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THE EFFECT OF EXCHANGE RATES AND INFLATION ON THE MONEY SUPPLY IN INDONESIA: AN AUTOREGRESSIVE DISTRIBUTED LAG (ARDL) APPROACH

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Abstract

This study aims to analyze the effects of inflation and exchange rates on the money supply in Indonesia and to identify the short-term and long-term relationships among these variables. A country's economic stability is inextricably linked to the dynamics of inflation, exchange rates, and the money supply, which are interrelated within the economic system. This study employs a quantitative approach using secondary data obtained from Bank Indonesia and the Central Statistics Agency (BPS) for the period 2020-2024. The analysis method used is the Autoregressive Distributed Lag (ARDL) model, as it is capable of estimating both short-term and long-term relationships simultaneously within a single model. The results indicate a long-term relationship among inflation, exchange rates, and the money supply. Partially, the exchange rate has a positive and significant effect on the money supply in Indonesia. This suggests that changes in the exchange rate particularly when the rupiah depreciates can drive increased liquidity in the economy through monetary policy mechanisms and international trade activities. Meanwhile, inflation does not have a significant effect on the money supply in the short term. This indicates that changes in inflation during the study period did not directly influence money supply policy due to the inflation control policies implemented by Bank Indonesia. Thus, exchange rate stability is a critical factor that must be considered in maintaining monetary equilibrium and national economic stability.

Keywords: Exchange Rate, Inflation, Money Supply, Monetary Policy, ARDL

INTRODUCTION

Economic stability is one of the key prerequisites for sustainable economic growth. In macroeconomic analysis, economic stability is generally influenced by several key indicators, namely the inflation rate, the exchange rate, and the money supply. Controlled inflation reflects price stability for goods and services, thereby maintaining the public's purchasing power (Kaftan et al., 2023). A stable exchange rate also plays a crucial role in maintaining the balance of the international trade sector and investor confidence. Meanwhile, the money supply must be managed appropriately to avoid causing inflationary pressure or an economic slowdown(Fadilah et al., 2023). These three indicators are interrelated and serve as benchmarks for assessing a country's economic stability.

In the context of monetary policy in Indonesia, monetary stability is the primary objective pursued by Bank Indonesia as the monetary authority (Hudaya & Firmansyah, 2023).Through various monetary policy instruments, such as interest rate control, open market operations, and banking liquidity management, Bank Indonesia strives to maintain the stability of the rupiah's value both against goods and services (inflation) and against other countries' currencies (exchange rate) (Hendra Permana, 2022). These efforts to maintain monetary stability are crucial for fostering a healthy financial system, enhancing market confidence, and supporting overall economic stability. Thus, Bank Indonesia's role in managing monetary policy is highly strategic in maintaining the balance of the national economy (Agung & Juhro, 2016).

Money supply is one of the key indicators reflecting the level of liquidity in an economy. This liquidity indicates the availability of funds that can be utilized by the public and businesses to conduct various economic transactions. The larger the amount of money circulating in the economy, the greater the public's ability to make payments, purchase goods and services, and meet other economic needs (Ulfa & Fisabilillah, 2023). Thus, money supply functions not only as a medium of exchange but also as a reflection of the dynamics of economic activity

taking place within a country. Changes in the money supply also have a significant impact on various aspects of economic activity, such as consumption, investment, and production (Department of Accountancy, Cross River University of Technology, Calab When the money supply increases, the public's purchasing power tends to rise, thereby boosting household consumption (Panjaitan, 2025). Additionally, greater liquidity availability can encourage the business sector to increase investment as access to financing becomes easier. Conversely, if the money supply decreases, the public's ability to spend and invest may decline, which could ultimately slow down overall economic activity (Herlina et al., 2023). Therefore, managing the money supply is a key instrument in monetary policy to maintain economic stability and growth.

Inflation is an economic phenomenon characterized by a general and sustained rise in the prices of goods and services over a specific period. This price increase does not occur in just one or two commodities, but extends to most goods and services consumed by the public, thereby reducing people's purchasing power for essential economic needs. Consequently, inflation is often used as a key indicator in assessing a country's economic stability.

Table 1. Monthly Inflation in Indonesia, 2020–2024 (% YoY)

Month	2020	2021	2022	2023	2024
January	2.82	1.55	2.18	5.28	2.57
February	2.57	1.38	2.06	5.47	2.75
March	2.48	1.37	2.64	4.97	3.05
April	2.83	1.42	3.47	4.33	3.00
May	3.32	1.68	3.55	4.00	2.84
June	3.28	1.33	4.35	3.52	2.51
July	3.32	1.52	4.94	3.08	2.13
August	3.49	1.59	4.69	3.27	2.12
September	3.39	1.60	5.95	2.28	1.84
October	3.13	1.66	5.71	2.56	1.71
November	3.00	1.75	5.42	2.86	1.55
December	2.72	1.87	5.51	2.61	1.57

Source: Bank Indonesia

In the context of macroeconomic policy, inflation is closely linked to liquidity management and monetary policy implemented by monetary authorities, such as central banks. High inflation rates are generally driven by an excessive money supply in the economy, necessitating appropriate monetary policies to manage that liquidity. Through policy instruments such as interest rate setting, open market operations, and the regulation of minimum reserve requirements, central banks strive to maintain price stability so that inflation remains at a controlled level and does not disrupt sustainable economic growth (Rasyidin et al., 2022).

Exchange rate fluctuations have a significant impact on price stability and the dynamics of an open economy. In an economy integrated with international trade, changes in exchange rates affect the prices of imported and exported goods. When the exchange rate weakens, the prices of imported goods tend to rise, potentially driving up production costs for sectors reliant on imported raw materials. This situation can ultimately lead to higher prices for goods and services domestically. Conversely, a strengthening exchange rate can lower the prices of imported goods but may also reduce the competitiveness of exports. Therefore, exchange rate stability is a critical factor in maintaining price equilibrium and economic stability in countries with open economies.

Table 2. Rupiah Exchange Rate 2020–2024

Month	2020	2021	2022	2023	2024
January	13.662	14.061	14.335	15.295	15.610
February	13.726	14.042	14.351	15.126	15.665
March	15.867	14.417	14.348	15.300	15.702
April	15.157	14.558	14.368	14.866	16.100
May	14.733	14.287	14.558	14.930	16.245
June	14.256	14.338	14.688	14.932	16.282
July	14.568	14.511	14.984	15.039	16.262
August	14.659	14.270	14.829	15.325	16.145
September	14.840	14.215	15.227	15.455	15.998
October	14.676	14.145	15.495	15.733	15.917
November	14.118	14.331	15.638	15.527	15.859
December	14.105	14.269	15.592	15.397	16.000

Source: Bank Indonesia

In addition, exchange rate fluctuations can also trigger inflationary pressures and influence the direction of monetary policy adopted by financial authorities. Exchange rate depreciation often leads to imported inflation that is, price increases stemming from rising prices of imported goods. To mitigate these effects, central banks typically respond with specific monetary policies, such as interest rate adjustments or interventions in the foreign exchange market to maintain exchange rate stability. Thus, exchange rate movements not only impact the international trade sector but also serve as a key indicator considered in the formulation of monetary policy to maintain price stability and economic growth.

Inflation and exchange rates are two macroeconomic indicators that frequently undergo fluctuations over time. In recent years, Indonesia's inflation rate has shown fluctuating trends, influenced by various factors such as changes in global commodity prices, monetary policy, and domestic economic conditions. Similarly, the rupiah's exchange rate against foreign currencies tends to fluctuate in line with global economic developments, international capital flows, and domestic economic stability. Fluctuations in these two variables indicate an evolving economic dynamic and are a key consideration in the formulation of economic policy (Putri et al., 2023).

On the other hand, the money supply in Indonesia has shown a rising trend year over year. This increase aligns with economic activity growth, public liquidity needs, and monetary policies implemented by financial authorities to maintain stability and foster economic growth. The increase in the money supply also reflects rising economic transactions in society, whether in the consumption, investment, or trade sectors (Uang et al., 2024). Therefore, managing the money supply is crucial to ensure it remains at a balanced level, thereby preventing excessive inflationary pressure in the economy.

Table 3. Money Supply (M2) Trend 2020-2024

Tahun	M2 (Triliun Rp)
2020	6.900
2021	7.867
2022	8.528
2023	8.824,7
2024	9.210,8

Source: Bank Indonesia

Most previous research in macroeconomics tends to view the money supply as a cause of inflation, emphasizing that an increase in the money supply will drive up price levels in the economy. This approach suggests that inflation is a variable influenced by monetary dynamics, particularly changes in the money supply. However, research examining this relationship from a different perspective remains relatively limited specifically, by treating inflation and the exchange rate as variables that simultaneously influence the money supply. Yet, in the context of an open economy and global market dynamics, fluctuations in inflation and exchange rate movements have the potential to exert pressure on monetary policy, which ultimately affects the money supply. Therefore, research is needed to analyze the simultaneous effects of inflation and exchange rates on the money supply to provide a more comprehensive understanding of the reciprocal relationship between these macroeconomic variables.

This study aims to analyze the effect of inflation on the money supply, analyze the effect of the exchange rate on the money supply, and analyze the short-term and long-term relationships among the variables. This study uses the ARDL method, which aims to analyze short-term and long-term relationships simultaneously within a single estimation model. Through this approach, researchers can identify the adjustment dynamics of variables in the short term while also observing the long-term equilibrium relationships among the variables under study (Aprilia et al., 2024). Thus, the ARDL model not only provides an overview of the direct effects occurring within a specific time period but also explains how these variables move toward long-term equilibrium.

LITERATURE REVIEW

There are three points discussed in this literature review, namely basic theory, previous studies, and hypotheses developed from prior research. This section explains the theoretical foundation regarding the influence of exchange rates and inflation on money supply, supported by empirical findings and leading to the formulation of research hypotheses (Herlina et al., 2023).

The traditional society

In macroeconomic analysis, money supply (JUB) is a fundamental indicator reflecting liquidity conditions in an economy. According to the Quantity Theory of Money by Irving Fisher, the relationship between money supply, velocity, price level, and output is expressed in the equation MV = PT, implying that an increase in money supply without proportional output growth leads to inflation. This is reinforced by Milton Friedman's monetarist view that inflation is primarily a monetary phenomenon caused by excessive money supply growth (Putri et al., 2023).

Inflation itself represents a sustained increase in the general price level and plays a critical role in macroeconomic stability. Rising inflation often reflects excess aggregate demand driven by increased liquidity. Consequently, central banks respond through monetary policy instruments to maintain price stability and purchasing power(Ponziani, 2023).

On the external side, the exchange rate is a key variable in an open economy such as Indonesia. It reflects the relative value of domestic currency against foreign currencies and is influenced by interest rates, inflation, and capital flows. Exchange rate depreciation can increase domestic liquidity through foreign exchange interventions and balance of payments adjustments, thereby affecting money supply.

The central bank, particularly Bank Indonesia, plays a strategic role in controlling money supply through monetary instruments such as policy interest rates, open market operations, and reserve

requirements. Effective monetary policy influences inflation, exchange rates, and overall economic stability. To capture the dynamic relationship among variables, the Autoregressive Distributed Lag (ARDL) model is widely used. This method allows simultaneous estimation of short-run and long-run relationships and accommodates variables with different integration orders (I(0) and I(1)). Therefore, ARDL is appropriate for analyzing the interaction between exchange rate, inflation, and money supply.

Previous Study and Hypothesis

Previous studies indicate that monetary policy plays a crucial role in controlling money supply and stabilizing the economy. Empirical findings show that effective policy instruments can regulate liquidity and maintain inflation stability (Uang et al., 2024). From the inflation perspective, several studies consistently find that inflation has a significant effect on money supply. Higher inflation is often associated with expansionary monetary responses, leading to increased liquidity. This indicates a bidirectional relationship where money supply and inflation mutually influence each other (Parulian & Utami, 2024). Regarding exchange rates, empirical evidence suggests that exchange rate fluctuations significantly affect money supply. Currency depreciation tends to increase domestic liquidity through external sector adjustments and central bank interventions. Additionally, studies reveal causal relationships between exchange rates, inflation, and economic growth, highlighting their interconnected dynamics (Aprilia et al., 2024).

Further research also shows that money supply influences other macroeconomic variables such as interest rates, investment, and economic growth. This confirms the importance of monetary transmission mechanisms, where changes in money supply act as a key channel affecting overall economic performance (Anggraeni & Dwiputri, 2022). Methodologically, prior studies highlight that the ARDL approach is effective in capturing both short-term adjustments and long-term equilibrium relationships among macroeconomic variables. This strengthens its relevance for analyzing the interaction between exchange rates, inflation, and money supply (Hendra Permana, 2022; Ponziani, 2023).

Based on previous studies and empirical data, the Research Gap of this Research, although previous studies confirm the significance of inflation and exchange rate on money supply, most analyses:

1. do not simultaneously emphasize short-run and long-run dynamics in the Indonesian context,
2. lack integration between internal (inflation) and external (exchange rate) shocks within a unified framework,
3. and have limited focus on recent macroeconomic volatility.

METHOD

This study employs a quantitative approach with the primary objective of identifying, measuring, and empirically analyzing the impact of several macroeconomic variables on the money supply in Indonesia during the period from 2020 to 2024. The independent variables analyzed in this study include the exchange rate and inflation. The data used in this study consists of secondary data collected from various official and credible sources, including Bank Indonesia, the Central Statistics Agency (BPS), and other relevant financial institutions. The use of this secondary data aims to obtain accurate and scientifically accountable historical information to support the validity of the research results. The time range of the analyzed data covers a period of more than three years, namely from 2020 to 2024, so it is expected to provide a comprehensive picture of inflation dynamics and the factors influencing them in the long term in Indonesia.

This study applies an econometric method using the Auto Regressive Distributed Lag (ARDL) approach, which is a combination of two main models: the Auto Regressive (AR) model and the Distributed Lag (DL) model. The AR model refers to a regression model that utilizes one or more past values (lags) of the dependent variable in its estimation process, while the DL model uses current and past values of the independent variables to predict the dependent variable (Ponziani, 2023). Furthermore, this model is capable of producing estimates for both the short and long term simultaneously and has the ability to reduce the risk of autocorrelation in the regression model. In general, the form of the ARDL model used in this study can be expressed in the following econometric equation:

$$JUB_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i JUB_{t-i} + \sum_{j=0}^{q} \beta_j INF_{t-j} + \sum_{k=0}^{r} \gamma_k ER_{t-k} + \varepsilon_t$$

Notes:
JUB_t = Money Supply Amount
INF_t = Inflation

ER_t = exchange rate
p, q, r = lag length of each variable

Prior to estimating the ARDL model, several econometric procedures were conducted to ensure the validity and reliability of the model. The first step involved performing a stationarity test using the Augmented Dickey-Fuller (ADF) unit root test to identify the order of integration of each variable and to ensure that none of the variables were integrated at the second difference I(2), since the ARDL approach can only be applied to variables integrated at level I(0) or first difference I(1). After confirming the stationarity of the variables, the optimal lag length was determined using the Akaike Information Criterion (AIC) to obtain the most appropriate model specification. Furthermore, the Bounds Test approach was employed to examine the existence of a long-run cointegration relationship among the variables. If cointegration was confirmed, the Error Correction Model (ECM) representation of the ARDL model was estimated to analyze both short-run dynamics and long-run equilibrium relationships simultaneously. In addition, several diagnostic tests, including normality, heteroscedasticity, and autocorrelation tests, were conducted to ensure that the estimated model fulfilled the classical assumption requirements and produced robust estimation results.

RESULTS AND DISCUSSION

Descriptive Statistics

Table 4. Descriptive Statistics of Research Variables

Variable	Mean	Median	Maximum	Minimum	Std. Dev.
LOGY (Money Supply)	15.8643	15.8816	16.0398	15.6152	0.1196
LOGX1 (Exchange Rate)	9.6135	9.6078	9.7035	9.5219	0.0460
X2 (Inflation)	2.8287	2.6750	6.0000	1.0000	1.3190

Source: Processed Data using EViews 12

Table 4 presents the descriptive statistics of the variables used in this study during the 2020–2024 period. The results indicate that the average value of the money supply variable (LOGY) was 15.8643, with a maximum value of 16.0398 and a minimum value of 15.6152, reflecting a relatively increasing trend in money supply throughout the observation period. Meanwhile, the exchange rate variable (LOGX1) had an average value of 9.6135 with a relatively low standard deviation of 0.0460, indicating that exchange rate fluctuations during the study period were relatively stable despite experiencing several periods of depreciation. The inflation variable (X2) recorded an average value of 2.8287 with a standard deviation of 1.3190, indicating that inflation experienced moderate fluctuations during the observation period. Overall, the descriptive statistics show that all variables exhibit sufficient variation and are suitable for further econometric analysis using the ARDL approach.

Unit Root Test (Stationarity Test)

Before estimating the ARDL model, a stationarity test was conducted to determine the integration order of each variable and to ensure that no variable was integrated at the second difference I(2). The Augmented Dickey-Fuller (ADF) unit root test was employed for this purpose. In the ARDL approach, variables may be integrated at level I(0) or first difference I(1), but not at the second difference I(2). Therefore, testing stationarity is an essential prerequisite before proceeding to the ARDL estimation.

Table 5. Augmented Dickey-Fuller (ADF) Unit Root Test Results

Variable	ADF Statistic	Prob.	Integration Order
D(LOGY)	-10.99087	0.0000	I(1)
D(LOGX1)	-8.181233	0.0000	I(1)
D(X2)	-10.04196	0.0000	I(1)

Source: Processed Data using EViews 12

Based on Table 5, the results of the Augmented Dickey-Fuller (ADF) test indicate that all variables become stationary at the first difference level, as evidenced by probability values below the 5% significance level. The money supply variable (LOGY) has an ADF statistic value of -10.99087 with a probability value of 0.0000, while the exchange rate variable (LOGX1) records an ADF statistic of -8.181233 and the inflation variable (X2) records -10.04196, both with probability values of 0.0000. These findings confirm that all variables are integrated of order

one I(1). Since none of the variables are integrated at the second difference I(2), the ARDL approach is appropriate and can be applied for further analysis of the short-run and long-run relationships among the variables in this study.

Optimal Lag Selection

Determining the optimal lag length is an important step in the ARDL approach because the accuracy of the model estimation depends on the selected lag structure. An inappropriate lag length may lead to biased estimation results, autocorrelation problems, or the loss of important dynamic information among variables. In this study, the optimal lag selection was determined using the Akaike Information Criterion (AIC), where the model with the lowest AIC value is considered the best specification.

Based on the Akaike Information Criterion (AIC) results, the ARDL (1,0,0) model was selected as the optimal model specification because it produced the lowest AIC value among the alternative lag structures evaluated. The selected model indicates that the dependent variable, namely money supply (LOGY), uses one lag, while the exchange rate (LOGX1) and inflation (X2) variables do not require additional lag structures in the final model estimation. The selection of the ARDL (1,0,0) model suggests that the current movement of the money supply is influenced by its previous period value, while the exchange rate and inflation variables exert their effects contemporaneously within the observed period. Therefore, the ARDL (1,0,0) model is considered the most efficient and statistically appropriate specification for analyzing the relationship between exchange rates, inflation, and money supply in Indonesia.

ARDL Bounds Cointegration Test

After determining the optimal lag structure, the next step in the ARDL approach is conducting the Bounds Test for cointegration to examine whether a long-run equilibrium relationship exists among the variables. The Bounds Test compares the calculated F-statistic with the lower bound I(0) and upper bound I(1) critical values. If the F-statistic exceeds the upper bound critical value, the null hypothesis of no cointegration is rejected, indicating the existence of a long-run relationship among the variables.

Figure 1. Akaike Information Criterion (AIC) for ARDL Model Selection

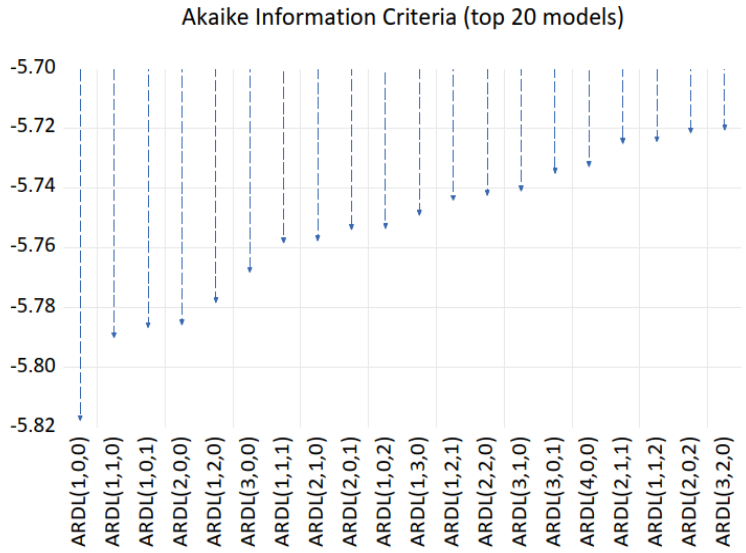

Table 6. ARDL Bounds Test for Cointegration

Test Statistic		Value
F-statistic		39.294691
Significance Level	**I(0) Bound**	**I(1) Bound**
10%	2.738	3.465
5%	3.288	4.070
1%	4.558	5.590

Source: Processed Data using EViews 12

Based on Table 6, the ARDL Bounds Test results show that the F-statistic value of 39.294691 is substantially higher than the upper bound critical value I(1) at the 1% significance level, which is 5.590. Therefore, the null hypothesis of no long-run relationship is rejected. These findings indicate that exchange rates, inflation, and money supply are cointegrated and have a long-run equilibrium relationship in Indonesia during the 2020–2024 period. This result implies that changes in exchange rates and inflation are associated with long-term adjustments in the money supply. In other words, although fluctuations may occur in the short term, the variables tend to move together toward equilibrium over time. The existence of cointegration also confirms that the ARDL model estimation can be continued to analyze both long-run and short-run dynamics among the variables.

Long-Run Estimation

After confirming the existence of cointegration among the variables through the ARDL Bounds Test, the next step is estimating the long-run coefficients to identify the long-term relationship between exchange rates, inflation, and money supply in Indonesia. The long-run estimation explains how changes in the independent variables affect the dependent variable over time when the economy moves toward equilibrium.

Table 7. Long-Run Coefficients of the ARDL Model

Variable	Coefficient	Std. Error	t-Statistic	Probability
LOGX1	0.172860	0.053432	3.235109	0.0021
X2	0.001158	0.002391	0.484304	0.6301
C	0.006781	0.001327	5.111941	0.0000

Source: Processed Data using EViews 12

Based on Table 7, the exchange rate variable (LOGX1) has a positive and statistically significant effect on the money supply in the long run, as indicated by a coefficient value of 0.172860 and a probability value of 0.0021, which is smaller than the 5% significance level. This finding indicates that an increase in the exchange rate, particularly depreciation of the rupiah against foreign currencies, tends to increase the money supply in Indonesia over the long term. Exchange rate depreciation may encourage monetary authorities to increase liquidity through monetary policy adjustments and foreign exchange market interventions to maintain economic stability.

Meanwhile, the inflation variable (X2) has a coefficient value of 0.001158 with a probability value of 0.6301, indicating that inflation does not have a statistically significant effect on the money supply in the long run. This result suggests that inflation fluctuations during the observation period were relatively manageable and did not directly alter money supply policy significantly. The implementation of inflation-targeting policies by Bank Indonesia may have contributed to maintaining inflation stability, thereby weakening the direct long-run relationship between inflation and the money supply. Overall, the long-run estimation results indicate that exchange rate dynamics play a more dominant role than inflation in influencing the money supply in Indonesia. These findings highlight the importance of maintaining exchange rate stability as part of monetary policy to support long-term economic stability and liquidity management.

Error Correction Model (ECM)

The Error Correction Model (ECM) is estimated to analyze the short-run adjustment process toward long-run equilibrium after cointegration among variables has been confirmed. The ECM approach is important in the ARDL framework because it explains how quickly disequilibrium in the short term can be corrected to return to

long-run equilibrium conditions. The key indicator in the ECM estimation is the Error Correction Term (ECT), where a negative and significant coefficient indicates the existence of a stable adjustment mechanism.

Table 8. Error Correction Model (ECM) Estimation

Variable	Coefficient	Std. Error	t-Statistic	Probability
D(LOGX1)	0.172860	0.053432	3.235109	0.0021
D(X2)	0.001158	0.002391	0.484304	0.6301
C	0.006781	0.001327	5.111941	0.0000

Source: Processed Data using EViews 12

Based on Table 8, the short-run estimation results indicate that the exchange rate variable continues to have a positive and significant effect on the money supply in Indonesia in the short term. The coefficient value of 0.172860 with a probability value of 0.0021 indicates that exchange rate depreciation tends to increase liquidity and money circulation within the economy. This result confirms that exchange rate movements are an important determinant affecting monetary conditions in Indonesia. Meanwhile, the inflation variable does not show a statistically significant effect on the money supply in the short run, as indicated by the probability value of 0.6301, which is greater than the 5% significance level. This finding suggests that inflation fluctuations during the observation period did not directly influence short-term money supply adjustments. The relatively stable inflation conditions and the implementation of inflation-targeting policies by Bank Indonesia may explain why inflation did not significantly affect money supply dynamics during the study period. Overall, the ECM estimation confirms that exchange rate dynamics have a stronger influence on money supply adjustment than inflation, both in the short run and in the process of achieving long-run equilibrium. These findings indicate that maintaining exchange rate stability is essential for supporting monetary stability and controlling liquidity in the Indonesian economy.

Short-Run Dynamics Estimation

After estimating the Error Correction Model (ECM), the short-run dynamics of the ARDL model were analyzed to examine the immediate effects of exchange rates and inflation on the money supply in Indonesia. The short-run estimation explains how changes in the independent variables influence the dependent variable within the current period before the economy reaches long-run equilibrium.

Table 9. Short-Run ARDL Estimation Results

Variable	Coefficient	Std. Error	t-Statistic	Probability
D(LOGY(-1))	-0.312214	0.115123	-2.712005	0.0090
D(LOGX1)	0.226829	0.064422	3.520970	0.0009
D(X2)	0.001520	0.003143	0.483552	0.6307
C	0.008898	0.001932	4.605478	0.0000

Model Statistics	Value
R-squared	0.301223
Adjusted R-squared	0.262402
F-statistic	7.759292
Prob(F-statistic)	0.000213
Durbin-Watson Stat	1.849960

Source: Processed Data using EViews 12

Based on Table 9, the exchange rate variable (D(LOGX1)) has a positive and statistically significant effect on the money supply in the short run. The coefficient value of 0.226829 with a probability value of 0.0009 indicates that an increase in the exchange rate contributes to an increase in the money supply in Indonesia. This finding suggests that depreciation of the rupiah tends to encourage higher liquidity within the economy through monetary policy responses, foreign exchange market interventions, and international trade activities. Meanwhile, the inflation variable (D(X2)) has a coefficient value of 0.001520 with a probability value of 0.6307, indicating that inflation does not have a statistically significant effect on the money supply in the short run. This result implies that inflation fluctuations during the observation period were relatively controlled and did not directly affect money supply adjustments implemented by monetary authorities. The inflation-targeting framework implemented by Bank Indonesia may have contributed to stabilizing inflation without requiring substantial changes in liquidity policy.

The lagged dependent variable D(LOGY(-1)) has a negative and significant coefficient of -0.312214, indicating that previous period disequilibrium affects current money supply adjustments. This finding reflects the existence of dynamic adjustment mechanisms within the Indonesian monetary system. Furthermore, the R-squared value of 0.301223 indicates that approximately 30.12% of the variation in the money supply can be explained by exchange rates and inflation, while the remaining variation is influenced by other variables outside the model. The significant F-statistic probability value confirms that the model is jointly significant and appropriate for explaining the short-run dynamics of the money supply in Indonesia.

Diagnostic and Stability Tests

Diagnostic and stability tests were conducted to evaluate whether the estimated ARDL model satisfies the classical assumption requirements and produces reliable estimation results. These tests include the normality test, autocorrelation test, heteroscedasticity test, and stability tests using the CUSUM and CUSUMSQ approaches.

Table 10. Normality Test Result

Indicator	Value
Jarque-Bera Statistic	1.425927
Probability	0.490189

Source: Processed Data using EViews 12

Based on Table 10, the Jarque-Bera probability value is 0.490189, which is greater than the 5% significance level. Therefore, the residuals of the ARDL model are normally distributed. This finding indicates that the model fulfills the normality assumption and that the residual distribution does not exhibit serious deviations from normality.

Table 11. Autocorrelation Test Result

Indicator	Value
Prob. F (2,52)	0.5997
Prob. Chi-Square (2)	0.5685

Source: Processed Data using EViews 12

The Breusch-Godfrey Serial Correlation LM Test results show that the probability values of Prob. F and Prob. Chi-Square are greater than 0.05. Therefore, the null hypothesis of no serial correlation cannot be rejected, indicating that the estimated ARDL model is free from autocorrelation problems. This result confirms that the residuals are independent across time and that the model estimation is statistically reliable.

Table 12. Heteroscedasticity Test Result

Indicator	Value
Prob. F(3,54)	0.8411
Prob. Chi-Square(3)	0.8298

Source: Processed Data using EViews 12

Based on the Breusch-Pagan-Godfrey heteroscedasticity test, the probability values are greater than the 5% significance level. Thus, the null hypothesis of homoskedasticity cannot be rejected, indicating that the residual variance is constant. This finding shows that the model does not suffer from heteroscedasticity problems and that the estimated coefficients are efficient and unbiased.

The stability test results using the CUSUM and CUSUMSQ approaches indicate that the plots remain within the 5% critical bounds throughout the observation period. These findings confirm that the estimated ARDL model is structurally stable and does not experience significant parameter instability during the 2020–2024 period. Therefore, the model is considered robust and suitable for analyzing the relationship between exchange rates, inflation, and money supply in Indonesia.

Discussion

Exchange Rate and Money Supply

The empirical results indicate that the exchange rate has a positive and statistically significant effect on the money supply in Indonesia, both in the short run and the long run. This finding implies that depreciation of the rupiah tends to increase the amount of money circulating in the economy. Economically, this condition occurs because exchange rate depreciation increases the cost of imports, external debt obligations, and foreign exchange demand, thereby encouraging monetary authorities to maintain liquidity stability through monetary expansion and exchange market intervention policies. In a small open economy such as Indonesia, exchange rate volatility directly affects domestic monetary conditions because the Indonesian economy remains highly dependent on imported raw

Figure 3. CUSUM Stability Test

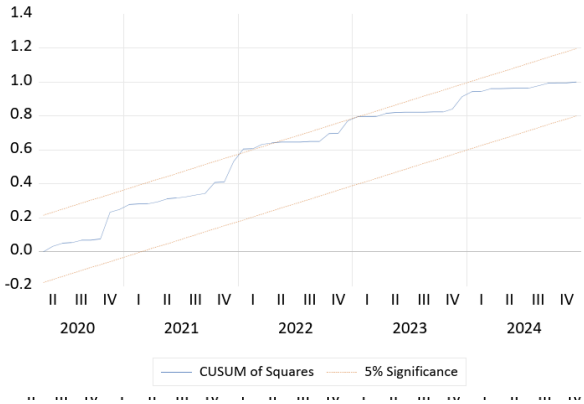

Figure 2. CUSUMSQ Stability Test

materials, global trade, and foreign capital flows.

This result strongly reflects the monetary conditions experienced by Indonesia during the 2020–2024 period. During the post-pandemic recovery phase, global uncertainty, tightening monetary policy by the United States Federal Reserve, and fluctuations in commodity prices placed considerable pressure on the rupiah exchange rate. Under these circumstances, Bank Indonesia prioritized exchange rate stabilization policies while maintaining domestic liquidity to prevent excessive economic contraction. According to the Monetary Policy Report - Quarter III 2024 by Bank Indonesia, Bank Indonesia maintained monetary intervention and liquidity management policies to stabilize the rupiah amid global uncertainty. This condition explains why exchange rate movements became more dominant in influencing money supply dynamics than inflation during the observation period. (Bank Indonesia, 2024)

The findings of this study are consistent with research conducted bySyamad and Handoyo, (2023), which explains that exchange rate depreciation significantly affects monetary adjustments and liquidity expansion in Indonesia through the monetary transmission mechanism. Likewise, research published in Sajidah et al., (2026)found that exchange rates have an important relationship with monetary variables in Indonesia in both short-run and long-run equilibrium models. Critically, the significant influence of exchange rates on money supply indicates that Indonesia's monetary structure remains highly vulnerable to external sector disturbances. This finding suggests that monetary stability in Indonesia is increasingly determined by global financial conditions rather than solely domestic macroeconomic fundamentals. In other words, exchange rate instability can rapidly transmit into domestic liquidity pressures, especially in periods of capital outflow and rising global interest rates. This condition reveals that Indonesia still faces structural dependence on foreign exchange stability and imported economic activity.

Consequently, monetary policy cannot rely exclusively on inflation control instruments but must simultaneously prioritize exchange rate stabilization to maintain monetary equilibrium and financial system stability.

Inflation and Money Supply

The empirical results further show that inflation has a positive but statistically insignificant effect on the money supply in both the short run and the long run. This finding indicates that inflation fluctuations during the 2020–2024 period did not significantly influence monetary expansion in Indonesia. Economically, this condition suggests that inflation in Indonesia during the observation period was not primarily driven by excessive growth in the money supply, but rather by supply-side disturbances, food price volatility, energy price adjustments, and global external shocks following the COVID-19 pandemic. This result contradicts classical monetarist theory proposed by Milton Friedman, which argues that inflation is fundamentally a monetary phenomenon caused by excessive money supply growth. However, the Indonesian case during 2020–2024 demonstrates different dynamics. Inflation remained relatively controlled despite fluctuations in global commodity prices and exchange rates. According to the Monetary Policy Report - Quarter III 2024 by Bank Indonesia, inflation in Indonesia was maintained within the target corridor of 2.5 ±1% through inflation-targeting policies, exchange rate stabilization, and macroprudential coordination. Bank Indonesia, (2024)This explains why inflation did not exert a statistically significant effect on the money supply in the ARDL estimation.

The findings are also consistent with research published in Fitrianti & Rachmawati, (2024), which found that money supply does not always significantly affect inflation in Indonesia because inflation dynamics are increasingly influenced by non-monetary factors such as consumption patterns, food supply, and administered prices. Fitrianti & Rachmawati, (2024) Likewise, Faulina et al., (2024) research from concluded that exchange rate effects tend to dominate inflation dynamics, while monetary aggregate effects become weaker in the long run. Critically, the insignificant relationship between inflation and money supply reveals an important structural transformation in Indonesia's monetary transmission mechanism. The implementation of inflation targeting by Bank Indonesia has reduced the direct dependence between inflation and monetary aggregates. Modern monetary management increasingly relies on interest rate policy, market expectations, exchange rate stabilization, and macroprudential instruments rather than pure money supply control. This finding indicates that monetary aggregate targeting is becoming less effective as a primary policy instrument in Indonesia. Therefore, controlling inflation in the current Indonesian economy requires broader policy coordination involving exchange rate stabilization, food supply management, fiscal intervention, and financial market credibility rather than relying solely on monetary expansion or contraction policies.

CONCLUSION

Based on the results of the above study using the Autoregressive Distributed Lag (ARDL) approach for the 2020–2024 period, it can be concluded that the exchange rate and inflation variables have different effects on the dynamics of the money supply in Indonesia. The cointegration test results indicate that there is a long-term relationship between the inflation, exchange rate, and money supply variables, meaning that changes in these variables over the long term will mutually influence one another within the economic system. Partially, the exchange rate is proven to have a positive and significant influence on the money supply in Indonesia. This indicates that changes in the exchange rate, particularly when the rupiah depreciates against foreign currencies, can drive an increase in the money supply through monetary policy mechanisms, international trade activities, and changes in capital flows within the economy. Thus, exchange rate stability is a critical factor that monetary authorities must maintain, as it can influence liquidity and monetary dynamics in the economy.

Meanwhile, the inflation variable in this study did not show a significant effect on the money supply in the short term. This indicates that changes in the inflation rate during the study period have not directly influenced changes in the money supply. This may be due to the relatively stable inflation rate throughout the study period, as well as the inflation control policies implemented by Bank Indonesia through an inflation-targeting framework, allowing inflation fluctuations to be managed without the need to significantly alter the money supply directly. Overall, this study shows that exchange rate dynamics play a more dominant role than inflation in influencing the money supply in Indonesia during the study period. Therefore, appropriate monetary policy coordination, particularly in maintaining exchange rate stability and managing liquidity, is crucial for supporting economic stability and maintaining the balance of the national financial system.

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