

## Factors Affecting the Exchange Rate of the Indonesian Rupiah Against the United States Dollar: January 2013 - December 2023

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### ABSTRACT

This study examines factors affecting the Rupiah-US Dollar exchange rate from Jan 2013 to Dec 2023. Using monthly data from Bank Indonesia and Investing.com, the researchers apply the Autoregressive Distributed Lag (ARDL) model to capture both short and long run dynamics among inflation, money supply (M2), the BI Rate, and world crude oil prices (WTI). Findings indicate that higher inflation leads to Rupiah appreciation, whereas increases in money supply and the BI Rate cause depreciation in both horizons; WTI prices have a significant negative effect only in the short term. These results underscore the need for balanced monetary policy controlling inflation and managing liquidity and diversified foreign-exchange sources to uphold Rupiah stability amid shocks and inform targeted policy decisions.

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## INTRODUCTION

Monetary policy aims to maintain macroeconomic stability and control inflation through instruments such as the money supply, interest rates, exchange rates, and expectation (Hutomo & Faridatussalam, 2023). Interest rates influence investment and production, while the exchange rate determines the prices of inputs, export-import goods, and national competitiveness (Irawan et al., 2023). Under a floating exchange rate regime, the stability of the rupiah is crucial for reflecting the effectiveness of monetary policy and affecting the allocation of economic resources (Adewuyi et al., 2021) The legal basis is provided by Law No. 4/2023, which stipulates that rupiah stability encompasses the stability of goods and services prices as well as the exchange rate (Kabundi & Mlachila, 2019).

However, in recent years the rupiah exchange rate has shown increasingly sharp volatility, with a depreciation of more than 4% to touch IDR 17,200/USD during the first quarter of 2025, triggering repeated interventions by Bank Indonesia to dampen market turmoil. The rupiah's low point of IDR 16,970/USD on April 9, 2025 set a record for the highest daily volatility in the last decade, especially as fears of trade war escalation and global liquidity tightening increased. These fluctuations create uncertainty for exporters and importers, especially the manufacturing and oil and gas industries, in production cost planning and forex risk management (Nugroho & Nasrudin, 2022). At the macro level, exchange rate uncertainty drives rapid domestic price adjustments, exacerbates inflationary pressures, and complicates the formulation of consistent fiscal and monetary policies (Marchella et al., 2024)

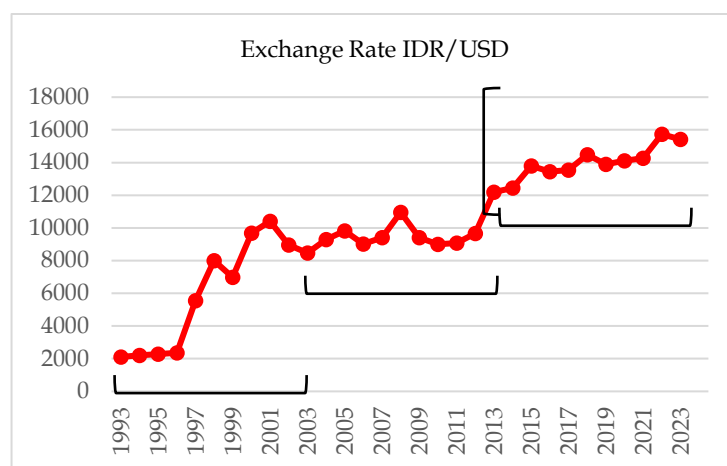


Figure 1. IDR/USD statistics 1993-2023

Source: Central Bank of Indonesia 2024 (data processed)

From 1993 to 2023, the rupiah has generally trended downward with episodes of sharp volatility triggered by global and domestic shocks. The 1997–1998 Asian financial crisis saw the exchange rate fall from around IDR 2,432/USD in July 1997 to IDR 16,800/USD a year later due to large external debt and limited reserves, sparking market panic and economic contraction (Sunardi et al., 2024). Maulidia et al. (2023) Said the 2008–2009 global financial crisis, driven by U.S. subprime mortgage defaults, weakened the rupiah from

about IDR 9,000/USD to over IDR 12,000/USD, though its impact was more contained thanks to lessons learned earlier. In 2013, the Fed's taper tantrum reductions in QE triggered capital outflows, forcing Bank Indonesia to raise its policy rate by 175 bps and pushing the rupiah from IDR 9,670/USD to IDR 12,180/USD (Ananda et al., 2024). The COVID-19 pandemic in 2020 again drove depreciation from IDR 14,413/USD on March 2 to IDR 16,741/USD on April 2 before briefly appreciating to IDR 13,956/USD on June 8 and weakening again to IDR 14,979/USD in September (Sunaryati & Munandar, 2023). Finally, according to Susetio et al. (2022) Russia's invasion of Ukraine in 2022 accelerated the increase in global commodity prices and added pressure on the rupiah, so that policy measures need to be taken to reduce exchange rate volatility.

In facing unavoidable exchange rate fluctuations, the government, through monetary authorities, has implemented strategies such as a flexible Inflation Targeting Framework (ITF), a managed floating exchange rate system, as well as interventions in the foreign exchange market and interest rate policies to maintain stability. These efforts aim to reduce volatility, preserve purchasing power, and strengthen domestic economic resilience (Lafarguette & Veyrune, 2021). Then Nugroho & Nasrudin (2022) said that exchange rate stability is crucial, as excessive fluctuations can create uncertainty, trigger crises, and burden the real sector including exports, imports, and GDP growth. In an open economy like Indonesia, a stable exchange rate also boosts investor confidence, enhances capital inflows, and supports domestic capital accumulation (Hassan et al., 2020). According to Dwi et al. (2023) given Indonesia's reliance on international trade and its position as a net commodity importer, the exchange rate is highly sensitive to global commodity prices. Therefore, maintaining exchange rate stability is vital to support export competitiveness and limit the pass-through effect on domestic inflation. If not properly managed, exchange rate volatility can worsen fiscal conditions, as seen in the Argentine Peso Crisis, which was marked by currency depreciation, capital flight, and a surge in import costs (Castillo-Ponce & Lai, 2020).

The topic of exchange rates has been widely researched for a long time. Various studies on the influence of monetary variables on exchange rates have been conducted and found some inconsistent results. Related to inflation, research by Chandrarin et al. (2022) states that inflation has a positive coefficient on the exchange rate, meaning that any increase in inflation will make the exchange rate depreciate, while the results of research by Widiyono et al. (2021) showed the opposite result. Furthermore, the effect of the money supply is also positive on the exchange rate (Funashima, 2020). However, research by Syamad & Handoyo (2023) showed the opposite result. Monetary policy instruments through an increase in interest rates result in exchange rate strengthening or appreciation (Harahap et al., 2024).

The results of Karimah & Laulita (2023) actually show conflicting results, where the increase in interest rates causes exchange rate depreciation. International trade factors through imports of West Texas Intermediate (WTI) world crude oil have also been studied by various previous studies. Meylani & Prasetyo (2023) showed that international crude oil prices have a negative impact

on the rupiah exchange rate. But research from Hattantyo et al. (2023) gave the opposite result. The findings of various research results indicate that the determinants of exchange rates, especially those related to the monetary sector and international trade, are important to discuss, considering that to intervene in exchange rate movements, the main tools used by the state will be realized through policies in the monetary sector and international competitiveness.

While many studies have explored the determinants of exchange rates, there are some gaps that need to be filled. First, the period of previous studies generally ends before the COVID-19 pandemic and thus has not incorporated the influence of recent global shocks such as the supply crisis, US monetary policy changes, and geopolitical conflicts. Second, few studies have simultaneously integrated macroeconomic variables (inflation, interest rates, money supply) and international trade variables (WTI prices, trade balance) in one comprehensive model framework. Third, studies on the differential short- and long-run effects of these variables on exchange rates are limited, although global literature suggests asymmetries in exchange rate pass-through. Therefore, this study aims to analyze the factors influencing the Rupiah-US Dollar exchange rate over the period of January 2013 to December 2023, as a basis for more targeted and effective monetary policy formulation.

## **LITERATURE REVIEW**

### ***Purchasing Power Parity Theory***

The Purchasing Power Parity (PPP) theory, introduced by Gustav Cassel in 1918, explains that exchange rates should reflect the relative price levels between countries based on the Law of One Price. It connects inflation differences with currency value, stating that a country experiencing higher inflation will see its currency depreciate to maintain purchasing power parity. There are two forms of PPP: absolute, which assumes no trade barriers, and relative, which accounts for market imperfections and suggests that exchange rate changes align with inflation differentials over time (Cassel, 1967; Madura, 2012).

### ***Liquidity Preference Theory***

The Liquidity Preference Theory, proposed by John Maynard Keynes (1936), explains that interest rates are determined by the supply and demand for money in the monetary market, challenging classical views that interest rates simply balance savings and investment. Keynes argued that household savings are driven more by income levels than by interest rate fluctuations. According to Sukirno (2015), Keynes identified three motives for holding money: the transaction motive (daily spending needs), the precautionary motive (saving for future uncertainties), and the speculative motive (holding cash for potential investment gains), with the first two increasing as income rises.

### ***Quantity Theory of Money***

The Quantity Theory of Money explains the proportional relationship between the money supply and the general price level in an economy. Initially introduced by Nicolaus Copernicus in 1517, the theory gained popularity through Milton Friedman and Anna Schwartz in *A Monetary History of the United*

*States, 1867–1960* (1963). They showed how changes in the money supply impact price stability and long-term economic activity (Friedman et al., 2022). According to this theory, doubling the money supply will also double the price level, assuming other factors remain constant, leading to higher inflation. This mechanism also applies to money: an increase in the money supply reduces purchasing power, causing prices to rise (Boediono, 2018). Irving Fisher's Quantity Equation, which links money supply, velocity, price level, and transaction volume, is fundamental to this theory (Damanik et al., 2024).

### ***Exchange Rates***

Cassel (1967) defines the exchange rate as the relative value of one currency against another, reflecting the price level between countries. Cassel emphasizes that the exchange rate represents the relative value of a country's currency. The exchange rate has a role in monetary policy, which is influenced by central bank intervention and interest rates. Indonesia has experienced three phases of the exchange rate system: fixed (1970-1978), controlled floating (1978-1997), and free floating (1997). There are three factors that affect the exchange rate viz: macroeconomic factors, supply-demand dynamics, and psychological factors. Sukirno (2015) added consumer preferences and economic growth. These factors together shape exchange rate movements.

### ***Inflation***

Inflation is a sustained and general increase in prices within an economy, reflecting a decline in the purchasing power of money (Boediono, 2018). When domestic inflation is higher than that of trading partner countries, local goods become relatively more expensive, reducing export competitiveness and increasing import demand. This leads to higher demand for foreign currency, ultimately causing a depreciation of the domestic exchange rate (Chandrarin et al., 2022; Harahap et al., 2024). The Purchasing Power Parity theory Cassel (1967) explains that exchange rates adjust in response to inflation differentials between countries in order to maintain relative purchasing power. Therefore, high inflation generally tends to weaken the exchange rate. However, under certain conditions – such as economic stability, increased production capacity, or strong inflows of foreign investment – the exchange rate can remain stable despite rising inflation (Kurniasih et al., 2022; Widiyono et al., 2021).

H1: Inflation has a positive effect on the Exchange Rate.

### ***Money Supply***

Money, in its simplest sense, refers to currency held by the public, which directly influences prices and economic transactions (Boediono, 2018). As a core instrument of monetary policy, the money supply helps central banks manage inflation and stabilize exchange rates (Sa'adah, 2020). An increase in money supply may stimulate economic activity, but if excessive, it triggers inflation, reduces the purchasing power of the domestic currency, and pressures the exchange rate to depreciate (Sangadji et al., 2024). According to the Quantity Theory of Money (Friedman), higher money supply raises demand, and if not matched by output, leads to demand-pull inflation (Funashima, 2020). Over time,

this weakens export competitiveness and increases import dependency, further stressing the exchange rate. While some studies confirm this negative impact (Funashima, 2020; Sa'adah, 2020), others find that a controlled money supply can strengthen the exchange rate by enhancing investment and trade (Sangadji et al., 2024; Syamad & Handoyo, 2023).

H2: The Money Supply has a positive effect on the Exchange Rate.

### ***BI Rate***

Interest rate, as defined by Boediono (2018) is the cost of using money over a certain period and serves as a key tool of Bank Indonesia's monetary policy through the BI Rate. This rate influences capital flows, inflation, and exchange rate stability. An increase in BI Rate attracts foreign capital due to higher returns, boosting demand for Rupiah and strengthening its exchange rate, whereas a rate cut may trigger capital outflows and depreciation (Udiyana et al., 2023). Based on Keynes' liquidity preference theory, a higher interest rate encourages saving and reduces consumption, thus lowering inflation and narrowing the trade deficit (Karimah & Laulita, 2023). Lower inflation improves export competitiveness, potentially strengthening the exchange rate (Sa'adah, 2020). While many studies find a positive relationship between BI Rate and exchange rate (Harahap et al., 2024), others highlight the risks of excessively high rates, such as economic slowdown or capital flight if global markets offer better returns (Astuty, 2022; Sa'adah, 2020). Hence, the BI Rate's effect on the exchange rate is context-dependent and influenced by broader macroeconomic conditions.

H3: Interest Rates have a negative effect on Exchange Rates.

### ***West Texas Intermediate (WTI)***

West Texas Intermediate (WTI) is a key global benchmark for crude oil and plays a vital role in many economic sectors such as transportation and manufacturing (Solibakke, 2024). As a US dollar-denominated commodity, fluctuations in WTI prices significantly impact trade balances and exchange rate stability, particularly for oil-importing countries. When oil prices rise, import costs increase, putting pressure on foreign exchange reserves and leading to depreciation of the local currency. Conversely, oil-exporting countries may experience currency appreciation due to increased export revenues (Baek & Kim, 2019; Gusman et al., 2023). Moreover, higher oil prices often trigger domestic inflation by raising production costs, reducing purchasing power, and further weakening the exchange rate (Jiang et al., 2020). According to purchasing power parity (PPP) theory, exchange rates adjust to reflect changes in inflation; thus, oil-induced inflation can result in currency depreciation, especially in oil-importing nations (Karimah & Laulita, 2023; Saidi et al., 2020).

H4: The world crude oil price (WTI) has a positive effect on the Exchange Rate.

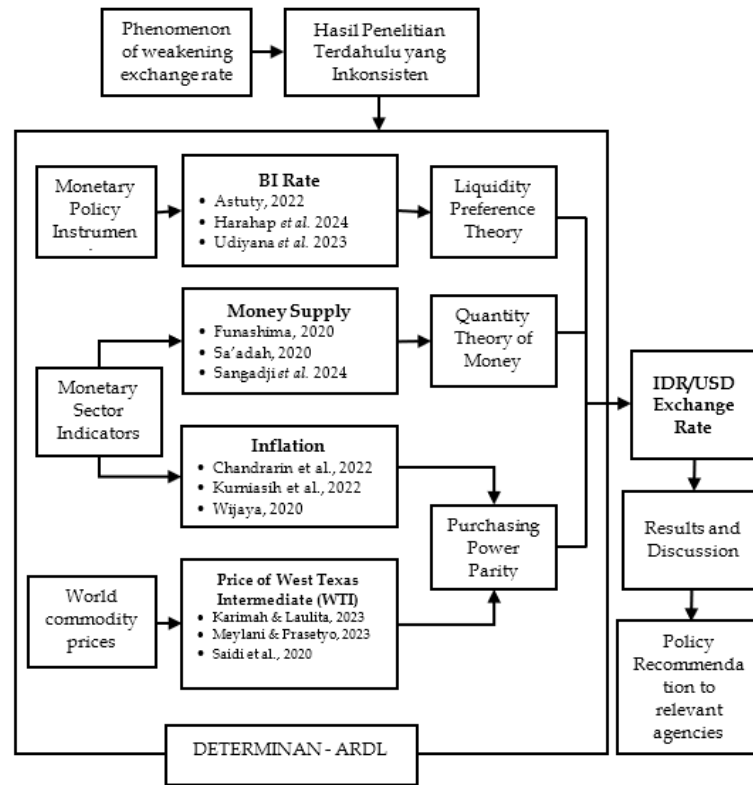


Figure 2. Conceptual Framework

## METHODOLOGY

This study uses a quantitative approach with data collected in numerical form and analyzed statistically and econometrically to test the relationships between variables. The data used are secondary data, consisting of monthly data from January 2013 to December 2023. The main focus of the research is to analyze the factors that influence the exchange rate of the Rupiah against the US Dollar (IDR/USD) (Y) in the short and long run. The independent variables suspected to have an effect include Inflation (X1), Money Supply (X2), BI Rate (X3), and World Crude Oil Price (WTI) (X4).

Table 1. Operational definitions of variables

Code	Variable	Description	Measurement	Data Source
NT	Exchange Rate	Last month JISDOR rate IDR/USD	IDR/USD	BI
INF	Inflation	Consumer Price Index Approach	%	BI
LJUB	Money Supply (Log)	Total broad money supply (M2)	Billion Rupiah	BI
SBI	BI Rate	Bank Indonesia 7 days repo rate (BI7DRR)	%	BI
WTI	West Texas Intermediate	WTI oil closing price	USD per Barrel	Investing.com

The approach used is the Autoregressive Distributed Lag (ARDL) model, introduced by Pesaran et al. (2001), chosen as the main methodology due to its ability to facilitate integrated analysis between short-run dynamics and long-run

equilibrium relationships. This method is particularly suitable for time series data due to its flexibility in accommodating variables with different levels of stationarity (stationary at level I(0) or first difference I(1)), while avoiding the risk of spurious regression. In the ARDL method, hypothesis testing is done by looking at the direction of the statistical coefficient (positive or negative). If the result is contrary to the established hypothesis, the null hypothesis (H0) is accepted. Next, the level of significance is decided based on the probability (p-value) of the statistical results. If the p-value is <0.05, the result indicates that the effect has a significant probability.

With ARDL, the researcher can estimate the Error Correction Model (ECM) coefficients to understand the speed of adjustment towards long-run equilibrium after an economic shock. Models meeting the BLUE (Best Linear Unbiased Estimation) criteria in ARDL are constructed through several stages: stationarity testing using the Augmented Dickey-Fuller test, classic assumption tests (autocorrelation and multicollinearity). Bound testing, model selection based on the Akaike Information Criterion, ARDL estimation, and model stability testing through the CUSUM and CUSUM Square Tests. The mathematical model used was:

$$NT_t = \sum_{i=0}^n \alpha_1.NT_{t-i} + \sum_{i=0}^n \alpha_2.INF_{t-i} + \sum_{i=0}^n \alpha_3.LJUB_{t-i} + \sum_{i=0}^n \alpha_4.SBI_{t-i} + \sum_{i=0}^n \alpha_5.\Delta WTI_{t-i} + C_t + \epsilon_t \dots\dots\dots()$$

However, if the Bound test results indicate cointegration (I(1) value greater than I(0)), the model to be used is ARDL-ECM, which divides ARDL into long-run and short-run components, with the following mathematical model:

$$\Delta NT_t = \sum_{i=0}^n \beta_1 \cdot \Delta INF_{t-i} + \sum_{i=0}^n \beta_2.\Delta LJUB_{t-i} + \sum_{i=0}^n \beta_3.\Delta SBI_{t-i} + \sum_{i=0}^n \beta_4.\Delta WTI_{t-i} + CointEq.(NT - (\alpha_1.INF + \alpha_2.LJUB_{t-i} + \alpha_3.SBI_{t-i} + \alpha_4.WTI_{t-i} + C_t + \epsilon_t \dots\dots\dots()))$$

Where:  $\sum i$  represents the period of the effect from the variables,  $\beta_1$  to  $\beta_4$  are the short-run coefficients of the variables, and *CointEq* refers to the adjustment speed of the model. The long-run coefficients of each variable are denoted by  $\alpha_1$  to  $\alpha_4$ , while *C* is the constant of the model. Finally,  $\epsilon$  represents the error term or residual.

**RESEARCH RESULT**

***Data Stationarity Test***

The analysis of exchange rate determinants using ARDL begins with a data stationarity test. The stationarity test in this study uses the Augmented Dickey-Fuller Test (ADF). The ADF test tests and provides results on each variable.

Table 2. Stationarity Test Results

Probability Value	Variable				
	NT	INF	LJUB	SBI	WTI
Level	0,0278*	0,0000*	0,8654	0,5171	0,4245
1st difference	0,0000*	0,0000*	0,0000*	0,0026*	0,0000*

*Source: Eviews 12 Output Results (2024)*      \**p-value* <0,05

Based on the Augmented Dickey-Fuller (ADF) stationarity test results, the two Exchange Rate (NT) and Inflation (INF) variables show stationarity at the level with probability <0.05, so the null hypothesis ( $H_0$ ) is rejected. In contrast, the variables of Money Supply (LJUB), BI Rate (SBI), and Crude Oil (WTI) are not stationary at the level (probability >0.05), indicating the acceptance of  $H_0$ . However, after first difference testing, all variables achieved stationarity (probability <0.05) with the rejection of  $H_0$ . This finding fulfills the main prerequisite of applying the ARDL (Autoregressive Distributed Lag) method, which allows the combination of stationary variables at level and/or first difference. Thus, all five variables can be integrated into the analytical model without compromising the validity of the estimation results.

### **Classical Assumption Test**

Furthermore, a classical assumption test is conducted to ensure that the data produces a BLUE model. Normality test does not need to be done on data with more than 30 (n) observations, because it already meets the assumptions of the Central Limit Theorem. Heteroscedasticity test is also not needed considering that the research location (cross section) is only 1 (Ajija et al., 2011). Therefore, the classic assumption tests performed are autocorrelation and multicollinearity tests. Then the tests carried out are autocorrelation and multicollinearity tests.

#### *a. Autocorrelation Test*

In this study, autocorrelation is detected using the Breusch-Godfrey Lagrange Multiplier (LM) test: if the p-value of the  $\chi^2$  statistic falls below the chosen significance level  $\alpha$ , we reject the null hypothesis of no autocorrelation (indicating that autocorrelation is present); if the p-value is equal to or greater than  $\alpha$ , we fail to reject the null hypothesis (indicating no evidence of autocorrelation).

Table 3. Autocorrelation Test Results

Methods	Measurement	Results
LM test	Prob. Chi Square >0,05	0,5905

*Source: Eviews 12 Output Results (2024)*

From the LM test, the result is  $0.5905 > 0.05$  prob. Chi square then  $H_0$  is accepted so that it can be stated that there are no autocorrelation symptoms.

*b. Multicollinearity Tests*

Table 4. Multicollinearity Test Results

<b>Variable</b>	<b>Measurement</b>		<b>Results</b>
INF	Variance	Centered	1.112097
LJUB	Inflation	VIF <10	1.650374
SBI	Factor (VIF)		1.644923
WTI			1.097430

*Source: Eviews 12 Output Results (2024)*

Based on the multicollinearity test results shown in Table 4.3, the VIF values are as follows: INF of 1.112097 < 10, LJUB of 1.650374 < 10, SBI of 1.644923 < 10, and WTI of 1.097430 < 10. With these values, it can be concluded that the five independent variables do not experience multicollinearity.

***Boundtesting Cointegration Test***

The Bound Testing method is a cointegration analysis technique that aims to verify the existence of a long-term equilibrium relationship between variables in a model. In this study, cointegration verification is carried out through the Bound Testing Cointegration approach, where the upper and lower critical values are compared with the F-calculated statistics.

Table 5. Boundtest Result

<b>Test statistics</b>	<b>Value</b>	<b>Significance level</b>	<b>I (0)</b>	<b>I (1)</b>
<b>F-statistics</b>	26.10327	10%	2,2	3,09
		5%	2,56	3,49
		2,5%	2,88	3,87
		1%	3,29	4,37

*Source: Eviews 12 Output Results (2024)*

The test results in Table 5. It can be concluded that there is a long-term relationship between variables, because the value of I(1) Bound is greater than the value of I(0) Bound. The F-statistic value obtained is 26.10327 > I (1) and all levels of confidence level, so H0 is rejected so that in the model there is a long-term relationship or there is cointegration. After passing the stationarity test, classical assumptions, and boundtest, data processing can proceed to the ARDL estimation stage.

***Determination of Optimum Lag***

This test is conducted to determine the optimal lag length in the analysis using Akaike Information Criteria (AIC). Based on the AIC criteria, the optimal lag length obtained through testing is as follows:

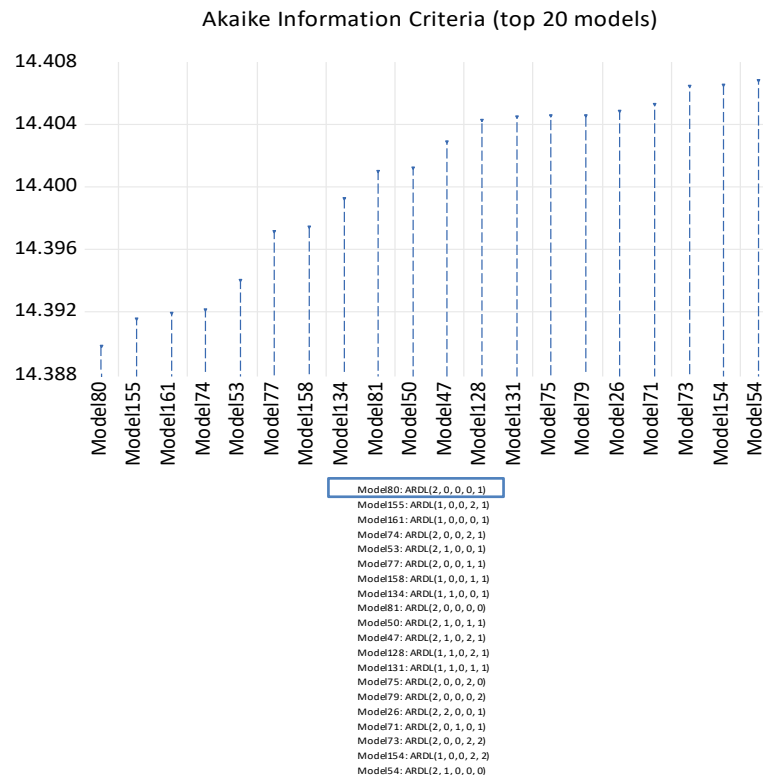


Figure 3. Akaike Information Criteria Test Results  
Source: Eviews 12 Output Results (2024)

According to Burnham & Anderson (2002) AIC estimates the information lost when using a model to approximate the real process and therefore, the model with the smaller AIC value is chosen as the best model. Based on the test results presented in Figure 4.1. estimation of lag selection criteria by looking at the smallest Akaike Information Criteria (AIC) of the 20 best models. The best criterion is ARDL (2,0,0,0,1) meaning that the NT variable has 2 lags, the INF, LJUB and SBI variables have 0 lags, and WTI has 1 lag.

### Estimation of ARDL and ECM Model

Since the Bound Test results indicate cointegration, the model should be further analyzed into the short run and long run (ARDL-ECM). The following are the estimation results in the short run.

Table 6. ARDL and ECM Model Estimation Results

Short Term				Long Term			
Variabel	Koefisien	Std. Error	Prob.	Variabel	Koefisien	Std. Error	Prob.
$\Delta NT_{t-1}$	-0.152015	0.081138	0.0634	INF	-8390.596	4134.400	0.0446
$\Delta NT_{t-2}$	-0.121228	0.082665	0.1451	LJUB	9116.295	1958.281	0.0000
$\Delta INF$	-10683.27	5127.343	0.0393	SBI	23465.40	11102.48	0.0366
$\Delta LJUB$	11607.26	2061.290	0.0000	WTI	-2.397943	4.762596	0.6155
$\Delta SBI$	29877.15	14632.79	0.0433	C	-25.66565	26.23013	0.3298
$\Delta WTI$	-12.29380	4.936998	0.0141				
$\Delta WTI_{t-1}$	9.240638	5.110678	0.0731				
CointEq(-1)	-32.67862	32.48521	0.3164				

Source: Eviews 12 Output Results (2024)

Changes in the exchange rate (NT) one and two periods earlier have a negative effect on the exchange rate itself but are not statistically significant. In the short term the inflation variable (INF) has a significant negative effect on the exchange rate (NT) This means that an increase in inflation affects the appreciation of the exchange rate. In the long run, a 1% increase in inflation causes an appreciation of the exchange rate by Rp. 8,390.596/USD. The short-term coefficient of the Inflation variable (INF) is greater than the long-term coefficient, meaning that if inflation consistently increases, the exchange rate appreciation that occurs in the short term is greater than the appreciation that occurs in the long term. This result proves that statistically, Hypothesis 1 is rejected.

The money supply variable (LJUB) shows a significant positive effect in both the short and long term. This means that an increase in the volume of money in circulation tends to cause exchange rate depreciation, although the level of depreciation is smaller in the long run than in the short run, as reflected by the magnitude of the variable coefficient. Based on these results, Hypothesis 2 can be accepted.

The interest rate variable (SB) also provides a statistically significant positive effect in both time frames. From this result, it can be concluded that an increase in interest rates will encourage exchange rate depreciation, with a more moderate depreciation effect in the long run. This finding supports the proposed Hypothesis 3. Meanwhile, the world crude oil price (WTI) shows a significant negative effect in the short term, but its effect in the previous period and the long term is not significant. This result is not in line with the hypothesis.

**Model Stability Test**

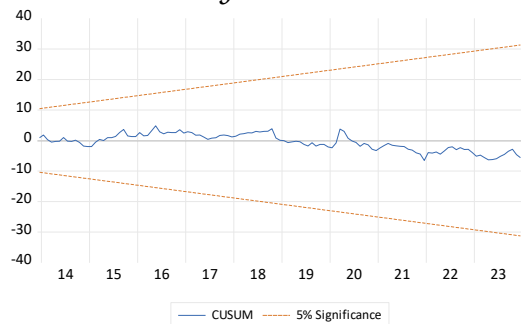


Figure 4. CUSUM Stability Test Results

Source: Eviews 12 Output Results (2024)

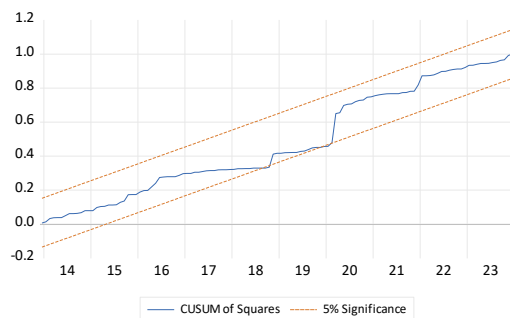


Figure 5. CUSUM Square Stability Test Results

Source: Eviews 12 Output Results (2024)

The stability test of the ARDL model using CUSUM and CUSUM Square Test shows that the model is proven to be stable and can be used for the long term because the CUSUM value is within the 5% significance area (red line). From the data processing that has been done, the ARDL model produced in this study is:

$$D(NT) = -0.152014907723 \cdot D(NT(-1)) - 0.12122815889 \cdot D(NT(-2)) - 10683.2684985 \cdot D(INF) + 11607.2591646 \cdot D(\text{LOG}(LJUB)) + 29877.1530917 \cdot D(SBI) - 12.2938022396 \cdot D(WTI) + 9.24063776121 \cdot D(WTI(-1)) - 32.678615496$$

## DISCUSSION

### *The Effect of Inflation on Exchange Rate*

The results show that inflation has a negative and significant effect on the Rupiah/USD exchange rate, both in the short and long term. In the short term, an increase of 1 unit of inflation decreases the exchange rate (Rupiah appreciation) by 10,683.27 units with a probability of  $0.0393 < 0.05$ , while in the long term the effect is reduced to -8,390.596 units with a probability of  $0.0446 < 0.05$ . This finding contradicts Hypothesis 1 (H1) which refers to Purchasing Power Parity (PPP) theory, which states that inflation should cause domestic currency depreciation. This paradoxical phenomenon is in line with the study of Widiyono et al. (2021) which also found a similar negative relationship. Although PPP theory states that high inflation reduces domestic purchasing power, other factors such as foreign capital flows, credible monetary policy, and manageable inflation expectations (Akbaş et al., 2024; Beirne et al., 2023). are thought to explain why inflation actually triggers Rupiah appreciation.

This can be explained by the theoretical framework of the Keynesian growth-inflation trade-off, where controlled inflation (as in Indonesia, which averaged 4.07% in 2013-2023) can be a stimulus for economic growth. Inflation within Bank Indonesia's target range (2-4%) maintains people's purchasing power, boosts domestic demand and encourages companies to expand production, creating a virtuous cycle. This stability builds investor confidence and attracts foreign direct investment (FDI), which increases demand for the rupiah. In developing countries, mild inflation (<10% annualised) is not necessarily harmful as long as it is not hyperinflationary. Moderate price increases can boost corporate profits, thereby encouraging business expansion, employment and economic growth. In Indonesia, controlled inflation also does not trigger a massive increase in imports, but rather contributes to the stability of the rupiah exchange rate.

Empirically, Indonesia experienced a unique period where high inflation was accompanied by Rupiah appreciation. For example, in 2013-2014, inflation jumped to 8.36% due to the removal of fuel subsidies, but Bank Indonesia (BI) responded by raising the BI Rate from 5.75% to 7.50%. The rate hike attracted foreign capital into Indonesian financial instruments, increasing demand for the Rupiah and causing it to appreciate. A similar phenomenon occurred in 2022-2023: inflation rose due to rising global energy prices after the Russia-Ukraine war, but BI again raised interest rates gradually. This policy maintains monetary credibility and investor confidence, so that foreign capital continues to flow in even though the balance of payments surplus is not as large as in 2021 (US\$13,461 million). A firm and credible policy response is the key to turning inflationary pressure into a momentum to strengthen the Rupiah.

### *The Influence of Money Supply on Exchange Rate*

The results of the research analysis show that money supply (JUB) has a positive and significant effect on the depreciation of Rupiah/USD exchange rate, both in the short and long run. The ARDL estimation reveals that in the short run, an increase of 1 unit of JUB increases the exchange rate (Rupiah depreciation) by 11,607.26 units with a probability of  $0.0000 < 0.05$ , while in the long run, the

JUB coefficient remains significant at 9,116.295 with a probability of  $0.0000 < 0.05$ , thus hypothesis H2 is accepted. Theoretically, this finding is in line with the Quantity Theory of Money: when JUB growth exceeds real production capacity, excess liquidity decreases the competitiveness of Rupiah in the forex market. The studies of Funashima (2020) and Sa'adah (2020) reinforce this mechanism, showing that expansionary monetary policy creates an oversupply of Rupiah, thus reducing its value relative to foreign currencies.

An increase in money supply (JUB) that is not matched by economic growth creates pressure on the rupiah exchange rate through the mechanism of trade balance deficit. The increase in JUB increases domestic purchasing power, driving greater import demand than exports, thus reducing foreign exchange supply and causing rupiah depreciation. This situation is exacerbated by negative market sentiment, such as speculation of rupiah depreciation that triggers massive foreign currency buying, as well as a decline in foreign investor confidence. The risk is heightened if JUB is allocated to unproductive projects, which increases foreign debt and reduces foreign exchange earnings due to low global commodity prices.

Empirically, JUB pressure on the rupiah is reflected in several critical periods. In 2013-2015, the Fed's tapering off triggered capital outflows from emerging markets, while high JUB worsened Indonesia's trade deficit. The rupiah depreciated to IDR 12,000/USD (2013), forcing Bank Indonesia (BI) to raise interest rates and the government to reduce fuel subsidies. In 2016-2019, infrastructure reforms increased the current account deficit due to reliance on capital goods imports, exacerbated by the US-China trade war that pushed the rupiah to IDR 15,000/USD (2018). The COVID-19 pandemic (2020-2022) deepened the economic contraction, triggering BI and the government to implement expansionary policies (QE and fiscal stimulus) that weakened the rupiah to IDR 16,000/USD (2020). Facing rising global interest rates (2022-2024), BI remains optimistic about Indonesia's economic prospects supported by structural reforms and strategic projects such as IKN, provided that JUB management is prudent and export-investment increases to maintain rupiah stability.

### *The Influence of BI Rate on Exchange Rate*

The results of the research analysis show that the BI Rate has a positive and significant effect on the depreciation of the Rupiah/USD exchange rate, both in the short term (coefficient 29,877.15; probability  $0.0433 < 0.05$ ) and long term (coefficient 23,465.40; probability  $0.0366 < 0.05$ ), thus rejecting Hypothesis 3 (H3) which assumes a negative relationship. This finding contradicts the studies of Udiyana et al. (2023) and Harahap et al. (2024) which state that an increase in BI Rate actually strengthens the Rupiah through foreign capital flows and investor confidence. However, this result is in line with Astuty (2022) who revealed that too high BI Rate can weaken domestic economic fundamentals, as well as Sa'adah (2020) who noted the risk of capital flight when global interest rates are more attractive. Thus, the impact of BI Rate on exchange rates depends on the macroeconomic context and external factors.

In theory, an increase in the domestic interest rate (BI Rate) should encourage Rupiah appreciation through a liquidity preference mechanism, where high yields on domestic financial instruments attract capital inflow, increase demand for Rupiah, and strengthen the exchange rate. However, the results of this study show that an increase in BI Rate has an impact on Rupiah depreciation, rejecting this theory. This paradoxical phenomenon occurs because the exchange rate response is highly dependent on investors' perceptions: if the BI Rate hike is seen as an emergency (rather than anticipatory) policy to contain currency volatility-especially amidst the threat of global recession or rising US interest rates-investors tend to doubt the stability of the domestic economy and switch to safer US dollar assets. As a result, despite the high BI Rate, the negative sentiment and increased demand for US dollars actually depresses the Rupiah exchange rate, suggesting that the policy context and external factors (such as global interest rate dynamics) are the main determinants of the BI Rate's impact on the exchange rate.

In the Indonesian context, BI Rate hikes are often outpaced by global interest rates, especially those of the US Federal Reserve. When the BI Rate rises but US interest rates rise faster (e.g. 2022-2023: BI Rate 6% vs Fed 5.25-5.5%), the yield spread narrows, prompting foreign investors to switch to US dollar assets that are considered safe-haven and more profitable, especially with the risks of current account deficit, political volatility, and import dependency in Indonesia. As Sa'adah (2020) explains, high interest rates increase the risk of capital outflows\* if global yields are more attractive. Rupiah depreciation occurs when capital outflows outweigh the positive effect of BI Rate, especially in an open economy that depends on the dollar and foreign investors. In the long run, a high interest rate policy that is maintained for too long-as Astuty (2022) can weaken economic fundamentals (high borrowing costs, slowing domestic investment), worsen economic prospects, and trigger structural depreciation if the current account deficit grows and external pressures (such as prolonged Fed rate hikes) are not addressed. Nevertheless, a BI Rate hike can stabilize Rupiah if it succeeds in restoring investor confidence, but the response is never isolated-interactions with global conditions, market expectations, and fiscal/structural policies are the key determinants.

### *The Influence of West Texas Intermediate on Exchange Rate*

The results of the research analysis show that the price of WTI crude oil has a negative and significant effect on the Rupiah/USD exchange rate in the short term (coefficient -12.29380; probability  $0.0141 < 0.05$ ), but not significant in the long term (coefficient -2.397943; probability  $0.6155 > 0.05$ ), thus rejecting Hypothesis 3 which predicts a positive relationship. This discrepancy occurs because short-term WTI fluctuations are volatile and trigger quick market reactions, such as changes in investor sentiment, sudden capital flows, and trade balance disruptions. While in the long run, the economy adjusts through monetary policy, trade balance balancing, and economic sector restructuring, so that oil price shocks can be muted and the effect on the exchange rate becomes insignificant.

The results of this study contradict the studies of Karimah & Laulita (2023) and Saidi et al. (2020) which state that the increase in WTI oil prices weakens the exchange rate of importing countries. Instead, the increase in WTI appreciates the Rupiah (IDR), contrary to the Purchasing Power Parity (PPP) theory. This finding is in line with Hattantyo et al. (2023). The data shows that Indonesia's oil imports from the US (WTI producer) are very small, only 0.8-4.1 million tons/year (2017-2022) or 1.6-6.6% of total imports. In 2022, US oil imports are only 3.1 million tons, far below Singapore (10.9 million tons) and Saudi Arabia (5.9 million tons). The majority of Indonesia's oil imports refer to the Brent/Dubai benchmark, so the increase in WTI does not immediately have a significant impact on the trade balance.

Indonesia's asymmetric response can be seen from the rise in global oil prices that was matched by a surge in commodity exports. In 2016-2017, coal exports reached 360.1 million tons (+11.2% YoY) and CPO 28.2 million tons (+23% YoY), resulting in a trade balance surplus of \$11.84 billion. This strengthened the Rupiah from IDR13,400/USD (2016) to IDR13,100/USD (2017). In 2022, coal exports reached a record 494.1 million tons (\$46.7 billion value) when coal prices broke \$400/ton due to the Russia-Ukraine War. The flow of foreign capital into the energy sector drove IDR appreciation from IDR14,400/USD (January 2022) to IDR14,000/USD (August 2022). Thus, IDR appreciation is more influenced by export performance and oil import structure that is not dependent on WTI.

## **CONCLUSIONS AND RECOMMENDATIONS**

This study shows that inflation appreciates Rupiah (contrary to PPP theory) due to investor confidence, BI's responsive monetary policy, and foreign capital flows. However, an increase in money supply and BI Rate hike negatively affect the exchange rate, while WTI oil price fluctuations only have a short-term effect. Indonesia's economic resilience is supported by diversified commodity exports (coal, CPO) and minimal dependence on US oil imports, so external shocks can be neutralized.

The government and BI need to keep inflation within the 2-4% target, manage liquidity through open market operations or interest rate adjustments, and strengthen economic fundamentals to attract investment without depending on BI Rate hikes. Diversification of non-oil commodity exports and education of market participants on macroeconomic dynamics are also crucial for Rupiah to remain stable in the face of global volatility.

## **ADVANCED RESEARCH**

This study is limited to only one country, limited variables and a time span of only 11 years. Future researchers are advised to expand the scope of research by adding several countries and including additional macroeconomic variables such as economic growth and fiscal policy as well as extending the observation period and increasing the frequency of data.

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