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The Influence of Macroeconomic Factors on The Exchange Rate

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ABSTRACT
The exchange rate is a relatively important economic indicator because it influences a country's economy. This study aims to analyze the influence of economic factors, including the inflation rate, money supply, and exports, on the rupiah exchange rate in the long and short term. This study uses monthly data from 2016 to 2021. The analysis tool used is the Error Correction Model. The results indicate that inflation and exports have a positive and significant impact on the rupiah exchange rate in both the long and short terms. Meanwhile, the money supply variable has a positive but insignificant effect on the rupiah exchange rate in the long and short term.

Keywords: inflation, money supply, exports, exchange rate, *error correction model*

INTRODUCTION

The exchange rate is an important economic indicator for a country's economy. A country's economy can be measured by its stability using indicators such as inflation control and foreign policies related to exports and imports. Wijaya (2020) argues that the exchange rate is the price of one country's currency in terms of another country's currency, which is used for trade between the two countries. The balance of supply and demand in the foreign exchange market determines its value. The exchange rate is one way for a country to transact with other countries, as using it as a transaction tool tends to be easier (Demak et al., 2018). The amount of one currency from the exchange of one currency for another or the price of one currency in an exchange currency (Carissa & Khoirudin, 2020). The Indonesian rupiah exchange rate is classified as a soft currency because its value is unstable, and changes in the exchange rate can occur in two directions: depreciation (weakening) or appreciation (strengthening), which are possible in the currency. The following graph shows the rupiah exchange rate against the dollar.

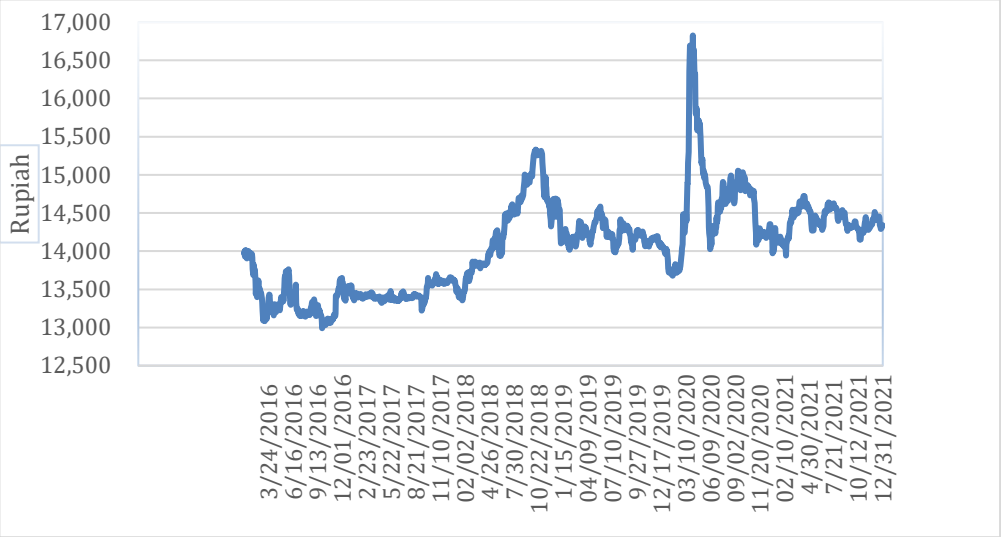


Figure 1
Graph of Rupiah Exchange Rate against the Dollar

The Indonesian rupiah exchange rate in 2016 was Rp. 13,967.00 and continued to increase until it reached Rp—14,418.00 in June 2019. However, the following year, the exchange rate changed again to Rp. 13,694.00. This is problematic because the exchange rate experienced significant changes throughout the year. In 2020, the rupiah weakened to Rp. 16,825.00 due to the pandemic that entered Indonesia. This condition is quite worrying because there are fluctuations in the rupiah exchange rate against the dollar. Several factors cause exchange rates to fluctuate, namely the inflation rate, the money supply, and exports.

Increases/decreases in the prices of goods and services cause fluctuating exchange rates. Price increases affect the rupiah exchange rate (Nasution et al., 2020). High inflation is caused by an excessive money supply, where the amount of money in circulation exceeds the demand for it. This causes demand for goods to increase, while the quantity demanded remains constant. If a country wants to maintain a low inflation rate, the government must be able to control price increases by suppressing the rate of increase in the money supply. Inflation has a significant positive effect on the rupiah exchange rate (Chandra & Wahyuningsih, 2021). Inflation is related to the exchange rate because changes in the inflation rate directly affect the demand for money in a country. This also affects international trade patterns. Inflation rates vary across countries, so international trade patterns and exchange rates adjust accordingly to these differing inflation rates. The inflation data used includes monthly data from 2016 to 2021. The movement of inflation over the six years shows fluctuations each month. The following graph illustrates the inflation rate in Indonesia.

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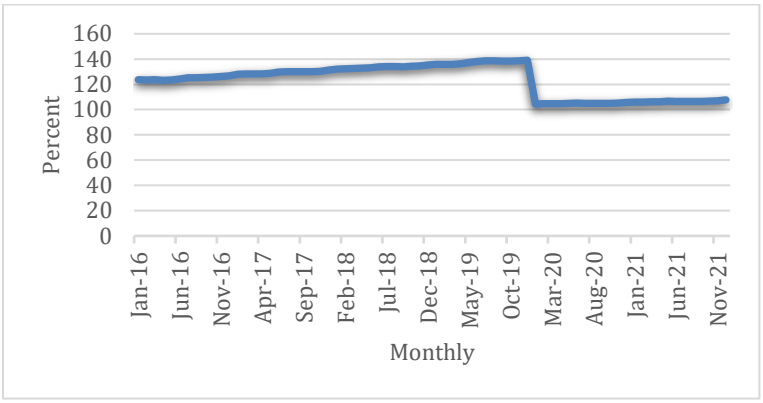


Figure 1
Graph of the Inflation Rate in Indonesia

The highest inflation rate occurred in December 2019, reaching 139.07%. Over time, the inflation rate continued to fluctuate, reaching a decline of 107.66% by the end of 2021. The frequent annual fluctuations in the inflation rate reflect the tendency for the prices of goods and services to fluctuate over a given period. High inflation causes the country's economy to heat up, leading to a decline in people's real incomes and a fall in the standard of living (Chandra & Wahyuningsih, 2021).

The money supply plays a crucial role in a country's economy. Excessive money supply in a country's economy will put pressure on the currency's exchange rate against foreign currencies (Carissa & Khoirudin, 2020). Meanwhile, according to Susetyo et al. (2011), the money supply is the amount of money issued and distributed by the central bank in the form of coins and paper money. The basis for the creation of this money supply is the existence of core and primary money; thus, the distribution of the money supply is greatly influenced by the amount of core money available. The money supply and the exchange rate are related because an increase in the money supply can cause the currency's value to depreciate (Tiara Nofia Landa, 2017; Carissa & Khoirudin, 2020). The depreciation of the rupiah against the dollar indicates that the economy is experiencing a decline (Kholifatul I & Wahyuningsih, 2021). The following is a graph of the amount of money in circulation:

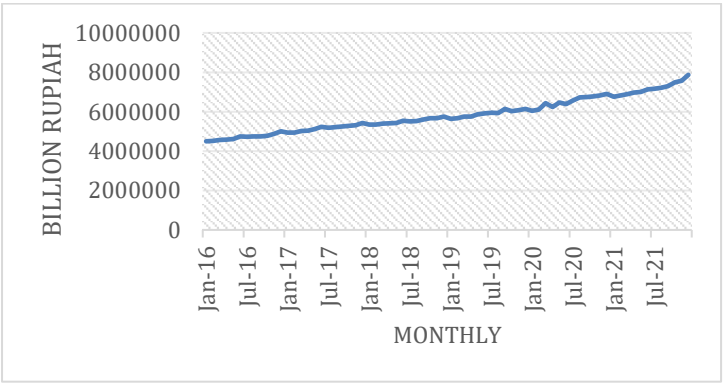


Figure 2
Graph of Money Supply (M2) Year (2016-2021)

The graph shows that the amount of money in circulation continues to increase

every year, from Rp. 4,498,361 at the beginning of 2016 to Rp. 7,870,452 at the end of 2021.

Additionally, fluctuations in the rupiah exchange rate can also be influenced by export activities; changes in these activities can impact the rupiah exchange rate (Yudha & Hadi, 2019). Export is the process of transporting goods from one country to another. According to Sabtiadi and Kartikasari (2018), export is a trading activity that involves removing goods from Indonesia to be sent outside the country. For Indonesia, foreign trade, particularly exports, has a significant impact. In the long term, exports can harm the exchange rate, a phenomenon often observed in developing countries (BR Silitonga et al., 2019). This study aims to analyze the effects of inflation and macroeconomic factors on the exchange rate in Indonesia, examining both the long-term and short-term implications. The following graph illustrates the value of Indonesia's exports.

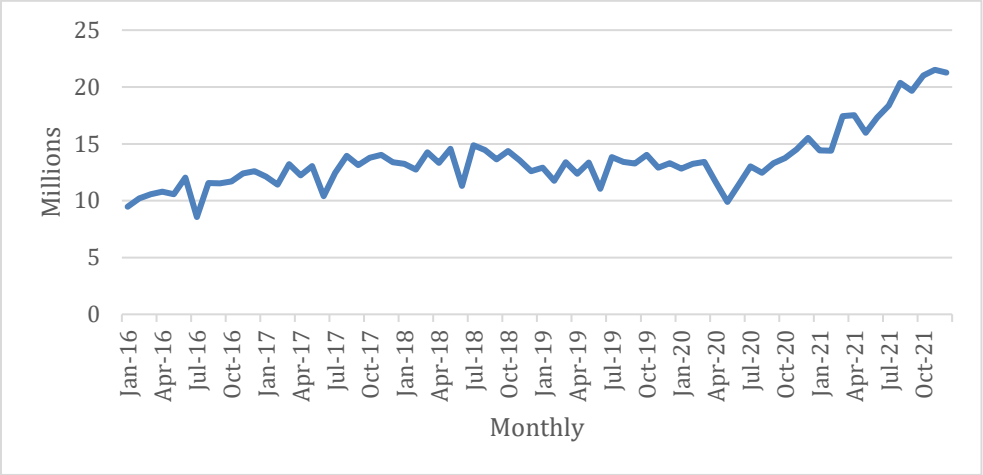


Figure 3
Export Value Graph

As shown in the graph above, the export value reached only 8,560 in July 2016 and continued to fluctuate until the end of 2021, when it reached 21,266. This could be due to several factors, including external factors such as declining prices of key commodities and a weak global economy, which will lead to a decline in international trade transactions.

Carissa & Khoirudin (2020) Research shows that the money supply, interest rates, inflation, and imports collectively have a significant effect on the rupiah exchange rate. Partially, the money supply, interest rates, and imports have a positive and significant effect on the rupiah exchange rate. (Chandra & Wahyuningsih, 2021) Research simultaneously found that the interest rate, inflation rate, and exports significantly influence the rupiah exchange rate against the US dollar. The interest rate has a positive influence on the rupiah exchange rate against the US dollar. In contrast, interest rates, inflation, and exports have all contributed to the weakening of the rupiah exchange rate against the US dollar. Based on these findings, the researchers are interested in conducting a study entitled "The Influence of Macroeconomic Factors on the Rupiah Exchange Rate (2016-2021).

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RESEARCH METHOD

Data Types and Sources

This study uses a quantitative approach, which is derived from an assumption, then determines variables and analyzes them using a measurable research model (D. Gujarati, 2015). The data used are secondary, in the form of monthly data for the period 2016-2021, sourced from the Central Statistics Agency (BPS) and CEIC. This study uses four variables: the rupiah exchange rate, inflation, money supply, and exports.

Analysis Techniques

The ECM model is used to find long-term and short-term equilibrium regression equations and determine the consistency of a model (D. N. Gujarati & Porter, 2010). The purpose of this *error correction model* is to address data issues related to spurious and non-stationary time series data (D. Gujarati, 2011). The ECM regression model used in this study is as follows:

a. Long Run Equation:

$$\mathbf{Log(KURS_t) = \beta_0 + \beta_1 INF_t + Log\ \beta_2 (JUB_t) + Log\ \beta_3 (EXP_t) + e_t} \ldots\ldots (1)$$

Where :
Kurs: Exchange Rate
INF: Inflation Rate
JUB: Amount of Money in Circulation
EXP: Export Value
β_0 : Contanta
β_1, β_2 : Coeficient
ε: residual

b. Short Term Equation:

$$\mathbf{\Delta Log(KURS_t) = \beta_0 + \beta_1 \Delta INF_t + \beta_2 \Delta Log(JUB_t) + \beta_3 \Delta Log(EXP_t) + ECT_t} \ldots.(2)$$

Where :
Kurs: Exchange Rate
INF: Inflation Rate
JUB: Amount of Money in Circulation
EXP: Export Value
ECT: Error Correction Term
β_0 : Contanta
β_1, β_2 : Coeficient
ε: residual

RESULTS AND DISCUSSION

The results of statistical data analysis and discussion will yield conclusions. In *Error Correction Model* (ECM) research, several testing stages must be carried out, including the following:

Data Stationarity Test

The stationarity test is the initial stage in the *Error Correction Model method*, aimed at determining whether the data on the dependent and independent variables are stationary. This study employs the *Augmented Dickey-Fuller* (ADF) Unit Root Test, a method also used by econometricians to test for stationarity. The results of the data stationarity test are shown in the following table:

Table 1. Data Stationarity Test

	Level Level		Level 1 st *Difference*	
Variables	**T-Statistic**	**Prob**	**T-Statistic**	**Prob**
Kurs	-2.834705	0.0586	-14.73685	0.0001**
Inflation	-1.419226	0.5682	-7.816796	0.0000**
Jub	2.384199	1,0000	-11.47938	0.0001**
Export	-8.015866	0.0000	-8.833112	0.0000**

*Significant at level 1%, **significant at level 5%, ***significant at level 10%

Based on the results of the table above, it can be seen that the export variable has passed the stationarity test at the level. However, the exchange rate, inflation, and money supply variables have passed the stationarity test at the first level. *Difference* or *First Difference,* with reference to the prob value, must be less than 5%.

Cointegration Test

The next step is a cointegration test, which is used to determine whether a long-term relationship exists between the dependent and independent variables. A cointegration test can be performed if the data used have the same degree of integration, that is, integrated. If the monthly data used is non-stationary, it can result in spurious regression, often referred to as *a spurious regression*. This study used *the Johansen Cointegration Test,* and the following cointegration test results were obtained:

Table 2. Cointegration Test

Eigenvalue	*Trace Statistics*	*Critical Value*	*Prob.*
0.514516	70.13994	40.17493	0.0000**
Eigenvalue	*Max-Eigen Statistics*	*Critical Value*	*Prob.*
0.514516	49.86000	24.15921	0.0000**

*Significant at level 1%, **significant at level 5%, ***significant at level 10%

From the table above, the *Trace Statistic value* of 70.13994 is greater than the *Critical Value value* of 40.17493. Meanwhile, *the Max-Eigen Statistic* is 49.86000, which is greater than the *Critical value of 24.15921*, with a significance level of less than 0.05. It can be concluded that there is a cointegration relationship, or a long-term relationship, between the variables in this study.

Error Correction Model (ECM)

The results of the data stationarity test indicate that the processed data are stationary at both the level and the first difference level. Furthermore, the cointegration test proves a long-term relationship, but in the short term, there may be no equilibrium. Therefore, the following method used is the *Error Correction Model* (ECM) method. This method aims to determine whether an equilibrium exists between long-term and short-term variables. The following is the result of the long-term equation:

Table 3. Error Correction Model in the long run

Variables	Coefficient	Probability
C	2.064528	0.0025**
(INF)	1.417656	0.0013**

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Log(JUB)	0.000151	0.0992***
Log(EXP)	0.000506	0.0000**
R-squared	0.741976	-
F-statistic	65.18062	0.000000**

*Significant at level 1%, **significant at level 5%, ***significant at level 10%

The coefficient results of the inflation variable indicate a positive influence on the rupiah exchange rate, with a long-term value of 1.417656. This implies that when inflation rises by 1%, the rupiah exchange rate will experience depreciation by 1.41%, with a probability result of 0.0013, which is significant because it is smaller than 0.05. This indicates that the inflation variable has a positive and significant influence on the rupiah exchange rate in the long term. These results are in accordance with the hypothesis. In accordance with the theory of money supply, which explains that many factors can influence the movement of the money supply, one of which is the rupiah exchange rate, this is in line with research from Laili & Wahyuningsih (2022), which states that a high inflation rate will cause the rupiah exchange rate to weaken.

The coefficient value of the variable of money supply (jub) in the long term is 0.000151, which means that when jub increases by 1%, the rupiah exchange rate depreciates by 0.000151. In contrast, the probability value generated by jub is greater than 0.05, specifically 0.0992, indicating that the amount of money supply is positive and not significant in the long term for the rupiah exchange rate. These results are not in accordance with the hypothesis, because an increase in the money supply is expected to cause a higher price level, leading to a decrease in the exchange rate in the long term. The higher the domestic money supply, the greater the domestic currency's appreciation. These results align with research conducted by Landa et al. (2017).

In the long term, the coefficient results of the export variable indicate a positive influence of 0.000506, meaning that a 1% increase in exports will result in a depreciation of the rupiah exchange rate by 0.000506. In contrast, the probability value of the export variable yields a value of 0.0000, which is smaller than 0.05, indicating that the export variable has a positive and significant influence on the rupiah exchange rate in the long term. This occurs because when the rupiah exchange rate appreciates, prices outside the country are considered cheap, resulting in increased exports. These results are in accordance with the hypothesis and in line with previous research by Taufiq and Natasah (2019).

The coefficient of determination, R^2, [is] 0.741976, indicating that the variables in the equation account for 74.19%, while other factors outside the equation account for the remaining 25.81%. Then, for the *F-statistic coefficient value* in this long-term equation of 65.18062 with a probability result of 0.000000 less than 0.05, it can be stated that there is a significant influence between the independent variables, including the amount of money in circulation (jub), inflation, and exports, on the dependent variable, namely the rupiah exchange rate.

Table 4. Error Correction Model in the short term

Variables	Coefficient	Probability
C	-0.001489	0.4250
D (INF)	2.101423	0.0000**
D Log(JUB)	0.000158	0.5550

D Log(EXP)	0.000608	0.0000**
ECT(-1)	-0.384183	0.0004**
R-squared	0.906340	-
F-statistic	159.6688	0.000000**

*Significant at level 1%, **significant at level 5%, ***significant at level 10%

The results of the inflation variable show a positive coefficient value of 2.101423, indicating that when inflation rises by 1%, the rupiah exchange rate depreciates by 2.10%. This relationship is significant with a probability value of 0.0000. The inflation variable is stated to have a significant positive influence on the rupiah exchange rate variable in the short term. This result is in accordance with the hypothesis. Thus when the inflation variable jumps it is caused by the rise in the rupiah exchange rate, the resulting relationship is in accordance with the PPP theory, namely the inflation rate is the leading cause of exchange rate movements, and in accordance with previous research from America, (2018) revealed that the balance of the exchange rate adjusts the inflation rate of a country.

The short-term coefficient value of the money supply variable is 0.000158, which means that when the price of money increases by 1%, the rupiah exchange rate depreciates by 0.000158. The resulting probability value is 0.5550, which is greater than 0.05. The price of money is positive but does not have a significant effect on the rupiah exchange rate in the short term, which contradicts the hypothesis. This is caused by the increase in the money supply, which takes a considerable amount of time to reach the public and be consumed in the form of imported goods, thereby causing the exchange rate to appreciate again. However, this money supply must first be transmitted to the banking system, then to various sectors. These results are in accordance with previous research conducted. This condition is in accordance with the law of money supply theory, where the government will reduce the money supply if the rupiah exchange rate is experiencing depreciation.

In the export variable, the value generated on the coefficient value has a positive influence of 0.000608 so that a 1% increase in exports will affect the rupiah exchange rate to depreciate by 0.00068 while the probability value is 0.0000, it can be concluded that the export variable has a positive and significant influence on the exchange rate in the short term, these results are in accordance with the existing hypothesis. Exports have a positive and significant effect on the movement of the rupiah exchange rate. Moreover, in line with the supply theory that explains the relationship between exports and the rupiah exchange rate, where exports are the supply while prices are the exchange rate, if the supply of a commodity increases, then the price will weaken.

Furthermore, the coefficient of determination (R^2) ^{in} the short term is 0.906340, indicating that the variables in the equation have an influence of 96.53%, while 3.47% is influenced by other factors outside the equation. The results of the *F-statistic coefficient value* in the short-term equation are 159.6688. The probability value is 0.000000 less than 0.05, so it can be stated that, in the short term, there is a significant influence between the independent variables, including the amount of money in circulation (jub), inflation, and exports, on the dependent variable, namely the rupiah exchange rate.

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CONCLUSION AND SUGGESTIONS

Conclusion

Inflation affects the rupiah exchange rate. Based on long-term and short-term tests, it is evident that inflation has a significant positive impact on the rupiah exchange rate. The money supply does not affect the rupiah exchange rate. Based on long-term and short-term tests, the money supply variable has a positive effect on the rupiah exchange rate, but this effect is not statistically significant. Exports affect the rupiah exchange rate. Based on long-term and short-term tests, it shows that the export variable has a significant positive effect on the rupiah exchange rate.

Inflation and exports have a long-term and short-term effect on the rupiah exchange rate. When inflation and exports increase, the rupiah exchange rate will appreciate. Meanwhile, the JUB variable does not affect the dependent variable, the rupiah exchange rate, in either the long term or the short term. This contradicts the hypothesis, as when the money supply increases, the rupiah exchange rate depreciates.

Suggestion

The government can improve monetary policy by controlling the money supply (M2) to maintain stable inflation. It can also boost exports by improving product quality, thereby reducing imports and stabilizing the rupiah exchange rate. Further research on similar topics can utilize variables. The more data used, the better the results, and the broader the understanding.

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