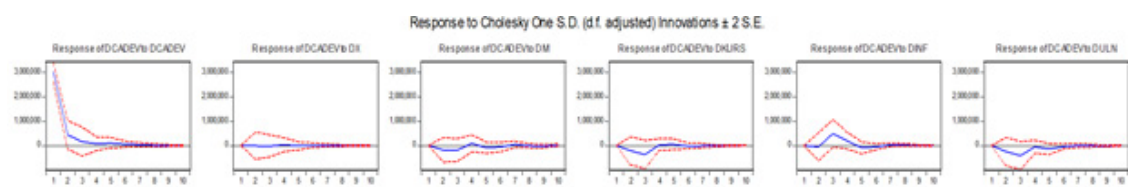
Graph 2. Results of Impulse Response Function (IRF) Analysis of Foreign Exchange Reserves
Source: Processed data (2021)

Based on the graph above, the response of the variable to foreign exchange reserves due to shocks to the variable itself fell drastically in the second month and was able to stabilize quickly. In contrast to foreign exchange reserves, exports have a stable impact on foreign exchange reserves despite shocks to the export variable. Shocks on the import had a negative impact until the third month and stabilized again within 6 months. Meanwhile, shocks to the rupiah exchange rate variable responded faster than the imported variable, which was within 4 months. Foreign exchange reserves began to show a positive response in the third month to shocks in inflation and stabilized again within 5 months. The last is foreign debt, where the response is negative until the fifth month and has a long enough time compared to other variables in the study to be stable from shocks due to foreign debt variables. So overall the results of the *Impulse Response Function* (IRF) analysis on the VECM model are to the results given during the *Variant Decomposition* (VD) analysis.

3.8 Forecast Error Variance Decomposition (FEVD)

Analysis of *Variance Decomposition* (VD) is the last analysis in the VECM test phase which aims to analyze how an endogenous variable would change due to the influence of other variables indicated by changes in the error variance of these variables (Ardhani *et al*, 2020). In this study, the author only explains the results of the VD variable of foreign exchange reserves as shown in Table 11 below.

During the observation period, the contribution given by each variant experienced fluctuations, where the foreign exchange reserve variable for 10 months had won over the contribution given to its variable with an average amount of 93.43%. The second is the inflation variable where the average contribution given is 2.31%. The three foreign debt variables are 2.05% on average. After that, the rupiah exchange rate variable with an average of 1.50%, imports with an average of 0.68%, and finally the export variable contributes an average of 0.01%.

Each independent variable contributes to the foreign exchange reserve variable, but the inflation variable which contributes the largest to foreign exchange reserves, this result is by the results of the causality test where among all the independent variables the inflation variable has a one-way causality relationship to foreign exchange reserves, while other independent variables are not significant.

Table 11. Results of Forecast Error Variance Decomposition Analysis of Foreign Exchange Reserves

Variance *Decomposition of DCADEV:*						
Period	S.E	DCADEV	DX	DM	DKURS	DINF	DULN
1	3019100.	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	3074035.	98.48994	0.000879	0.345108	0.492861	0.033306	0.637909
3	3172433.	92.72779	0.003181	0.664969	1.801825	2.489599	2.312639
4	3181531.	92.25486	0.014657	0.737508	1.806669	2.857927	2.328380
5	3189760.	91.89319	0.016210	0.812230	1.820548	2.928377	2.529446
6	3191585.	91.82387	0.016903	0.843311	1.822383	2.952871	2.540666
7	3192376.	91.79460	0.017266	0.864720	1.821840	2.961733	2.539843
8	3192537.	91.78651	0.017519	0.866156	1.823451	2.966018	2.540345
9	3192661.	91.77940	0.017751	0.870788	1.823520	2.965878	2.542665
10	3192718.	91.77640	0.017852	0.873303	1.824034	2.965777	2.542631

Source: Processed data (2021)

4. Conclusions

Exports and foreign debt will have a positive and significant effect in the future, imports and future inflation rates will have a negative and significant effect, and the rupiah exchange rate will not have an effect on the position of Indonesia's foreign exchange reserves, according to the results and discussion of the research. On foreign exchange reserves, exports, imports, exchange rates, inflation rates, and foreign debt all have a short- to long-term equilibrium.

The results of the IRF test reveal that in the early months, the reaction of the variable of foreign exchange reserves to shocks in the variables of exports, imports, exchange rates, inflation rates, and fluctuating foreign debt can recover to stability within five (5) or six (6) months. The findings of the FEVD test demonstrate that the variable itself has the greatest impact on the variable of foreign exchange reserves.

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