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Analysis of the Rupiah Exchange Rate in Indonesia

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ABSTRACT

Exchange rates are essential in the global economy, affecting international trade and a country's economic stability and monetary policy. The study aimed to determine how much influence the Money Supply, BI Rate, Foreign Exchange Reserves, and Exports have on the Rupiah Exchange Rate over the US Dollar. This research is quantitative. The data used is secondary data in the form of monthly time series data from 2015-2023. The data is analysed using the Vector Error Correction Model (VECM) method. The long-term VECM estimation results show that the money supply variable is negative and significant to the exchange rate. The BI Rate variable has a negative and insignificant effect on the exchange rate, while foreign exchange reserves and Exports have a positive and significant impact on the exchange rate. The short-term VECM estimation results show that the money supply variable has a negative and insignificant effect on the exchange rate. In contrast, the BI rate has a positive and negligible effect on the exchange rate, foreign exchange reserves have a negative and significant impact on the exchange rate, and exports have a positive and insignificant effect on the exchange rate. These findings have significant implications for policymakers and investors, providing insights into the factors influencing the Rupiah Exchange Rate and guiding monetary policy decisions and international trade decisions.

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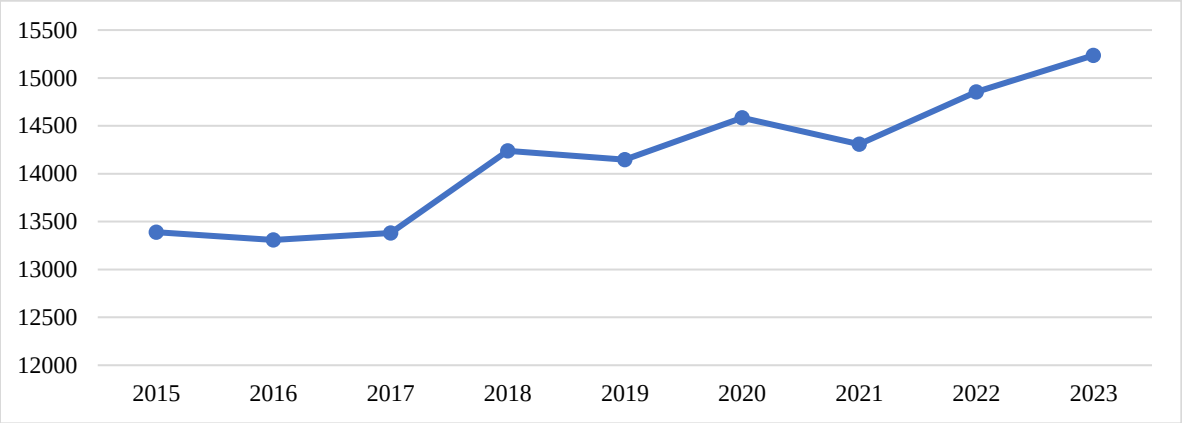
INTRODUCTION

The global economy faces various challenges, such as geopolitical uncertainty, commodity price fluctuations, and economic slowdown in major economies such as the US and China, which directly impact the Indonesian economy. As a country active in international trade, fluctuations in global commodity prices affect Indonesia's national income and economic growth. Despite the worldwide slowdown, Indonesia's economic growth in 2023 will remain at 5.05%, which is better than that of the G20 and ASEAN countries. This was driven by an increase in household consumption by 4.82% and the manufacturing sector by 4.64%, as well as the support of controlled inflation and the role of the state budget. The state budget supports people's purchasing power by allocating funds for social welfare programs and infrastructure development, stimulating economic activity. The Indonesian government also implemented fiscal policy through budget management, taxes, and subsidies to control inflation and boost economic growth. Meanwhile, the monetary policy run by Bank Indonesia, which includes the interest rate and liquidity settings, aims to maintain currency stability. A large interest rate differential with foreign countries attracts foreign investors, which is expected to encourage exchange rate appreciation.

According to Nopirin (2013), changes in currency exchange rates can occur in two opposite directions: appreciation (strengthening) and depreciation (weakening). If other conditions remain (caters paribus), a country's currency depreciates, making its goods cheaper abroad; on the contrary, if other conditions remain, a country's currency appreciation causes goods to be more expensive. The following is the development of exchange rates from 2015 to 2023:

Figure 1.1 Exchange Rate of Rupiah against Dollar



Source: Bank Indonesia (2024)

Figure 1.1 demonstrates the fluctuation and growth of the exchange rate from 2015 to 2023. The highest dollar price was Rp15,325 in 2023, and the lowest was Rp13,308 in 2016. As depicted in the figure, the Rupiah's journey over the past nine years has been complex. As (Puspitaningrum and Suhadak, 2014) explain, these fluctuations are not random but are influenced by various factors, with macroeconomic factors playing a

crucial role. These factors, such as money supply, interest rates, foreign exchange reserves, and exports, are the intricate gears that drive the exchange rate market.

The money supply is one macroeconomic factor affecting the Rupiah's exchange rate against the US Dollar. The money supply has a significant role in a country's economy. According to Carissa & Khoirudin (2020), the money supply is the total value of money in society and a country's economy. According to Permatasari & Rosyidi (2017), the domestic currency depreciates when the amount of domestic money in circulation increases. Based on this statement, it can be explained that if the amount of money in circulation is too large, the public will use it for transactions, thus causing an increase in the price of domestic goods. If the country has high prices compared to abroad, people prefer to buy goods from abroad (imports). This will cause the rupiah currency to weaken or depreciate.

In addition to the money supply, interest rates are one of the variables that affect the exchange rate. Fluctuations in the exchange rate associated with changes in the inflation rate ultimately lead to the rise and fall of the benchmark interest rate. Bank Indonesia, which has a policy of controlling interest rates, is expected to help stabilise the rupiah's value. The BI Rate, or Bank Indonesia's benchmark interest rate, significantly influences the exchange rate. Interest rates will increase when the BI Rate rises, attracting investors to save and invest in the currency. This can increase demand for the currency, which in turn can strengthen the exchange rate. Conversely, a decrease in the BI Rate can reduce the attractiveness of the domestic currency, causing the exchange rate to weaken.

Foreign exchange reserves can also influence another variable that can cause changes in the rupiah exchange rate. Foreign currency held by central banks and monetary authorities in the form of different foreign currencies, namely Dollars, Euros, Yen or Pounds Sterling and others obtained from trade activities between countries. Foreign exchange reserves on the balance of payments that have increased can make the exchange rate appreciate. Foreign exchange reserves that can meet foreign exchange needs can hold the rupiah exchange rate to depreciate so that if the rupiah depreciates, Bank Indonesia will issue foreign exchange reserves as an effort to stabilise the rupiah exchange rate against foreign currencies (Sulaiman, 2019).

In addition to foreign exchange reserves, exports are one of the variables associated with exchange rates. Exporting goods and services from one country is a process of sending them to another country. Small and medium-sized companies usually use this export process to compete internationally. Export activity is a trading system in which goods are sent from domestic to foreign countries by fulfilling applicable regulations. According to Wijaya (2020), if exports increase, the government's foreign exchange earnings increase, which will cause the rupiah exchange rate to strengthen or appreciate. Increased exports have a positive impact on the exchange rate.

Many studies on money supply, such as research conducted by Musyaffa & Sulasmiyati (2017), partially show that money supply significantly affects the exchange rate. Meanwhile, Diana & Dewi's (2019) research states that the money supply does not affect the exchange rate. Interest rates are a topic that is always discussed. Therefore, many studies, such as research conducted by Yudiarti et al. (2018), conclude that interest rate variables have no significant effect on exchange rates. The study conducted by Carissa & Khoirudin (2020) has concluded that the interest rate variable positively and significantly affects the exchange rate.

The findings of foreign exchange reserve research are numerous, such as research conducted by Yulianti (2014) in the short term and long term, the foreign exchange reserve variable has a significant effect on the rupiah / US dollar exchange rate, while research conducted by Hasyim (2019) has concluded that foreign exchange reserves have a negative and insignificant effect on the exchange rate. The results of export findings are also widely found, such as research conducted by Wijaya (2020), which concluded that exports do not significantly affect the rupiah exchange rate in the short and long term. Another study conducted by Arfiani (2019) concluded that the export variable is significant at the 90% confidence level, causing changes in the exchange rate, while the exchange rate variable is significant at the 95% confidence level, causing changes in the export variable. Given the above problems and previous research on exchange rates, the researcher will analyse the Rupiah Exchange Rate in Indonesia.

LITERATURE REVIEW

As Wijaya (2020) explains, the exchange rate, the price of a country's currency against another country's currency during trade, is not a fixed value. It is determined by the dynamic interplay of demand and supply in the foreign exchange market, an essential aspect of its market dynamics that you should be aware of. Exchange rates, a fundamental aspect of international trade, are categorised into two distinct types. This division is not just a technicality but a critical concept that underpins the global economy. The nominal exchange rate is a crucial factor in international trade. It is the price of a currency compared to another country's currency. Understanding its role is critical to navigating the complexities of global commerce.

The actual exchange rate, a concept often misunderstood, is the rate at which one country's goods and services can be exchanged for another country's goods and services. Mastering this concept is a significant leap towards a comprehensive understanding of international economics, enlightening you about the intricate dynamics of global trade.
Money supply is the total value of money in the hands of the public and circulating in a country's economy (Permatasari & Rosyidi, 2017). According to Suparmono (2018), the money supply can be divided into 2, namely in a narrow sense (M1) and a broad sense (M2): 1. Money supply in a narrow sense (M1): money in circulation in society consists of currency and demand deposits. 2. Broad money supply (M2): the total money supply consisting of currency, demand deposits, and quasi-money. Quasi money refers to highly liquid assets that can be quickly converted into cash, such as savings accounts and time deposits. In other words, broad money consists of narrow money plus quasi-money.

As Mishkin (2008) points out, the amount of money in circulation in a country directly impacts the exchange rate of its national currency. When there is an excess of money in circulation, it is used more frequently for transactions, leading to a rise in the prices of domestic goods. This, in turn, causes domestic prices to surpass foreign prices, resulting in a weakening or depreciation of the rupiah as local consumers turn to foreign markets.

Carissa and Khoirudin's (2020) research, Factors Affecting the Rupiah Exchange Rate in Indonesia, highlighted the significant impact of certain variables on the rupiah exchange rate. Their findings showed that money supply, interest rates, and imports had a partial yet significant positive effect on the rupiah exchange rate, underscoring their

importance in the context of the Indonesian market. However, the inflation rate was found to have no significant impact on the rupiah exchange rate.

The BI Rate, also known as the BI benchmark interest rate, is crucial in controlling the money market's liquidity. Set by Bank Indonesia, the central bank of Indonesia, and announced to the public at every monthly meeting by the Board of Governors, it plays a crucial role in fulfilling the operational objectives of monetary policy (Suparmono, 2018).

Changes in relative interest rates between two countries can affect investors' interest in investing in foreign securities. When interest rates in one country are higher than those in another, investors tend to move their funds to the country with higher interest rates to earn greater profits. This increases the demand for the currency of the country with higher interest rates, thereby affecting the exchange rate of that currency. The International Fisher Effect (IFE) theory explains that differences in nominal interest rates between two countries will affect exchange rate movements. According to IFE, the currency of a country with higher interest rates will depreciate compared to the currency of a country with lower interest rates because higher interest rates reflect higher inflation expectations, which in turn reduce the purchasing power of the currency (Puspitaningrum & Suhadak, 2014).

The study by Hasyim (2019) is titled Factors Affecting Exchange Rate Changes in Indonesia for the Period 2006-2018. The results showed that the t-test showed real income interest rates had a negative and significant relationship to the exchange rate. Inflation has a positive relationship with the exchange rate but is not significant. The foreign exchange reserve variable against the exchange rate has a positive and insignificant relationship.

Foreign currency reserves, or foreign exchange reserves, are deposits held by central banks and monetary authorities in reserve currencies such as dollars, euros, or yen. They are used to meet their obligations, namely local currency issued and reserves from various banks deposited at the central bank by the government or financial institutions (Hasyim, 2019).

The relationship between foreign exchange reserves and exchange rates is explained through the price mechanism. The Keynesian theory says that if the exchange rate appreciates (foreign currency increases and domestic currency decreases), this will inevitably lead to higher prices of export goods than imported goods. This has the effect of increasing exports and decreasing imports. The position of a country's foreign exchange reserves can be increased if exports are more significant than imports on the International Balance of Payments and vice versa (Hasyim, 2019).

The empirical findings of Ibrahim & Kornitasari (2023), titled "Analysis of the Effect of Inflation, Foreign Exchange Reserves, and Interest Rates on the Rupiah Exchange Rate Against the Dollar," showed that inflation and foreign exchange reserves affect the exchange rate negatively and significantly, and interest rates do not significantly affect it. Export is the sale of goods and services that cross national borders to obtain profits that can be achieved through individuals, organisations, or countries by applicable regulations. Exports are conducted to reduce the overproduction of domestic products and fulfil the needs of foreign markets.

According to the balance of payments theory, exports are often a factor that can drive up and down a country's currency exchange rate. An increase or surplus in the trade balance allows a country's currency to depreciate. Conversely, a decrease in the value of exports or a trade deficit allows a country's currency to appreciate (Silitonga & Ishak,

2017). Arfiani's study (2019) titled Empirical Analysis of the Relationship between Exports, Imports, Exchange Rates and Economic Growth in Indonesia brought a significant aspect of economic dynamics to light. The results showed a two-way causality relationship between the export and import variables. Notably, significant export variables at the 90% confidence level influence the exchange rate variable, while significant import variables at the 95% confidence level also affect the variable. These changes strongly impact import and export variables and vice versa. Significantly, all variables in the study, except for the economic growth variable and the exchange rate variable, are influenced by changes in the exchange rate variable, underscoring its pivotal role in economic relationships.

METHODOLOGY

The quantitative method is used in this research. According to Sugiyono (2016), Quantitative research, including explanatory research, prioritises a discussion of the influence between the variables used in the study and then seeks to link the variables through hypothesis testing. The data used is secondary data in the form of monthly time series data from 2015-2023, sourced from BI (Bank Indonesia) and BPS (Central Bureau of Statistics). The secondary data is meticulously analysed using the Vector Error Correction Model (VECM) method, ensuring a thorough understanding of the data. The time series research model used in this study can be formulated as follows:

$$NT_t = \alpha + \beta 1 JUB_t + \beta 2 RATE_t + \beta_3 CD_t + \beta_4 EX_t + \varepsilon_t$$

Description:

α : Constant

β : Regression coefficient

NT_t : Exchange Rate at time t

JUB_t : Money supply at the time t

RATE : BI Rate at time t

CD_t : Foreign exchange reserves at the time t

Ext_t : Exports at the time t

e_t : Error term at time t

Several stages of VECM testing that must be carried out include:

1. Data Stationary Test
   The initial and crucial stage in estimating time series data is the Data Stationary Test. This test is of paramount importance as it determines whether the data used has a unit root or whether it uses the Augmented Dickey-Fuller (ADF) test.
2. Optimum Lag Determination
   Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC), Hanna Quinn Information Criterion (HQ) and Final Prediction Error (FPE) are some of the criteria that can be used to determine the optimal number of lags. However, SIC is usually used to determine the ideal lag length for consistency and stability, also known as the number of asterisk signs (*) found in most lags (Adnan, 2023).
3. Johansen Cointegration Test

The cointegration test is a process that involves comparing the trace statistic value and the maximum eigenvalue with the critical value at the 5% significance level. This comparison helps determine if there is a long-term balance between variables. A cointegration effect between the tested variables is established if the trace statistic and maximum eigenvalue are more significant than the 5% critical value. Conversely, if the trace statistic estimate and the maximum eigenvalue are less than the critical value, it can be concluded that there is no cointegration relationship between the variables (Ajija, 2011).

4. Granger Causality Test
   The Granger causality test is conducted to see if a variable has a causal or reciprocal relationship with other variables. The purpose of the Granger causality test is to determine the causal relationship between the dependent variable and the independent variable. This test uses a 5% confidence level, and the lag is by the optimal lag test conducted (Adnan, 2023).
5. VECM Estimation
   According to Ajija (2011), if there is a cointegration relationship between the research variables, the estimation is done with VECM. However, if there is no cointegration relationship between the variables, the estimation is done with the VAR model. By comparing the statistical value in the estimation with the t-table value, we can find out whether there is a relationship between the short-term and the long-term. If the t-statistic value is more than the t-table value, it can be stated that there is a long-run or short-run relationship, or vice versa.
6. Impulse Response Function (IRF) Test
   IRF analysis is used to determine the reaction of an endogenous variable to a shock, or shock, of another variable, which in this analysis is not only in the short term but can analyse several horizons for an extended period. In this analysis, if there is a particular shock of one standard error in each equation, the long-term dynamics of each variable can be seen. The IRF test shows how a variable will react in the future if there is a disturbance in another variable (Basuki & Prawoto, 2017).
7. Variance Decomposition Test (VDC)
   Variance Decomposition analysis shows how important each variable is in contributing a percentage of the variance due to changes caused by certain variables in the VECM system. Variance Decomposition in a graph or table can provide an overview of a variable's variance caused by shocks to other variables or to itself.

RESULTS AND DISCUSSION

RESULTS

1. Variable Stationarity Test

Table 1 ADF Test Results at Level and First Difference Levels

Variable	Level		First different	
	t-statistic ADF	Critical Value 5%	t-statistic	Critical Value 5%

Exchange Rate	-1460118	-2.889200	-10.19474	-2.889200
Money Supply (M2)	-0.127061	-2.888932	-14.77931	-2.888932
BI Rate	-2.134666	-2.889200	-6.345790	-2.888932
Foreign Exchange Reserves	-0.930070	-2.888669	-9.699325	-2.888932
Exports	-1.058893	-2.888932	-10.90067	-2.889200

Source: Results of Data Processing with Eviews 12 (2024)

The results of the variable stationarity test show that none of the variables are stationary at the level. This is evident from the ADF t-statistic value, which is smaller than the critical value of 5%. However, the stationary test at the first difference level yields results showing that the ADF t-statistic value is greater than the critical value of 5%, indicating that the data is stationary at the first difference level. This finding supports the use of first difference data in VECM estimation, reassuring us of the validity of this approach.

2. Optimum Lag Determination Results

Table 2 Determination of Lag Length

Lag	LogL	LR	FPE	AIC	SC	HQ
0	1271.336	NA	183e-17	-24.35261	-24.22548	-24.30111
1	1329.936	110. 4388	957e-18	-24.99877	-24.23597*	-24.68974*
2	1361.194	55.90275*	852e-18*	-25.11911*	-23.72063	-24.55254
3	1374.667	22.80072	1.07e-17	-24.89744	-22.86329	-24.07334

Source: Results of Data Processing with Eviews 12 (2024)
Note: the * sign means the optimal lag proposed by Eviews 10

The lag length results show that the best lag length is at lag 2. The selection of lag 2 is optimal because, based on the proposed AIC, SIC, HQ and FPE criteria, lag 2. In addition, it can be seen from the asterisk sign (*) that there are three at lag 2. Therefore, the model chosen in the study is lag two because it meets the requirements for further analysis, namely the cointegration test.

3. Johansen Co-integration Test Results

Table 3 Results of AIC and SC on Johansen Cointegration Index

Recommended Trend Data	
Akaike Information Criteria (AIC)	**Schwarz Criteria (SC)**
2: None: Intercept No Trend	1: None : No Intercept No Trend

Source: Results of Data Processing with Eviews 12 (2024)

The two most suitable trend determination criteria are AIC and SC. There is no problem with the decision to determine the criteria for the use of AIC or SC. This study uses AIC so that the specification intercepts no trend. The results of the cointegration test with the assumption of Intercept No Trend are as follows:

Table 4 Cointegration Test (Trace Statistic)

Hypothesised No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.333132	106.9952	76.97277	0.0001
At most 1*	0.246545	64. 45304	54.07904	0.0045
At most 2*	0.137219	34.72906	35.19275	0.0560
At most 3*	0.126384	19.23164	20.26184	0.0688
At most 4*	0.046909	5.044661	9.164546	0.2786

Source: Results of Data Processing with Eviews 12 (2024)
Notes: * means the value of Trace Statistic > Critical Value 5%

The trace statistic cointegration test results show that in the first column, the trace statistic value is 106.99> from the 5% critical value of 76.97, and the probability value is <0.05, which is 0.00. In the second column, the trace statistic value is 64. 45 > from a critical value of 5%, 54.07, and probability value < from 0.05, which is 0.00. So, a cointegration equation occurs. However, there is no cointegration in the third, fourth and fifth columns; this is evidenced by the trace statistic value, which is smaller than the critical value of 5%, and the probability value, greater than $\alpha = 0.05$.

Table 5 Johansen Cointegration Test (Max-Eigen Value)

Hypothesised No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.333132	42.54217	34.80587	0.0049
At most 1*	0.246545	29.72399	28.58808	0.0357
At most 2*	0.137219	15.49742	22.29962	0.3354
At most 3*	0.126384	14.18698	15.89210	0.0909

At most 4*	0. 46909	5.044661	9.164546	0.2786

Source: Results of Data Processing with Eviews 12 (2024)
Notes: * means Max-Eigen Statistic value > Critical Value 5%

The Max-Eigen cointegration test results show that in the first column, the Max-Eigen Statistic value is 42.54> from the critical value of 5%, namely 34.80, and the probability value is <0.05, namely 0.00. In the second column, the Max-Eigen Statistic value is 29.72> from the critical value of 5%, which is 28.58, and the probability value is <0.05, which is 0.03. This proves that a cointegration equation occurs. However, there is no cointegration in the third, fourth and fifth columns; this is evidenced by the trace statistic value, which is smaller than the critical value of 5%, and the probability value, more significant than α = 0.05.

The test results of the two methods above show that H0 is rejected and H1 is accepted. In other words, the variables used in this study have cointegration or long-run relationships with each other. Therefore, the VECM estimation can be used and continued with the Granger causality test.

4. Granger Causality Test Results

Table 6 Granger Causality Test

Null Hypothesis:	F-Statistic	Prob.
JUB does not Granger Cause NT	6.64527	0.0019
NT does not Granger Cause JUB	0.56838	0.5682
RATE does not Granger Cause NT	0.65336	0. 4554
NT does not Granger Cause RATE	4.58474	0.0114
CD does not Granger Cause NT	7.93876	0.0006
NT does not Granger Cause CD	3.81338	0.0253
EX does not Granger Cause NT	3.77418	0.0263
NT does not Granger Cause EX	2.27190	0.1084
RATE does not Granger Cause JUB	0.96880	0.3830
JUB does not Granger Cause RATE	0.93875	0.3945
CD does not Granger Cause JUB	0.31564	0.7300
JUB does not Granger Cause CD	4.05588	0.0202
EX does not Granger Cause JUB	0.18462	0.8317
JUB does not Granger Cause EX	3.13874	0.0476
CD does not Granger Cause RATE	0.89748	0.4108
RATE does not Granger Cause CD	0. 46443	0.6298
EX does not Granger Cause RATE	9.52683	0.0002
RATE does not Granger Cause EX	4.38113	0.0150
EX does not Granger Cause CD	0.13594	0.8731
CD does not Granger Cause EX	5.23975	0.0068

Source: Results of Data Processing with Eviews 12 (2024)

The Granger causality test results can explain that the variables that show the Granger causality relationship have a probability value of less than α = 0.05. There is a causality relationship between the test results of foreign exchange reserves variables, the exchange and export variables and the BI rate. There is a one-way causality relationship between money supply to the exchange rate, exchange rate to BI Rate, exports to the exchange rate, money supply to foreign exchange reserves, and foreign exchange reserves to exports. Meanwhile, the variables of BI Rate to money supply and foreign exchange reserves to BI Rate have no causality relationship.

5. Vector Error Correction Model Estimation Results

Table 7 Long-term Analysis

Cointegrating Eq:	**CointEq1**
DNT (-1)	1.000000
JUB	-0.421268
	[-9.95537] *
RATE	-0.002272
	[-1.31696]
CD	0.201781
	[2.17642] *
EX	0.167781
	[6.04823] *
C	-3.015242

Source: Results of Data Processing with Eviews 12 (2024)
Notes: [] = t-statistic * significant at α = 5% and df 102= (1.98)

From the VECM estimation results, the equation in the long run can be written as follows:

$$NT_t = -3.015242 - 0.42\ JUB_t - 0.002\ RATE_t + 0.20\ CD_t + 0.16\ EX_t + e$$

The results of the long-term VECM estimation show that the money supply variable has a negative and significant effect on the exchange rate. This means that every one-unit increase in the money supply reduces the exchange rate by 0.42. This finding suggests that changes in the money supply can substantially impact the exchange rate, which is a crucial insight for policymakers and market participants.

The BI Rate variable has a negative and insignificant effect on the exchange rate. Any increase in the BI Rate by one unit will decrease the exchange rate by 0.002 one unit. The foreign exchange reserves variable positively and significantly affects the exchange rate. This means that any increase in foreign exchange reserves by one unit will increase the exchange rate by 0.20 one unit. The export variable has a positive and

significant effect on the exchange rate. This means that any increase in exports by one unit will increase the exchange rate by 0.16 units.

The following are the results of the VECM estimation in the short term:

Table 8 Short-term Analysis

Error Correction :	**D(NT)**
CointEq1	-0.261797
	[-2.45317]*
D(NT (-1))	0.247769
	[2.01846]
D(JUB (-1))	-0.063513
	[-0.42870]
D(RATE (-1))	0.012756
	[1.13501]
D(CD (-1))	-0.202105
	[-2.44850]*
D(EX (-1))	0.016307
	[0.78438]

Source: Results of Data Processing with Eviews 12 (2024)
Notes: [] = t-statistic *significant at α = 5% and df 102= (1.98)

From the VECM estimation results, the equation in the short term can be written as follows:

$$NT_t = -0.26 - 0.06\ JUB_t + 0.01\ RATE_t - 0.20\ CD_t + 0.01\ EX_t + e$$

The money supply variable has a negative and insignificant effect on the exchange rate. Every one-unit increase in the money supply reduces the exchange rate by 0.06. The BI Rate variable, a critical factor in our analysis, has a positive and significant effect on the exchange rate. This means that any increase in the BI rate by one unit will increase the exchange rate by 0.01 one unit, underscoring its crucial role in our economic landscape. The foreign exchange reserves variable negatively and significantly affects the exchange rate. This means that every one-unit increase in foreign exchange reserves reduces the exchange rate by 0.20 one unit. The export variable has a positive and insignificant effect on the exchange rate. This means that every increase in export by one unit will increase the exchange rate by 0.01 one unit.

Based on the results of VECM testing in the short term, it is known that the value of CointEq1 is -0.261797 with a t-count value more significant than the t-table value (2.45>1.98), meaning that there is a long-term and short-term relationship of this variable. In contrast, the CointEq1 value shows how quickly the disequilibrium will

return to long-term equilibrium, with an acceleration of 0.26%, when there is a shock in the economy; the time needed to restore conditions to equilibrium is 3 months and 10 days.

VECM analysis results can not only show the effect of independent variables on the dependent variable. However, VECM estimation is also enhanced with IRF (Impluse Response Function) and VDC (Variance Decomposition) features to show the response and time required to return to the equilibrium point. In addition, the results of VECM analysis can also show the composition of the influence of each independent variable on the formation of the dependent variable. The results of IRF and VDC analyses are explained as follows:

6. IRF Analysis Results (Impulse Response Function)

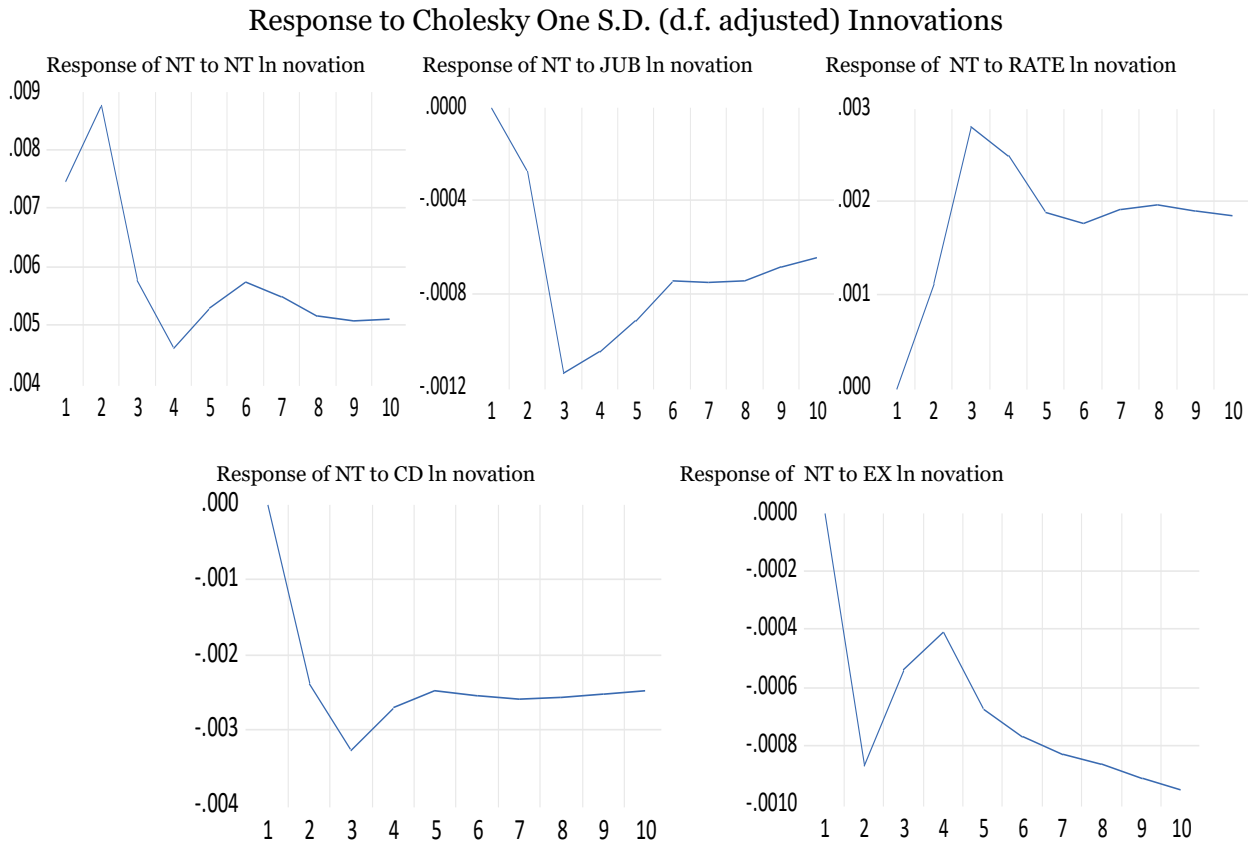
Table 9 Impulse Response Function Test Results

Response of NT: Period	NT	JUB	RATE	CD	EX
1	0.007468	0.000000	0.000000	0.000000	0.000000
2	0.008764	-0.000271	0.001134	-0.002381	-0.000865
3	0.005778	-0.001137	0.002808	-0.003263	-0.000535
4	0.004613	-0.001046	0.002503	-0.002688	-0.000410
5	0.005311	-0.000913	0.001881	-0.002480	-0.000673
6	0.005753	-0.000743	0.001779	-0.002540	-0.000766
7	0.005493	-0.000746	0.001926	-0.002587	-0.000827
8	0.005170	-0.000743	0.001973	-0.002558	-0.000861
9	0.005095	-0.000683	0.001904	-0.002507	-0.000908
10	0.005120	-0.000641	0.001846	-0.002482	-0.000946

Source: Results of Data Processing with Eviews 12 (2024)

The test results show that the exchange rate variable responds negatively to shocks given by the money supply variable, and there is also a positive response in the first period. The exchange rate responds positively permanently, meaning that the BI Rate variable shows positive shocks from the beginning to the end of the period. The exchange rate variable responds negatively to shocks given by the foreign exchange reserves variable, and there is also a positive response in the first period. Furthermore, the exchange rate variable responds negatively to shocks the export variable gives, and there is also a positive response in the first period. The following IRF graph is:

Figure 6 IRF Analysis Results



Source: Results of Data Processing with Eviews 12 (2024)

From the figure above, it can be seen that the IRF of the exchange rate against the exchange rate shock itself shows above the horizontal line, which means that the variable has a positive impact. The response of the exchange rate to the money supply shock is negative; the IRF line below the horizontal line evidences this. The response of the exchange rate to the BI Rate shock shows a significant fluctuation, which is a positive trend from the first period to the tenth period. The response of the exchange rate to the foreign exchange reserves shock itself is negative; the IRF line below the horizontal line evidences this. The response of the exchange rate to the export shock shows a notably negative trend, highlighting a potential risk factor. The IRF line below the horizontal line evidences this.

7. Variance Decomposition Analysis Results

Table 10 Results of VDC Analysis of Exchange Rate

Period	S.E.	NT	JUB	RATE	CD	EX
1	0.007468	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.011847	94.45815	0.052473	0.916647	4.040172	0.532554
3	0.013923	85.61428	0.704624	4.730212	8.417785	0.533099
4	0.015162	81.45198	1.070131	6.714609	10.24073	0.522546
5	0.016403	80.07384	1.224059	7.051505	11.03585	0.614738
6	0.017689	79.42921	1.228758	7.074953	11.55105	0.716029
7	0.018834	78.57200	1.240960	7.286794	12.07566	0.824581
8	0.019829	77.68509	1.259994	7.564223	12.55824	0.932460
9	0.020745	77.00914	1.259563	7.753436	12.93432	1.043544
10	0.021620	76.50697	1.247592	7.867568	13.22552	1.152353

Source: Results of Data Processing with Eviews 12 (2024)

From the above results in the first period, the exchange rate is strongly influenced by the exchange rate shock by 100%. From the above results in the first period, the exchange rate is strongly influenced by the exchange rate shock by 100%. In addition, the variables of money supply, BI Rate, Foreign exchange reserves and exports have not influenced the exchange rate. Then, from the 1st period to the 10th period, the amount of exchange rate shock remains large. The exchange rate shock gives an up-and-down proportion of influence on the exchange rate from the 1st period by 100% to the 10th period by 76.50%. Furthermore, the variable money supply in the second period contributed to the exchange rate of 0.05%. Then the shock of the money supply continued to rise until the 9th period and fell in the 10th period by 1.24%.

Furthermore, the BI Rate variable in the second period made a noticeable contribution of 0.91% to the exchange rate, a figure that increased steadily from the 2nd to the 10th period, reaching 7.86%. The foreign exchange reserves variable in the second period also made a significant contribution of 4.04% to the exchange rate, a figure that increased progressively from the 2nd to the 10th period, reaching 13.22%. Finally, the export variable in the second period made a modest but increasing contribution of 0.53% to the exchange rate, a figure that increased from the 2nd to the 10th period, reaching 0.74%.

DISCUSSION

The long-term VECM estimation results show that the money supply has a negative and significant effect on the exchange rate. This research is supported by the Purchasing Power Parity Theory, which states that an increase in money supply leads to higher domestic inflation than abroad, thus lowering the value of the domestic currency. In Indonesia, an increase in money supply tends to increase inflation, reduce the purchasing power of the rupiah, and cause a depreciation of the exchange rate. High inflation also reduces investment attractiveness, as investors prefer countries with low inflation and stable currencies. Therefore, this theory supports the finding that an increase in money supply significantly negatively affects the rupiah exchange rate, emphasising the

importance of tight monetary policy. This finding is in line with research by Musyaffa' & Sulasmiyati (2017), which states that the money supply has a significant effect on the exchange rate and rejects research conducted by Diana & Dewi (2019), which states that the money supply does not affect the exchange rate.

In the long term and short term, the BI rate variable does not significantly affect the exchange rate, according to the International Fisher Effect (IFE) theory, which says that differences in inflation rate estimates between countries cause differences in interest rates in various countries. However, high interest rates do not guarantee that the domestic exchange rate will increase. In some specific situations, it is found that the 7-day BI (Reserve) Repo Rate does not significantly impact bank interest rates, so its impact on the exchange rate is also insignificant. This is because the Bank Indonesia interest rate is only a recommendation and does not need to be obeyed, while bank interest rates directly impact the economy (Carissa & Khoirudin, 2020). The results of this study are based on the research of Yudiarti et al. (2018), who concluded that the interest rate variable has no significant effect on the exchange rate. Moreover, it rejects research conducted by Carissa and Khoirudin (2020), which has concluded that the interest rate variable positively and significantly affects the exchange rate.

Long-term research results showed that the foreign exchange reserves variable has a positive and significant effect on the exchange rate; the relationship between foreign exchange reserves and the exchange rate is explained through the price mechanism. The Keynesian theory says that if the exchange rate appreciates (the increase in foreign currency and domestic currency decreases), this will inevitably lead to higher prices of export goods than imported goods. This has the effect of increasing exports and decreasing imports. The position of a country's foreign exchange reserves can be increased if exports are more significant than imports on the international balance of payments and vice versa (Hasyim, 2019). The results of this study are as follows: Yulianti (2014). In the long term, the foreign exchange reserve variable has a significant effect on the rupiah / US dollar exchange rate. Moreover, rejecting research conducted by Hasyim (2019) has concluded that foreign exchange reserves have a negative and insignificant effect on the exchange rate.

Exports have a positive and significant effect on the exchange rate in the long run, in accordance with the theory of balance of payments. This theory explains that an increase in exports supports the strengthening of the exchange rate through increased demand for domestic currency, improving the balance of payments, and increasing foreign exchange earnings; conversely, a decrease in exports or a trade deficit can lead to currency appreciation (Silitonga & Ishak, 2017). This study's results align with Arfiani (2019), which found that exports are significant to the exchange rate with a confidence level of 90%. The exchange rate is significant to exports, with a confidence level of 95%. It rejects research conducted by Wijaya (2020), which concluded that exports do not significantly affect the rupiah exchange rate in the short and long term. The high confidence levels in these findings should reassure the audience of their reliability and significance.

CONCLUSION

The variable money supply in the long-term VECM estimation results shows a negative and significant effect on the exchange rate. The short-term VECM estimation results show that the money supply variable has a negative and insignificant effect on the

exchange rate. The BI Rate variable in the long-term VECM estimation results shows adverse and insignificant effects on the exchange rate. The short-term VECM estimation results show that the BI Rate variable is positive and has no significant effect on the exchange rate. The foreign exchange reserves variable in the long-term VECM estimation results shows positive and significant effects on the exchange rate. The short-term VECM estimation results show that the foreign exchange reserves variable negatively and significantly affects the exchange rate. The export variable in the long-term VECM estimation results shows positive and significant effects on the exchange rate. The short-term VECM estimation results show that the export variable is positive and has no significant effect on the exchange rate.

For the government, this research can be helpful when making decisions about monetary policy aimed at stabilising the rupiah exchange rate, such as controlling the money supply, BI Rate, foreign exchange reserves and exports. This is because the government's policies significantly impact the Indonesian economy. Other researchers can use this research as a reference because the variables that affect the Indonesian rupiah exchange rate are not limited to those discussed in this study. Other variables include investment, inflation, imports, and economic growth, updating the data sample and trying other test models.

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