



The Influence of Macroeconomic Variables on Asean- 5 Countries' Foreign Exchange Reserves Long-Term Relationship and Causality (Empirical Data Year 2014 to 2021)

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Abstract. The country's foreign exchange reserves are an important factor in supporting the economic development process in ASEAN-5 countries. The country's foreign exchange reserves are greatly influenced by macroeconomics so macroeconomic changes will have a large and rapid impact on foreign exchange reserves. So this research aims to determine the influence of macroeconomics, namely the rate of inflation, exchange rate, export value, and economic growth on the foreign exchange reserves of ASEAN-5 countries. The data processing was carried out using the multiple panel data regression method, empirical data from 2014 to 2021. The results of the data processing that has been carried out show that the model test, together with the inflation rate, exchange rate, export value, and economic growth, has an effect of 94.9867 percent. to the foreign exchange reserves of ASEAN-5 countries. Meanwhile, partially the export value and economic growth variables have a significant effect on ASEAN countries' foreign exchange reserves and are positively proportional, but the inflation rate and exchange rate have no effect on ASEAN countries' foreign exchange reserves and are negatively proportional. Apart from that, the role of the government is also very influential in maintaining the country's foreign exchange reserves because macroeconomics is determined by government policies.

Keywords : foreign exchange reserves, inflation rate, export value, exchange rate, economic growth.

1. Introduction:

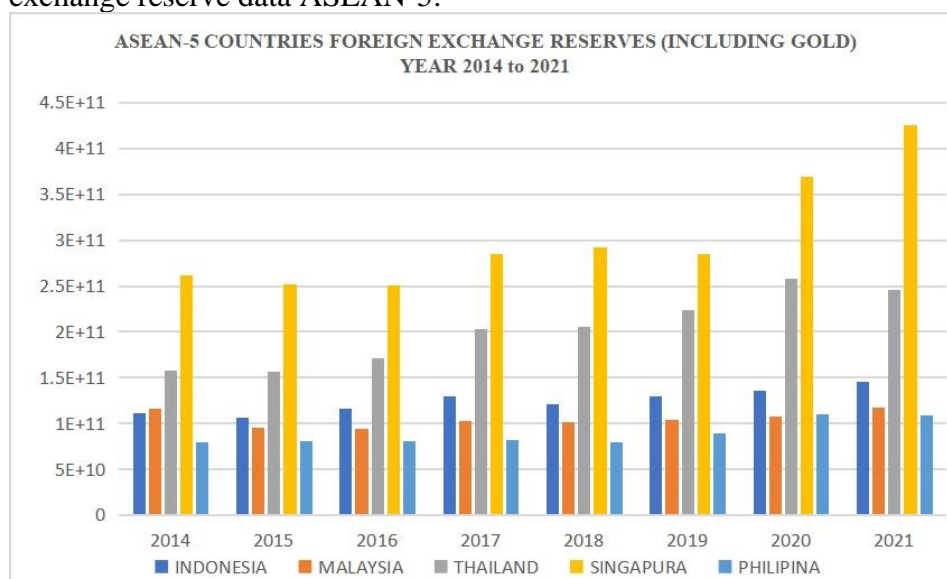
1.1 Background

A country's foreign exchange reserves are an important indicator in evaluating a country's economic stability. Foreign exchange reserves are a guarantee for the creation of monetary and macroeconomic stability in a country. The more actively a country trades, the more foreign exchange it needs. The size of a country's foreign exchange reserve position depends on various factors that influence it, especially macroeconomic factors (Juliansyah, Moulida, and Apridar 2020).

Foreign exchange reserves are the entire amount of foreign currency held by the government and private sector of a country. The state of the balance of payments can be used to calculate foreign exchange reserves.

The greater the amount of foreign exchange held by the government and residents of a country, the better the country's ability to carry out international economic and financial transactions and the stronger the country's currency (Rahmawati, Ismanto, & Sitorus, 2020 in Mulatsih et al. 2023)

While changing global conditions, ASEAN-5 countries (Indonesia, Malaysia, Philippines, Singapore, and Thailand) must consider various factors that can affect their foreign exchange reserves. ASEAN is an association of regional countries in the Southeast Asia region that has a large influence on the world economy. For this reason, to strengthen and stabilize the economies of these countries, foreign exchange reserves are needed. The country's foreign exchange reserves cannot be separated from the influence of macroeconomic factors. In this research, several macroeconomic factors were analyzed, namely the rate of inflation, economic growth, export value and exchange rate, their influence on foreign exchange reserves in ASEAN-5 countries based on empirical data from 2014 to 2021. The following is an overview of the country's foreign exchange reserve data ASEAN-5:



Source: World Bank

Figure 1.1: Foreign Exchange Reserves of ASEAN-5 Countries 2014-2021

It can be seen from the graph above that the largest foreign exchange reserves are in Singapore, followed by Thailand, Indonesia, Malaysia, and the Philippines. The growth of a country's foreign exchange reserves is very important to maintain the resilience or stability of a country's currency value in supporting the resilience of the external sector and maintaining the stability of the domestic macroeconomy and financial system. Apart from that, a country's foreign exchange reserves are also greatly influenced by the global economy.



One of the factors that influence a country's foreign exchange reserves is export activities. Exports are part of international trade where a country needs a commodity from another country that is not a country or the commodity can also be cheaper than other countries so that the country can export and compete in the international market. So the very important function of exports is for the country to gain profits and increase national income, so that it will increase the amount of output and the rate of economic growth (Tri and Laksono 2021). The relationship between exports and foreign exchange reserves is that by carrying out export activities, a country will obtain a certain amount of money in foreign currency or what is usually called foreign exchange, which is also a source of state income. So if the level of exports decreases, this will be followed by a decrease in foreign exchange reserves held (Pratiwi, Busairi, and Junaidi 2018)

Another factor is that the inflation rate is an indicator that describes the level of increase in the prices of goods and services in an economy. In the context of foreign exchange reserves, the rate of inflation can have a negative impact because it can reduce people's purchasing power and disrupt economic stability. However, the impact of inflation on foreign exchange reserves can vary between ASEAN-5 countries. For example, a country with a tight and stable monetary policy will tend to have lower inflation which in turn can increase the country's foreign exchange reserves. Inflation will have an impact on domestic product prices so that products cannot compete on the international market. As for the impact, domestic products will be more expensive than imported goods, so there will be an increase in demand for foreign products, which will ultimately reduce foreign exchange reserves (Soeharjoto and Danova 2020). The results of previous research, results were obtained with the finding that inflation has a negative and significant effect on foreign exchange reserves. (Osigwe, 2015 in Soeharjoto and Danova 2020)

Economic growth also plays an important role in determining a country's foreign exchange reserves. High economic growth tends to attract foreign investors and can increase exports which in turn can contribute to the country's foreign exchange. Currently, the ASEAN-5 countries have experienced significant economic growth over the last two decades, especially through the industrial and export sectors. So that high economic growth can contribute to and influence the increase in their foreign exchange reserves.

Another macroeconomic factor that greatly influences a country's foreign exchange reserves is the exchange rate. The exchange rate has a significant impact on the foreign exchange reserves of ASEAN-5 countries. Monetary policy regarding appropriate exchange rates can influence the value and volume of exports and can encourage foreign investment inflows. In theory, it explains that the depreciation of the domestic currency against

foreign currency tends to be positively related to an increase in the country's foreign exchange reserves because the country's export commodities are competitive or cheap on the international market. However, the consequences of exchange rate policies that are unstable or too volatile can affect the country's economic and financial risks. For this reason, exchange rate stability through monetary policy must always be maintained, which is the task of the central bank (Bank Indonesia) because this also greatly influences the stability of the country's foreign exchange reserves. From the results of previous research that exchange rate actors obtained research results with the finding that the exchange rate has a positive and significant effect on foreign exchange reserves (Sudjinan, 2016 in Soeharjoto and Danova 2020). The results of other research explain that partial exports and the exchange rate have a positive and significant effect on foreign exchange reserves (Habib 2022). So a country's strong economy is generally characterized by a strong exchange rate, high export value but few imports, and high economic growth.

There are several studies that have examined the impact of each of these variables separately, but there are also differences of opinion regarding the interaction and joint impact between the inflation rate, economic growth and the exchange rate on the country's foreign exchange reserves. Therefore, this research aims to provide more comprehensive insight by analyzing these factors simultaneously.

1.2 Research Objectives

The objectives of this research are as follows:

1. Analyzing the influence of the inflation rate on the foreign exchange reserves of ASEAN-5 countries: This research aims to identify the relationship between the inflation rate and the foreign exchange reserves of ASEAN-5 countries. By understanding the influence of the inflation rate on foreign exchange reserves, this research can provide important insights for policymakers in managing monetary policy and price stability to maintain the sustainability of foreign exchange reserves.
2. Knowing how much influence exports have on the foreign exchange reserves of ASEAN-5 countries. Export activities carried out by a country have an impact on that country's income because exports are selling that country's commodities to other countries. Therefore, a country must carry out more export activities and reduce imports from other countries.
3. Examining the effect of economic growth on the foreign exchange reserves of ASEAN-5 countries: High economic growth can have a significant impact on foreign exchange reserves. This research aims to analyze the influence of economic growth on the foreign exchange reserves of ASEAN-5 countries, to provide a better understanding of

the importance of maintaining sustainable economic growth and the sustainability of foreign exchange reserves.

4. Identifying the influence of exchange rates on foreign exchange reserves in ASEAN-5 countries: Currency exchange rates are also an important factor that can influence foreign exchange reserves. This research aims to examine the relationship between exchange rates and foreign exchange reserves of ASEAN-5 countries. By understanding the influence of the exchange rate on foreign exchange reserves, this research can guide in designing appropriate exchange rate policies to maintain the stability of the country's foreign exchange reserves.
5. Providing policy insights and recommendations: This research aims to provide policy insights and recommendations to policymakers in ASEAN-5 countries in managing their foreign exchange reserves. It is hoped that the results of this research can help policymakers in designing appropriate economic policies to increase foreign exchange reserves and maintain economic stability in ASEAN-5 countries amidst global challenges.

By achieving the objectives of this research, it is hoped that it can provide a better understanding of the factors that influence the foreign exchange reserves of ASEAN-5 countries and provide relevant policy recommendations in managing foreign exchange reserves to achieve strong and stable economic sustainability, especially in these countries. ASEAN-5.

2. Theoretical Framework of the Study

2.1 Foreign exchange reserves

Foreign exchange reserves are an important indicator for determining the economic health of a country. Foreign exchange reserves as a source of national development can illustrate the level of resilience of a country when facing economic turmoil. If Indonesia's foreign exchange reserves are high, this illustrates that the country's economy is good so that society can prosper evenly. (Marlianda Bolung, Syafri, and Ratnawati 2023).

Foreign exchange reserves are part of national savings, growth in the size of foreign exchange reserves is a signal to global financial markets regarding the credibility of a country's monetary policy. Foreign exchange reserves for a country have purposes and benefits just like the benefits of wealth for an individual. (Dananjaya, Jayawarsa, and Purnami 2019).

Foreign exchange reserves are defined as foreign assets controlled by monetary authorities that can be used at any time to finance balance of payments imbalances, maintain monetary stability through foreign

exchange market intervention, or for other purposes. According to this concept, a country's foreign exchange reserves can be used to maintain exchange rate stability and fund the balance of payments deficit. (Agung & Suresmiathi, 2015 in Mulatsih et al. 2023).

Foreign exchange reserves are the entire amount of foreign currency owned by the government and private sector of a country. The state of the balance of payments can be used to calculate foreign exchange reserves. The greater the amount of foreign exchange owned by the government and residents of a country, the better the country's ability to carry out international economic and financial transactions and the stronger the country's currency (Rahmawati, Ismanto, & Sitorus, 2020 in Mulatsih et al. 2023). Foreign exchange reserves, which can be defined as foreign exchange reserves, are a transaction tool in international trade, namely foreign exchange in the form of dollars which is kept by the central bank and the monetary authority to maintain monetary stability, pay foreign debt, and is also savings owned by the country. (Juliansyah et al. 2020).

The aim of maintaining the country's foreign exchange reserves is to keep the national currency stable, and liquid in the event of an economic crisis. Apart from that, foreign exchange reserves are used to maintain the development interests of a country, which is very important. (Aminda et al. 2023). So it can be concluded that foreign exchange reserves are a means of payment in international trade in the form of foreign currency which is managed by a domestic central bank, and can be used to maintain monetary stability, national savings and debt payments. (Khusnatun and Hutajulu 2021).

2.2 Inflation

Inflation is an essential indicator of the economy. Inflation that is unstable and tends to be high is a reflection of the tendency for prices of goods and services to increase in general and continuously over a certain period (Panji Adekantaria and Syamsul Amar B, 2021). High inflation will cause the cost of living to increase rapidly along with the increase in prices of goods and services, which means the value of money falls and people's purchasing power decreases. So the inflation rate needs to be controlled so that it remains low and stable. Inflation will have an impact on domestic product prices so that products cannot compete on the international market. As for the impact, domestic products will be more expensive than imported goods, so there will be an increase in demand for foreign products, which will ultimately reduce foreign exchange reserves. Thus, it can be assumed that inflation hurts foreign exchange reserves. (Soeharjoto and Danova 2020)

In maintaining the stability of the inflation rate, each country has its central bank which plays a role in maintaining the stability of the value of a country's currency. (Panji Adekantaria and Syamsul Amar B, 2021). The development of increases in the prices of several goods and services

in general over some time is referred to as the inflation rate, which is expressed in percent (%).

Effect of Inflation Rate on Foreign Exchange Reserves: Economic theory states that a high inflation rate can have a negative impact on a country's foreign exchange reserves. High inflation tends to reduce people's purchasing power, increase production costs, and disrupt overall economic stability. In the context of foreign exchange reserves, a decrease in people's purchasing power can reduce exports and increase imports, which in turn can cause a trade balance deficit and a decrease in foreign exchange reserves. Previous studies also show a negative relationship between inflation and foreign exchange reserves in ASEAN-5 countries. The inflation hypothesis for economic reserves is:

H1: Inflation has a negative effect on Foreign Exchange Reserves

2.3 Economic growth

Economic growth is the most general economic indicator to describe a country's progress over a certain period. Economic growth shows a greater increase in added value than in the previous period. (Arfiani 2019). In addition, economic growth in developing countries (in addition to other factors) can be explained by a “catch-up” process at the technological level. Technology diffusion plays a central role in the process of economic development. Underdeveloped economic growth depends on the adoption and application of new technologies that are already in use in developed countries (Abu Dalu 2014). **Most Influence of Economic Growth on Foreign Exchange Reserves:** Economic growth theory states that high growth can contribute positively to increasing foreign exchange reserves. High economic growth reflects strong economic activity, increased production, and increased exports. High economic growth can also attract inflows of foreign investment and increase state income through a trade balance surplus. Therefore, sustainable economic growth is an important factor in maintaining the sustainability of the foreign exchange reserves of ASEAN-5 countries. Economic growth as described above, in many countries economic growth is a parameter to see the development or progress of the country's economy and therefore many researchers conduct research on economic growth (Yolanda, Suharto, Wahyu Murti, Sugeng Haryono. 2023)

The hypothesis of economic growth on foreign exchange reserves is:

H2: Economic growth has a positive effect on foreign exchange reserves.

2.4 Export

Exports depend on the foreign country's income and also the exchange rate. The high income of a foreign country will increase demand for the foreign country's goods and services which will ultimately increase exports. This can increase a country's foreign exchange reserves.

The relationship between exports and foreign exchange reserves is that by carrying out export activities, a country will obtain a certain amount of money in foreign currency or what is usually called foreign exchange, which is also one of the sources of state income. So if the level of exports decreases, this will be followed by a decrease in foreign exchange reserves held. Likewise, if the level of exports increases, foreign exchange reserves will increase and have a positive effect (Juliansyah et al. 2020). Common international market entry modes include trade-based, contract-based, and investment-based approaches (Yang Mixue, 2023)

The hypothesis of exports value on foreign exchange reserves is:

H3: Exports value have a positive effect on Foreign Exchange Reserves

2.5 Exchange Rate

The exchange rate is an essential macro instrument in an open economy because it is determined by the balance between demand and supply that occurs in the market (Panji Adekantaria and Syamsul Amar B, 2021). A currency is said to experience a decrease in currency value (depreciation) when the value of that currency falls against the currency of another country. Likewise. When a currency experiences an increase in currency value (appreciation), the value of the currency will increase compared to the comparable currency. (Basyariah & Khairunnisa, 2016 in Panji Adekantaria and Syamsul Amar B, 2021). Effect of Exchange Rates on Foreign Exchange Reserves: Exchange rate theory states that currency exchange rates can affect a country's foreign exchange reserves. Currency depreciation (a decrease in the exchange rate) can increase the value of exports and attract foreign investment inflows, which in turn can increase foreign exchange reserves. However, currency appreciation (an increase in the exchange rate) can reduce the competitiveness of exports and cause a trade balance deficit, which has a negative impact on foreign exchange reserves. Therefore, an appropriate exchange rate policy is very important in maintaining the stability and sustainability of the foreign exchange reserves of ASEAN-5 countries. Based on the research results, it is clear that the stronger the value of a country's currency indicates that the country's economy will also strengthen so that the foreign exchange earned will also be greater. The relationship between the exchange rate and foreign exchange reserves is that the more foreign currency owned by

the government and residents of a country means the greater the country's ability to carry out international economic and financial transactions and the stronger the currency value. In addition, the higher the exchange rate of the country's currency, shows that the country's economy is getting stronger, so it can earn more foreign exchange. (Agustina and Reny 2014). The exchange rate hypothesis for foreign exchange reserves is:

H4: The exchange rate has a negative effect on Foreign Exchange Reserves

This literature review, it will examine whether several macroeconomic variables, inflation rate, economic growth, exports and exchange rates have a significant influence on the foreign exchange reserves of ASEAN-5 countries. In this context, stable monetary policy and economic policies that support sustainable growth are important factors in maintaining the sustainability of foreign exchange reserves. Apart from that, monetary policy through exchange rate stability policy, controlling the inflation rate and careful and coordinated export activities are also very important to pay attention to.

3. Data & Methodology.

3.1 Data & Research Methods

To carry out the analysis of this research, we use empirical data from 2014 to 2021 in ASEAN-5 countries (Indonesia, Malaysia, the Philippines, Singapore, and Thailand), so the type of data that will be used in the data processing that will be carried out is panel data using secondary data taken from several sources (Bank Indonesia, Central Bureau of Statistics and World Bank) and using multiple regression analysis methods to identify the relationship between these macroeconomic variables as well as other statistical tools relevant to the research carried out.

The multiple linear regression method will be used to analyze the influence of inflation rates, economic growth, and exchange rates on the foreign exchange reserves of ASEAN-5 countries. The variables inflation rate, economic growth, and exchange rate will be used as independent variables, while foreign exchange reserves will be the dependent variable. Multiple linear regression will allow us to empirically test the influence of the independent variable on the dependent variable and measure the level of significance of this influence. The estimated model used in this research is:

$$CD_{it} = \beta_0 + \beta_1 ER_{it} + \beta_2 INF_{it} + \beta_3 EG_{it} + \beta_4 EX_{it} + \varepsilon_{it}$$

Information :

CD : National Foreign Exchange Reserves

ER : Exchange Rate

INF : Inflation Rate

EG	: Economic Growth
EX	: Export Value
β_0	: Constanta (<i>intercept</i>).
$\beta_{(1.4)}$: Regression coefficient for each independent variable
ε	: Error Term

Simultaneous hypothesis testing will be carried out to test the significance of the research model on the influence of the independent variable on the dependent variable. In this context, the null hypothesis (H0) states that there is no significant influence between the rate of inflation, economic growth, export value, and exchange rate on the foreign exchange reserves of ASEAN-5 countries, while the alternative hypothesis (H1) states that there is a significant influence. Hypothesis testing will use the t-statistical test and a previously determined significance level. Apart from simultaneous model testing, partial tests were also carried out for each independent variable on the dependent variable.

Interpretation of Results and Discussion: After conducting statistical analysis and hypothesis testing, the results will be interpreted to understand the influence of the independent variable on the dependent variable. Findings will be discussed in the context of relevant theory and literature. Practical and policy implications will also be discussed, as well as possible policy recommendations that can be implemented to maintain and increase the foreign exchange reserves of ASEAN-5 countries.

3.2 Research Data Processing Steps

The steps that need to be carried out in processing panel data to form a VAR system are as follows:

Because the data used in the research uses panel data, it is necessary to select the best model, namely by using the Chow Test and the Hausman Test. Chow test to select the two best models between the Common Effect Model (CEM) and the Fixed Effect Model. Hypothesis:

H0: Common Effect Model

H1: Fixed Effect Model

Meanwhile, the Hausman test is used to select the two best models between the Fixed Effect Model and the Random Effect Model.

Hypothesis:

H0: Common Effect Model

H1: Fixed Effect Model

- After that, carry out a normality test using the Jarque Berra (JB) test on the selected model, whether the model estimation carried out is normal or not.

- Timeseries data allows that one variable to be influenced by itself in the previous period (lag). Therefore, determining the optimum lag is very important to be able to describe the behavior of the variables in the model. There are several methods used to determine the optimum lag length, including LR (Like hood Ratio) test statistics, Final Prediction Error, Akaike Information Criterion, Schwarz Information Criterion, and Hannan-Quinn Information Criterion. The optimum lag length is determined by selecting the optimum lag selected by most methods.

Causality is a short-term one-way or two-way (reciprocal) relationship between certain groups. The Granger causality test aims to see the past influence of a variable on the current condition of other variables. In simple terms, the Granger causality test is used to determine the causal relationship between variables in the VAR system (Kartiasih, 2004).

The research method above will provide a strong empirical approach to analyze the influence of the inflation rate, economic growth, export value, and exchange rate on the foreign exchange reserves of ASEAN-5 countries. By using this method, it is hoped that this research can provide better insight and understanding of the factors that influence foreign exchange reserves and their implications.

4. Results And Findings

4.1 Long-Term balance Relationship Estimation

The first data processing carried out was the Chow test, this test was used to select the best model between the common effect model (CEM) and the fixed effect model (FEM). The results of this test are as follows:

Table 4.1 : fixed effect test (FEM)

Effects Test	Statistic	d.f.	Prob.
Cross-section F	9.675758	(4,31)	0.0000
Cross-section Chi-square	32.410264	4	0.0000

The Chow test results table 4.1 above show that if prob > 0.05 then the common effect (CEM) is chosen as the best model, but if prob < 0.05 then the fixed effect model (FEM) is chosen as the best model. It turns out the result is prob. = 0 is smaller than 0.05 so the FEM model will be selected. After the chow test is carried out, the Hausman test is continued. The results of the Hausman test are as follows:

Table : 4.2 : Hausman test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	38.703032	4	0.0000

The results of the Hausman test table 4.2 above show that if prob > 0.05 then the random effect model (CEM) is chosen as the best model, but if

prob < 0.05 then the fixed effect model (FEM) is chosen as the best model. It turns out the result is prob. = 0 is smaller than 0.05 so the FEM model will be selected.

So the conclusion that can be drawn from these two tests is that in this research panel data, model we will choose the Fixed Effect Model (FEM) which will be used in this research model. After that, we see the results of the regression estimates from the research model, which are as follows:

Research Model Estimation

Tabel 4.3 : Panel Data Estimation.

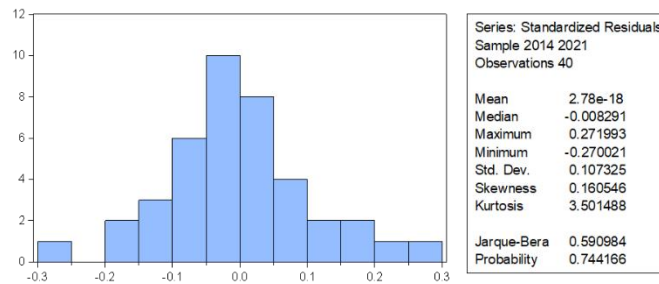
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-5.871252	5.196442	-1.129860	0.2672
EXP(inflasion_rate)	-5.61E-05	3.03E-05	-1.849101	0.0740
LOG(export_value)	0.682101	0.198716	3.432543	0.0017
LOG(exchange_rate)	-0.020896	0.016289	-1.282859	0.2091
1/EXP(economics_growth)	1.91E-05	9.64E-06	1.981886	0.0504
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.949867	Mean dependent var	11.91678	
Adjusted R-squared	0.936929	S.D. dependent var	0.479334	
S.E. of regression	0.120379	Akaike info criterion	-1.201229	
Sum squared resid	0.449227	Schwarz criterion	-0.821231	
Log likelihood	33.02458	Hannan-Quinn criter.	-1.063834	
F-statistic	73.41911	Durbin-Watson stat	0.946563	
Prob(F-statistic)	0.000000			

From the regression estimation results table 4.3 above, it can be seen that the model test (simultaneous) using the F test (Fisher's test) results is 73.41911 and the probability is 0 so hypothesis H₀ rejected until receiving H₁. This shows that together all the independent variables, namely, inflation, exchange rate, export value, and economic growth have a significant effect on the foreign exchange reserves of ASEAN-5 countries. Meanwhile, in a partial test using the t-test (t-statistic), it can be seen that the probability (<0.05) shows that the independent variable has a significant effect on the dependent variable. The result is that the export value and economic growth effect on the foreign exchange reserves of ASEAN-5 countries, while exchange rates and inflation have no effect on the foreign exchange reserves of ASEAN-5 countries. The correlation between the independent variable and the dependent variable is 94.9867 percent, the remaining 5.0133 percent is influenced by other factors.

The results of the data processing above show that the relationship between the independent variables shows that the inflation rate is negatively proportional to foreign exchange reserves, this means that if there is an increase in the inflation rate it will reduce the country's foreign exchange reserves and vice versa. Likewise with the exchange rate, a depreciation of the domestic exchange rate against the US dollar will

reduce the country's foreign exchange and vice versa. Meanwhile, export value and economic growth show a positive relationship, this means that if export value and economic growth increase, foreign exchange reserves will also increase and vice versa.

Normality Test



The results of the normality test above show that the probability value is 0.744165 (> 0.05). This means that the model is not significant. Meanwhile, based on the results of the normality test, it can be seen from the probability value from Jarque Bera (JB), if the probability is > 0.05 , then the model is declared normal. Based on this parameter, it is known that the probability value for JB is 0.744165 (> 0.05). Thus it can be concluded that the regression model meets the normality assumption.

The normality test above is due to Prob. JB > 0.05 , this shows that the research model used is normal.

4.2 Granger Causality Tests

Apart from seeing and observing the long-term balance relationship above, this research will look at the causal relationship between the independent variable and the dependent variable. First, we will determine the optimum lag used in the Causality Test, the results are as follows:

Test To Determine Optimum Lag

Table 4.4 : Optimum Lag Test

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1348.465	NA	7.28e+40	108.2772	108.5210	108.3448
1	-1184.423	249.3436*	1.13e+36*	97.15383	98.61649*	97.55951*
2	-1163.974	22.90279	2.13e+36	97.51792	100.1994	98.26166
3	-1132.042	22.99098	2.89e+36	96.96337*	100.8638	98.04517

From the output results for determining the optimum lag above, the most optimal result for determining the lag is lag = 1, this can be seen from the most optimal results of LR, FPE, AIC, SC and HQ.

The results of causality tests are as follows:

Table 4.5 : Causality Test

Lags: 1			
Null Hypothesis:	Obs	F-Statistic	Prob.
Inflation_Rate does not Granger Cause exchange reserves	35	0.22667	0.6372
exchange reserves does not Granger Cause Inflation_Rate		1.06786	0.3092
Export_Value does not Granger Cause exchange reserves	35	1.74324	0.1961
exchange reserves does not Granger Cause Export_Value		4.03796	0.050
Exchange_Rate does not Granger Cause exchange reserves	35	0.07406	0.7873
exchange reserves does not Granger Cause Exchange_Rate		0.13361	0.7171
Economic_Growth does not Granger Cause exchange reserves	35	0.85870	0.3610
exchange reserves does not Granger Cause Economic_Growth		5.85713	0.0214

It can be seen from the output results of the Granger causality test table 4.5 above that at lag 1 it is known that the probability value (Prob.) of the relationship between the inflation rate and the Exchange Rate is 0.4953, this result is greater than the significant level of 5 percent so from these results it can be concluded that there is no relationship causality of export value to the exchange rate. This means that export value does not influence on exchange rate fluctuations. Then we look at the opposite results of the exchange rate on export value, the results show that there has been a causality relationship between the exchange rate and export value. This can be seen from the probability value (Prob.) of 0.0030 which is smaller than the significant level of 5 percent, meaning that the exchange rate influences on export value. So, from the output results and information above, it can be concluded that there has been a one-way causality relationship between the exchange rate and export value and there is no reciprocal or two-way relationship.

In our analysis, we found that the inflation rate has a significant and negative influence on the foreign exchange reserves of ASEAN-5 countries. When the inflation rate increases, foreign exchange reserves tend to decrease. This can be explained by the fact that high inflation can reduce people's purchasing power, increase production costs, and disrupt overall economic stability. Therefore, ASEAN-5 countries need to maintain inflation stability to maintain the sustainability of their foreign exchange reserves.

5. Conclusion

In the research analysis we conducted, we found that together the macroeconomic variables, namely the inflation rate, export value, exchange rate, and economic growth, have a significant effect on the

foreign exchange reserves of ASEAN countries. However, partially only the value of exports and economic growth have a significant effect on ASEAN countries' foreign exchange reserves, while the inflation rate and exchange rate have no effect. Meanwhile, the inflation rate is negatively proportional to foreign exchange reserves, this means that if there is an increase in the inflation rate it will reduce the country's foreign exchange and vice versa. Likewise, with the exchange rate, a depreciation of the domestic exchange rate against the US dollar will reduce the country's foreign exchange and vice versa. Meanwhile, export value and economic growth show a positive relationship, this means that if export value and economic growth increase, foreign exchange reserves will also increase and vice versa. From the results of this research, the government should continue to maintain economic growth so that the country's foreign exchange reserves can be maintained.

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