

Analysis of the Relationship between Exports, Imports, Inflation, and Rupiah Exchange Rate in Indonesia

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Abstract: This study aims to analyze the relationship between Exports, Imports, Inflation and the Rupiah Exchange Rate in Indonesia. This type of research is a type of quantitative research. The data source in this study uses secondary data obtained from the Central Bureau of Statistics, the Ministry of Trade and Indonesia Bank. The data used are Export, Import, Inflation, and Rupiah Exchange Rate Data for 2017-2022. Data analysis was performed using Vector Error Correction Model (VECM) analysis. The results showed that in the long term relationship there was a negative and significant relationship between exports and the rupiah exchange rate, a positive and insignificant relationship between imports and the rupiah exchange rate, a positive and insignificant relationship between inflation and the rupiah exchange rate. In the short term, there is a relationship between exports and imports, exports and inflation, and imports and inflation. The results of the Granger causality test show that there is a unidirectional relationship between exports and rupiah exchange, exports and imports, exports and inflation, and imports and inflation in Indonesia.

Keywords: Rupiah Exchange Rate, Export, Import, Inflation, Vector Error Correction Model (VECM).

1. Introduction

Openness in the economy raises concerns for every country which is none other than due to the currents of globalization and liberalization which can have consequences for the economic fundamentals for each country. A country that is unable to maintain economic fundamentals will cause a country's macro economy to become unstable (Mukhlis, 2013).

International trade (Export and Import) shows very rapid development, this development can be observed from various activities of the business world, for example the exchange of certain products or goods has no boundaries between countries (Dewi, 2019).

Indonesia is a country adhering to an open economic system, with a free floating exchange rate system that has been in effect since 1997. The market mechanism determines the position of the rupiah exchange rate against other countries' currencies (especially the United States dollar) (Yuliyanti, 2014). Currency appreciation and depreciation can arise from changes in the exchange rate position (Wilya, 2014)

One of the fluctuations in the exchange rate is strongly influenced by inflation. Inflation is an increase in prices in general, and this increase occurs continuously (Natsir M, 2014). If the inflation rate increases significantly in Indonesia while the inflation rate remains relatively constant in the United States, then product prices in Indonesia will become more expensive. Increasingly expensive prices can affect demand for the rupiah because consumers will buy products from the United States, which of course has lower prices (Madesha, 2013). The movement of the rupiah exchange rate and the development of the inflation rate in Indonesia are as follows:



Figure 1: Rupiah Exchange Rate Against United States Dollar and Inflation in Indonesia in 2017-2022

Figure 1 shows that in 2018 the rupiah exchange rate weakened from the previous year, namely IDR 14,481.00 per US \$ compared to 2017 which amounted to IDR 13,548.00 per US \$ and then experienced a strengthening in 2019 amounting to IDR 14,105.00 per US\$ will continue to weaken until 2022. The rupiah exchange rate weakened the most, namely in 2022 which amounted to IDR 15,655.00 per US\$, while in 2017 the rupiah exchange rate strengthened at IDR 13,548.00 per US\$ becoming the strongest during the 2017-2022 period.

Figure 1 also shows (in red line) the inflation rate in Indonesia from 2017-2022, the highest in 2022 of 5.51 percent due to rising fuel prices (BBM), while the lowest inflation was in 2020 which was only 1.68 percent due to conditions countries hit by the Covid-19 outbreak (Central Bureau of Statistics, 2022)

In general, import growth develops faster than export growth with the occurrence of inflation. This means that inflation has a negative relationship to exports where inflation causes domestic prices to rise from prices abroad so that it tends to increase imports and makes demand for foreign exchange increase, inflation also tends to reduce exports. so that the supply of foreign currency is low, the price of foreign exchange will increase (Silitonga, 2017)

Export activities became the driving force for the Indonesian economy around the 1980s (Hodijah dan Angelina, 2021). The excess of domestic production where the excess is marketed abroad is called exports (Farid, 2016). Releasing goods from within the territory of Indonesia to outside the Indonesian customs territory is also referred to as exports (Sabtiadi dan Kartikasari, 2018). The development of exports in Indonesia can be seen in Figure 2 below:

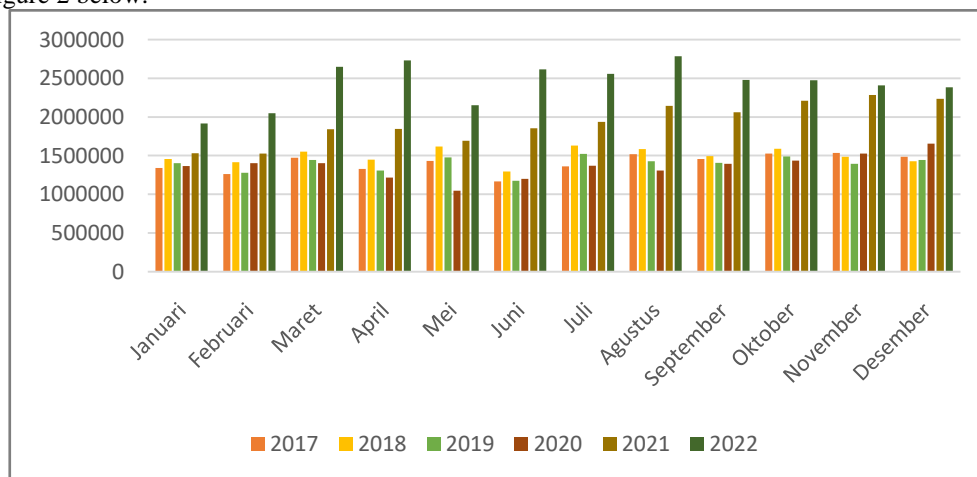


Figure 2: Development of Indonesian Exports in 2017-2022

Figure 2 shows that the highest export value in Indonesia from 2017-2022 was achieved in August 2022 with an export value of US\$ 27.86 billion, while the lowest export value was in May 2020 which was only US\$ 10.45 billion. The low export value was due to the implementation of the lockdown system as an effort to prevent the spread of Covid-19 which affected Indonesia's international trade so that in May 2020 Indonesian exports experienced a contraction which reached 29.13 percent (Central Bureau of Statistics, 2022). The development of imports in Indonesia itself can be seen as follows:

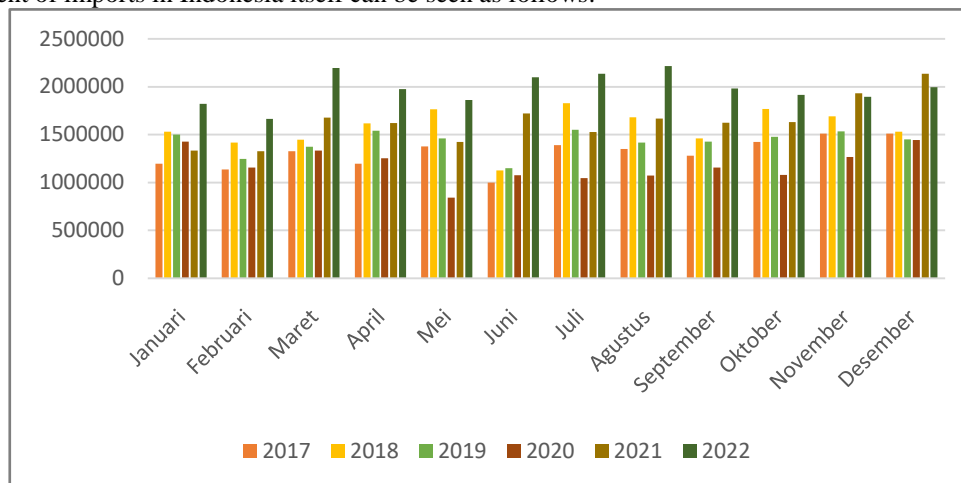


Figure 3: Development of Indonesian Imports in 2017-2022

Figure 3 shows that the highest import value was in August 2022 which reached US\$ 22.15 billion. The lowest import value was in April 2020 which was only US\$ 8.43 billion. Several previous studies have shown the influence of exports, imports, as well as inflation and the rupiah exchange rate, such as that conducted by Palasari (2015) explaining that exports and imports have an effect on the rupiah exchange rate, in addition to research conducted by Arfiani (2019) suggests that there is causality relationship between exports and imports, and the rupiah exchange rate with exports. Other research reveals that there is a long-term relationship between inflation and the exchange rate.

Inflation, exports and imports from 2017 to 2022 show erratic developments, sometimes increasing and decreasing. However, inflation, which is on an increasing trend, does not always reduce exports in Indonesia, inflation should weaken export growth (Silitonga, 2017). Likewise, high export growth does not guarantee that the rupiah exchange rate in Indonesia against the US dollar will strengthen. However, several other studies have revealed that exchange rate changes are not only related in one direction, it could be exchange rate movements that affect export and import activities. Research by Alfullah (2021) reveals that there is a two-way relationship between export-import variables and exchange rates.

Based on research conducted by Silitonga (2017), Arfiani (2019), no research has been conducted on the relationship between exports, imports, inflation and the rupiah exchange rate in Indonesia in a two-way manner. Therefore it is necessary to conduct research to determine the extent to which these variables influence each other.

2. Literature Review

2.1 Exchange Rates Theory

An exchange rate (exchange rate) is an agreement known as a currency exchange rate for current or future payments between two currencies from each region or country (Central Bureau of Statistics, 2022). The definition of the exchange rate also refers to the amount of domestic money needed, namely the number of rupiahs needed to get one unit of foreign currency (Sadono, 2015). Fundamental and non-fundamental factors have an influence on exchange rate movements in the market. Macroeconomic variables, such as the inflation rate, export and import developments, and economic growth are a reflection of fundamental factors (Sarno L, 2014).

The concept of the exchange rate according to Krugman is a convertible currency. Convertible currency is currency that can be used freely for various international transactions by residents or any country. The importance of using a currency that is easily exchangeable with other countries' currencies is emphasized in this concept. Non-convertible currencies can make international transactions difficult (Hasibuan and Pratomo, 2015)

Krugman (2000) states that there are several factors that affect changes in exchange rates, but in simple terms the most fundamental things that affect changes in exchange rates are demand and supply in the foreign

exchange market. Changes in currency supply and demand occur due to changes in the equilibrium of supply and demand (Madura, 2018). Sadono (2015) states changes in the demand and supply of a currency, which in turn cause changes in exchange rates due to several factors as follows: a) Changes in Community Taste, b) Changes in Prices of Export and Import Goods, c) Increase in General Prices (Inflation), d) Changes in Interest Rates and Rate of Return on Investment, e) Economic Growth.

One of the exchange rate theories is the theory of purchasing power parity put forward by Gustav Basel which states that the comparison of the value of another currency is determined by the purchasing power of that money in each country (Nopirin, 2013). Purchasing Power Parity is a condition where the price of an item that can be traded (Tradable Goods) in a currency should be the same wherever the item is purchased. This condition is referred to as the law of one price (Nyimas, 2014).

2.2 International Trade Concept

Buying and selling activities between countries include two activities, namely exports and imports. Salvatore revealed that trade that occurs between countries shows that these countries already have an open economic system, besides that Salvatore revealed that the export of a country is a form of import for other countries. International trade occurs as a result of efforts to maximize state welfare and it is hoped that the impact of this welfare will be received by exporting and importing countries (Aji et al, 2017).

International trade is trade carried out by residents of a country with residents of other countries based on the agreement of the two countries. The population in question can be individuals between individuals, individuals with the government of a country or the government of a country with the government of another country. International trade is one of the main factors increasing GDP (Gross Domestic Product). International trade has also contributed to industrialization, globalization, progress in transportation, and the presence of multinational companies. So that international trade activities can be said to be aimed at increasing the country's standard of living (Reinhard, 2013).

a) Exports

Export is an activity of sending goods and services sold by residents of a country to residents of other countries to obtain foreign currency from the buying country (Central Bureau of Statistics, 2023). The purpose of exports is to obtain foreign exchange that is needed by the country, to obtain export duties and other taxes, to create jobs for the domestic labor market, and to maintain a balance between the flow of money in circulation and the flow of goods within the country (Sasono, 2013).

According to Krugman, the change in export volume to the exchange rate, in this case the real exchange rate is positive, meaning that real depreciation makes domestic products relatively cheaper, thus stimulating exports (Erlina, 2013). The relationship between exports and the real exchange rate can be seen through the following systematic equation:

$$EX: f(P, Y, REER) \quad (1)$$

Information:

EX = Export volume

P = Price of exported goods

Y = Real income

REER = Real exchange rate

If the relative price of foreign goods will increase the real exchange rate then residents abroad will divert spending so they tend to buy domestic goods which can have a positive effect on exports. With a depreciating real exchange rate, product prices on the global market will be cheaper thereby increasing the volume of export value (Krugman, 2005).

b) Imports

In economics, imports can be interpreted as the entry of goods and services purchased by residents of a country from residents of other countries which results in the outflow of foreign currency from within the country (Central Bureau of Statistics, 2023). Import is one component of international trade. According to the Law of the Republic of Indonesia Number 17 of 2006 concerning customs, import is an activity of entering goods into a customs area. If the value of a country's imports exceeds its exports, then that country has a negative trade balance or is called a trade (Hodijah and Angelina, 2021).

Krugman (Meydianawati, 2014) states that there are several factors that encourage import activities, including the limited quality of human resources and technology available in processing available natural resources to achieve optimal effectiveness and efficiency in domestic production activities, there are goods and

services that have not or cannot be produced domestically, and the amount or quantity of goods domestically is insufficient.

In import activities carried out, the demand for imported goods will be influenced by the price level of imported goods, the real exchange rate and also the real GRDP which can be seen through a mathematical model, as follows:

$$IM : f(P, Y_d, REER) \quad (2)$$

Information:

EX = Import volume

P = Price of imported goods

Y_d = real GRDP

REER = Real exchange rate

An increase in the real exchange rate (depreciation) will have a negative effect on import demand. The depreciation of the real exchange rate resulted in a decrease in people's purchasing power for foreign goods, thereby reducing the volume of imports. If the relative price of foreign goods increases (REER increases) then the foreign community will divert their spending to buy domestic goods so that it will reduce the volume of imports (Krugman, 2012).

2.3 Inflation Theory

The concept of inflation according to the Central Bureau of Statistics is a tendency to increase prices of goods and services in general which takes place continuously. If the price of goods and services in the country increases, inflation will increase. Rising prices of goods and services cause a decrease in the value of money. Thus, inflation can also be interpreted as a decrease in the value of money against the value of goods and services in general (Badan Pusat Statistik, 2023). If this happens continuously, it can result in a worsening of overall economic conditions and can shake the political stability of a country (Irham, 2014).

Keynes (Boediono, 1998) explained that inflation occurs because a society wants to live beyond the limits of its economic capabilities (Rotinsulu Mandej, 2018). The process of inflation according to this view is a process of fighting over the share of fortune among social groups that want a larger share than can be provided by the community. This condition eventually makes people's demand for goods always exceed the amount available (inflationary gap). This will cause prices to rise, resulting in inflation (Upadiyanti et al, 2018).

3. Methodology

Data analysis is the processing of data obtained by using existing formulas or rules according to the research approach. Data analysis was carried out with the aim of testing the hypothesis in terms of drawing conclusions (Sugiyono, 2018). The analysis technique used is the Vector Error Correction Model (VECM).

VECM is a simultaneous equation, as a simultaneous equation VECM must identify a model that can be estimated or vice versa. There are three possibilities that can occur in the results of this study, namely, not found (under identified), found (exactly identified or just identified), and excess (over identified).

The first possibility, if the amount of information obtained is smaller than the number of parameters used as estimates. Second, if there is an information that is equal to the number of parameters being tested. While the third, if the information obtained exceeds the number of parameters estimated (Widarjono, 2013). The equation model that is explained if an application is made to this research variable is as follows:

$$\Delta Y: \mu_1 + \theta_1 ECT_{t-1} + \sum_{i=1}^n \beta_i \Delta X1_{t-i} + \sum_{i=1}^n \gamma_i \Delta X2_{t-i} + \sum_{i=1}^n \delta_i \Delta X3_t + \sum_{i=1}^n \delta_i \Delta X4_{t-i} + \varepsilon_t \quad (3)$$

In This Model:

ECT_{t-1} = Error correction term

β, γ, δ = Parameter Estimasi

ε_t = Error term

ΔEKS_t = Export (USD)

ΔIMP_t = Import (USD)

ΔINF_t = Inflation (%)

ΔEKS_t = Exchange Rate per 1 Dollar

4. Result and Discussion

The stationarity test is the first step in establishing the VAR/VECM model. The data stationarity test was carried out with Augmented Dicky-Fuller (ADF). The results of the data stationarity test can be seen in table 1. below:

Table 1: Difference Level Stationarity Test Results

Variabel	ADF	Prob
EKS	-8.737046	0.0000
IMP	-11.52689	0.0001
INF	-4.689741	0.0000
NTR	-7.253686	0.0000

Source: Data processed by Eviews, 2023

Based on the data stationarity test in Table 1. shows that the probability value of all variables is <0.05 so it can be concluded that the data is stationary at the first difference level. Furthermore, in the VAR and VECM systems the optimal lag length is very important in determining the period of influence of a variable on its past variables and other endogenous variables. The optimal lag length test results using the Akaike Information Criteria (AIC) selection criteria can be seen in Table 2 as follows:

Table 2: Optimum Lag Test Results

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-435.8702	NA	146.9475	13.50370	13.60406*	13.54330
1	-422.1005	25.84474*	126.9476*	13.35694*	13.75836	13.51533*
2	-415.1957	12.32231	135.6790	13.42141	14.12390	13.69859
3	-406.6608	14.44375	138.3067	13.43572	14.43928	13.83169
4	-403.5243	5.018415	167.1508	13.61613	14.92076	14.13089
5	-398.9839	6.845492	194.5489	13.75335	15.35905	14.38690
6	-393.2221	8.155137	219.6505	13.85299	15.75976	14.60533

Source: Data processed by Eviews, 2023

Based on Table 2. the optimum lag length test results in the VAR in several criteria, where the smallest value and there are many asymmetric signs (*) indicate the optimum lag length is 1. This indicates that it is estimated that the variables in the current period will affect other variables in the next 1 period.

VECM estimation is carried out because there is cointegration in the data when the cointegration test is carried out in view of long-term and short-term relationships. In this case the Exchange Rate becomes the dependent variable in this study. The estimation results of the VECM test can be seen in Table 3. as follows:

Table 3: Optimum Lag Test Results

Variabel	CointEq1	t-Statistic	t-Tablel
D(NTR(-1))	1.000000		
D(EKS(-1))	-5.298493	-5.37390	
D(IMP(-1))	8.000005	0.35006	1.995468931
D(INF(-1))	3.217865	0.73274	
C	15.330102		

Source: Data processed by Eviews, 2023

VECM's long-term estimate shows that exports have a negative and significant effect on the Rupiah exchange rate. VECM's long-term estimate also shows that imports (IMP) at lag 1 have a positive and insignificant effect on the rupiah exchange rate. INF) has a positive and insignificant effect on the Rupiah Exchange Rate.

Table 4: Short Term VECM Test Results Rupiah Exchange Rate

	Coefficient	Std. Error	t-Statistic	Prob.
CointEq1	0.033257	0.02126	1.56434	0.1222
D(NTR(-1))	-0.406032	0.16129	-2.51742	0.0142*
D(EKS(-1))	0.090226	0.14846	0.60773	0.5454
D(IMP(-1))	-1.330377	7.32680	-0.18159	0.8564
D(INF(-1))	-1.233688	5.73364	-0.21517	0.8302
C	2.209660	2.12742	1.03866	0.3026
Adj. R-Squared	0.331542			

Source: Data processed by Eviews, 2023

In the short-term relationship, the Rupiah Exchange Rate (NTR) is only affected by the variable itself at lag 1 with a negative and insignificant effect. Exports in the short term have a positive and insignificant effect on the Rupiah Exchange Rate. Imports and Inflation have a negative and insignificant effect on the Rupiah Exchange Rate in Indonesia.

Furthermore, a causality test is carried out to find out whether an endogenous variable can be treated as an exogenous variable. This begins when the influence is unknown between variables. If there are two variables x and y , does x cause y or y causes x or both are valid or there is no relationship between the two.

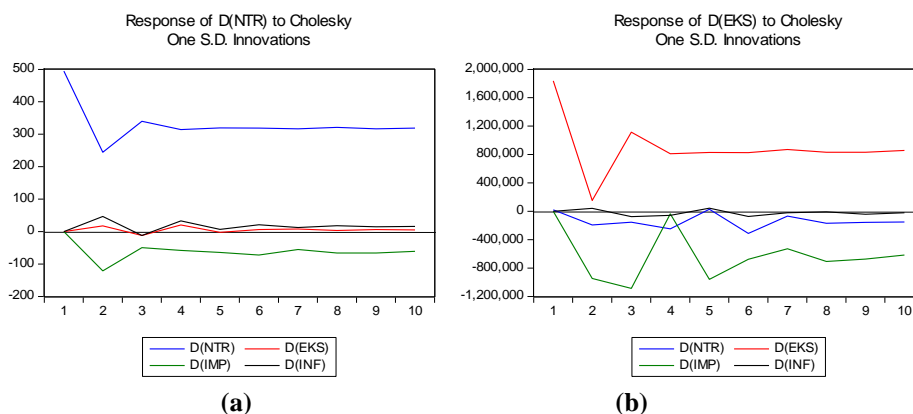
Table 5: Causality Test Results

Null Hypothesis:	obs	F-Statistic	Prob.
EKS does not Granger Cause NTR	71	3.74003	0.0457*
NTR does not Granger Cause EKS		0.00010	0.9920
IMP does not Granger Cause NTR	71	1.85175	0.1781
NTR does not Granger Cause IMP		0.58929	0.4454
INF does not Granger Cause NTR	71	0.58159	0.4483
NTR does not Granger Cause INF		0.00043	0.9835
IMP does not Granger Cause EKS	71	3.54735	0.0639
EKS does not Granger Cause IMP		13.7327	0.0004*
INF does not Granger Cause EKS	71	0.91839	0.3413
EKS does not Granger Cause INF		16.8727	0.0001*
INF does not Granger Cause IMP	71	0.04766	0.8278
IMP does not Granger Cause INF		14.4213	0.0003*

Source: Data processed by Eviews, 2023

The result is that there is a unidirectional relationship between Exports and the Rupiah Exchange Rate in Indonesia, there is no causal relationship whatsoever in the two variables of the Rupiah Exchange Rate and Imports in Indonesia, there is no causal relationship whatsoever in the two variables Inflation and the Rupiah Exchange Rate in Indonesia, there is a causal relationship there is a unidirectional relationship between Imports and Exports in Indonesia, there is a unidirectional relationship between Exports and Inflation in Indonesia, and there is a unidirectional relationship between Imports and Inflation in Indonesia. The conclusion from the ganger causality test is that there is a unidirectional relationship between Exports and the Rupiah Exchange Rate, Exports and Imports, Exports and Inflation and Imports and Inflation which can be seen through a probability value that is smaller than $\alpha = 0.05$.

Furthermore, namely the Impulse Response Function (IRF) is an estimation result in the VAR analysis which can be illustrated through a graph or table, by looking at the Impulse Response table or graph we can see how much the response of the variable to shock is equal to the standard deviation of the variables contained inside models.



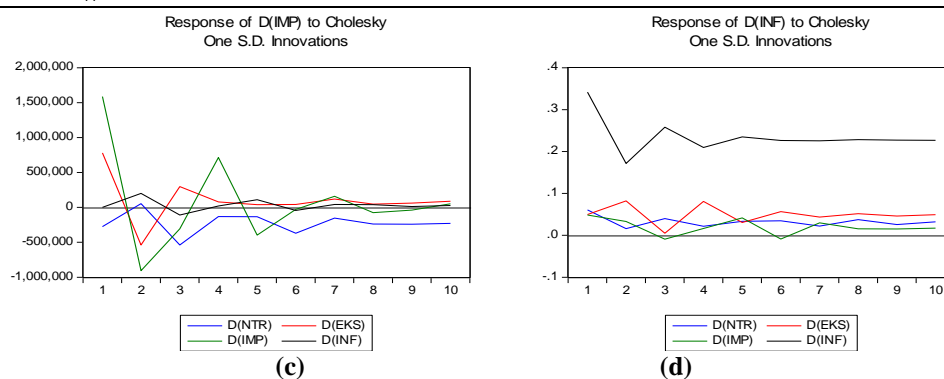


Figure 4: Impulse Response Function
 Source: Data processed by Eviews, 2023

Based on Figure (a) it is explained that the response of the Rupiah Exchange Rate (NTR) from the beginning of the period up to the tenth period gave a positive response to any changes and shocks to the Rupiah Exchange Rate (NTR) itself. The overall response of the Rupiah Exchange Rate to Exports (EKS) was positive but growth has been stagnant. It can happen that the volume of exports will be influenced by the real exchange rate prevailing in the exporting country. Based on

Figure (b) it is known that the response of Exports (EKS) to the Rupiah Exchange Rate (NTR) responds negatively to changes or shocks that occur in the Rupiah Exchange Rate (NTR). This can happen because an increase in the exchange rate does not increase exports where an increase in the value of a country's currency makes the price of goods and services for that country more expensive so that when the exchange rate rises, exported goods become more expensive in the currency of the export destination country which makes demand for export goods tends to decrease.

Based on Figure (c) it is known that the response of Imports (IMP) to the Rupiah Exchange Rate (NTR) responded negatively even though it had given a positive response in the second period. Imports that respond negatively to the rupiah exchange rate can occur because a country's exchange rate is not determined by how big the country is in carrying out import activities, but a country's exchange rate can be influenced by inflation rates, trade policies and balance of payments flows.

Based on Figure (d) it can be seen that the Inflation (INF) response to the Rupiah Exchange Rate (NTR) gave a positive response in the first period to the tenth period. Inflation that responds positively to the rupiah exchange rate in the long term can occur when the rupiah exchange rate strengthens against the dollar so that the rupiah will eventually have greater purchasing power for imported goods which in turn can reduce the domestic inflation rate.

Furthermore, based on the results of the forecast error variance decomposition (FEVD) on the Rupiah Exchange Rate (NTR) in Table 4.12, it can be seen that the Rupiah Exchange Rate in the first period was influenced by itself by 100 percent, without any contribution from Exports (EKS), Imports (IMP) and Inflation (INF). Imports have a greater contribution in influencing the Rupiah Exchange Rate when compared to Exports and Inflation.

5. Conclusion

The results showed that in the long term relationship there was a negative and significant relationship between exports and the rupiah exchange rate, a positive and insignificant relationship between imports and the rupiah exchange rate, a positive and insignificant relationship between inflation and the rupiah exchange rate. In the short term, there is a relationship between exports and imports, exports and inflation, and imports and inflation. The Granger causality test results show that there is a unidirectional relationship between exports and exchange rates, exports and imports, exports and inflation, and imports and inflation in Indonesia.

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