

CURRENT ACCOUNT SHOCKS AND RUPIAH EXCHANGE RATE DYNAMICS: A VECM ANALYSIS AMID MACROECONOMIC FLUCTUATIONS

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Abstract

The purpose of this research is to examine the impact of current account balance, GDP growth, inflation, and interest rates on the dynamics of the rupiah exchange rate in Indonesia. This study examines two major exchange rate regimes (managed floating and freely floating exchange rates) using annual time-series data from 1985 to 2024 to analyze structural and cross-policy changes in economic policy. Vector Error Correction Model (VECM) methodology is the analytical framework employed to identify both short-term dynamics and long-term equilibrium relationships. The test outcomes demonstrates that there is a long-term structural linkage that is interconnected. In the long term, the current account balance, GDP growth, inflation, and interest rates are proven to contribute to exchange rate dynamics, which at the same time supports the relevance of the External Balance, Balassa-Samuelson, PPP, and IRP theories in Indonesia. In contrast, in the short term, the influence of these macroeconomic variables is relatively limited. The results of the IRF and FEVD confirm that the short-term fluctuations of the rupiah are more dominated by internal exchange rate shocks themselves. Overall, the PPP mechanism is considered more relevant in explaining the volatility of the rupiah in Indonesia than the IRP mechanism on the short term. The policy recommendations emphasize the importance of coordination between Bank Indonesia and the government in controlling inflation and reducing the current account deficit in order to maintain exchange rate stability in a sustainable manner.

Keywords: Rupiah Exchange Rate, Current Account Balance, Macroeconomics, VECM, Purchasing Power Parity.

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1. Introduction

In an open economic system, the exchange rates signify much more than basic currency values, but an instrument of policy transmission that reflects the health of economic fundamentals and international competitiveness in real terms (Ardian et al., 2024). The difference in currency between countries can be an advantage as well as a risk for a country involved in international activities. Profit can arise if the currency exchange rate is favorable, while Risk occurs if the exchange rate fluctuates unfavorably (Qarina, 2023). Exchange rate volatility characterized by prolonged depreciation has the potential to increase the price of imported goods, trigger inflation, and reduce investor confidence in the domestic economy.

The fluctuating value of the rupiah is a constant problem for Indonesia, a rising nation with an open economy. There have been three major stages to Indonesia's exchange rate system. The initial phase featured a pegged exchange rate system during the early 1970s to 1997 where the rupiah was pegged to the US dollar, the second system was managed floating, until finally switching to free floating after the 1997–1998 Asian monetary crisis (Grace et al., 2022). To strengthen its economic resilience against external shocks, Indonesia officially adopted a free-floating exchange rate system following the 1998 financial crisis. (Ardian et al., 2024). But on the other hand, the system makes the rupiah more sensitive to changes in global economic conditions, international capital flows, and investor sentiment.

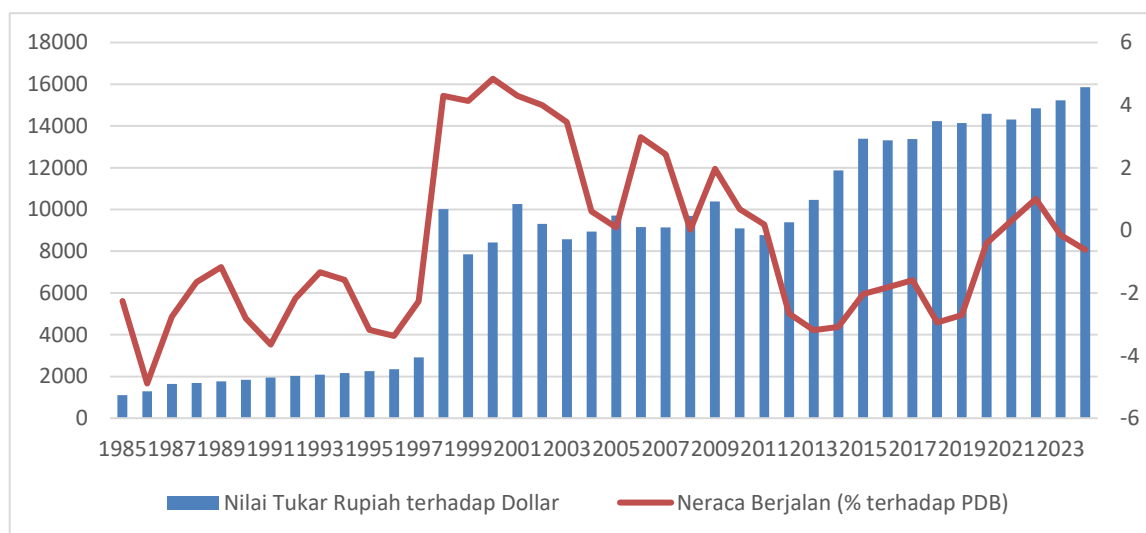
In the era of globalization, exchange rate stability is not entirely dependent on domestic fundamental conditions, but also on the dynamic interaction of international financial markets. Global financial integration makes developing countries such as Indonesia increasingly vulnerable to changes in the monetary policies of developed countries, fluctuations in international interest rates, and short-term capital movements (*Hot money*). This condition increases the risk of *Sudden Capital Reversal* which has the potential to stimulate exchange rate depreciation significantly (Fuchs, 2022). Therefore, maintaining the rupiah exchange rate requires a combination of credible monetary policy and strong external sector resilience.

Based on Figure 1, e fluctuations of Indonesia's exchange rate over the period of 1985 to 2024 which demonstrates that the exchange rate in Indonesia has fluctuated throughout the period. Various factors caused changes on the

exchange rate in Indonesia, the 1998 economic crisis which became one of the phenomena that caused Indonesia's domestic exchange rate to depreciate. Data shows that the exchange rate in 1997 was Rp 290,938, then increased to Rp 10,013,623. This means that there has been an increase of 244% from the previous value. The change reflects strong pressure on the exchange rate due to external and internal pressures that trigger capital flight and a decline in market confidence in the rupiah.

Furthermore, the exchange rate is shaped by macroeconomic determinants, including the current account balance, the growth of a nation's GDP, inflation, and interest rates. In more recent periods, the rupiah exchange rate continues to show high volatility and poses a serious challenge to Indonesia's macroeconomic stability.

Figure 1 Exchange Rate & Current Transaction Balance



The exchange rates and current account balances play a pivotal role in developing nations. The current account deficit in developing nations exerts a significant impact on exchange rates through the supply or demand frameworks of foreign currencies. External resilience driven by the current account balance directly determines exchange rate stability in Indonesia. The continuous current account deficit proved to be the main cause of exchange rate fluctuations in the foreign exchange market (Vilela & Macdonald, 2020). One part of the balance of payments that displays all transactions involving products, services, primary income, and current transfers between domestic and foreign people is the current

account balance (Krugman et al., 2018). The current account balance directly drives exchange rate stability by reinforcing external economic resilience; a current account surplus promotes the rupiah's appreciation by raising demand for domestic currency, while a persistent deficit puts pressure on depreciation because of the high demand for foreign exchange (Vilela & Macdonald, 2020).

In international economic theory, the current account balance is considered the main indicator of external balance because it reflects a country's ability to finance foreign exchange needs in a sustainable manner (Altayligil & Çetrez, 2020). The current account deficit that is taking place in a resistant manner shows that domestic consumption and investment are exceeding national production capacity, so it requires financing from abroad through foreign capital flows (Krugman et al., 2018). Current account imbalances can be a source of external vulnerability because they increase the risk of economic adjustment and pressure on a country's macroeconomic stability (Narayan & Srikanthakumar, 2020).

Figure 1 also shows that Indonesia's current account balance predominantly experienced a deficit than a surplus during the study period. The highest deficit value occurred in 1986 with a value of -4.89155, a similar thing occurred repeatedly in 2018 which was also accompanied by a balance of payments deficit. This prolonged deficit condition has become a structural problem that creates constant pressure on the rupiah exchange rate. Every time the deficit widens, the need for foreign exchange increases and the rupiah tends to depreciate. On the other hand, in 2021 where the whole world was hit by the Covid-19 outbreak, including Indonesia, the value of the balance of transactions experienced a surplus. As a result, the rupiah exchange rate appreciated or strengthened. However, in 2023 the current account balance will again experience a deficit.

The presence of a deficit in Indonesia indicates that the current account deficit is frequently a source of concern for international investors. At the time of the Taper Tantrum in 2013, the rupiah experienced considerable pressure due to the current account deficit and foreign capital outflows after monetary policy tightening by the United States. This condition shows that the current account position not only affects international trade, but also serves to shape investor perceptions regarding the nation's macroeconomic stability (Kuncoro & Fafurida, 2023).

Empirically, there are conflicting empirical findings regarding the relationship between the current account balance and the exchange rate. Yudiarti

& Mustika (2018) found the positive and significant influence of the current account balance on the rupiah exchange rate, while Kuncoro & Fafurida (2023) suggests that a deficit exceeding the 2% threshold of GDP significantly weakens the real exchange rate. Cross-country study of 70 countries by (Velic, 2024) indicates a positive correlation between real exchange rate appreciation and the current account surplus. However, Leonufna et al. (2016) in his study of Indonesian data 1998-2014 found a negative and insignificant influence. The inconsistency of these results shows that the relationship between the two variables is contextual and is strongly influenced by the observation era and structural economic conditions.

Beyond current account balances, diverse macroeconomic factors actively drive foreign exchange rate volatility. GDP growth is a reflection of the local economy's expansion, which draws in foreign investment and boosts the value of the currency (Mustofa, 2025). Within the framework of Balassa-Samuelson's theory, high-growth countries generally experience real exchange rate appreciation because expanding productivity elevates domestic prices (Krugman et al., 2018), but economic expansion at the same time increased imports, thus suppressing the current account balance.

Inflation affects exchange rates through mechanisms of Purchasing Power Parity (PPP). The PPP theory explains that the difference in the inflation rate between countries will encourage exchange rate adjustments to maintain purchasing power equality. The price of local goods becomes relatively low when domestic inflation increases more quickly than in other nations, which reduces export competitiveness and the demand for domestic currency. Research by Latifah & Michael (2022), found a relationship between inflation and exchange rates, although their magnitude and significance varied based on the model utilized in the research. An ASEAN panel study shows that rising domestic inflation tends to correlate with exchange rate depression than other countries in the short term (Jaya et al., 2025). Both studies show that inflation has a close relationship with exchange rate movements, although the direction and magnitude of the influence can differ depending on the economic characteristics of each country.

Meanwhile, interest rates work through the Interest Rate Parity (IRP). Interest Rate Parity (IRP) theory establishes that the variance in interest rates between nations dictates a currency's value (Adhawiyah et al., 2018). Higher domestic interest rates are attractive Capital Inflow and appreciate the rupiah, even though

its effectiveness is influenced by the credibility of the central bank and global financial market conditions. Theoretically, Converted Interest Parity (CIP) or closed interest rates do not apply since Interest Rate Parity (IRP) is a market equilibrium state established by the movement of interest rates and exchange rates to adjust in achieving a new equilibrium point. To establish this economic theory, interest rate parity evaluates domestic against foreign financial investments (Febrianto et al., 2025). A rise in Indonesian interest rates relative to global rates tends to attract foreign capital inflows, thereby boosting demand for the rupiah and triggering currency appreciation (Murdo et al., 2025). Therefore, the policy rate is a very important tool for maintaining exchange rate stability, especially in developing countries that have high capital mobility.

Conceptually, PPP, IRP, and external balance theories can be integrated to explain the relationship between the exchange rate, current account balance, GDP growth, inflation, and interest rates. This Interest Rate Parity theory illustrates how rate spreads trigger global capital reallocation and subsequently dictate foreign exchange market price adjustment dynamics, the PPP theory explains how inflation affects the exchange rate through shifts in purchasing power, and the external balance theory views current accounts as the primary gauge of a nation's external resilience. In an interconnected economic system, the real, monetary, and external sectors all interact simultaneously to produce the exchange rate.

Based on previous research, the relationship between macroeconomic variables and exchange rates still shows mixed results. While some studies indicate little impact, the majority of research on the current account variable concludes that an improved current account position yields currency appreciation. In the economic growth variable, there are differences in findings related to the direction of influence on exchange rates because increased economic activity can strengthen economic fundamentals, but also increase import needs. Based on the Purchasing Power Parity (PPP) theory, research on inflation generally indicates an impact on exchange rates, although the level of significance varies depending on the country and the period under study. Similarly, in the interest rate variable, some studies have found that increasing interest rates are able to attract capital inflows and strengthen the exchange rate, while other studies show different results due to the impact of external factors and financial market conditions. The disparity in the study's findings suggests that economic traits, observation times, and scientific techniques all have an

impact on the dynamic link between macroeconomic variables and exchange rates.

Although the studies mentioned above have made significant contributions, there is still a research gap. First, a short range of data that is not able to capture the behavior of the rupiah across exchange rate regimes (fixed, managed floating, free floating). Both dominate multiple linear regressions that ignore simultaneous endogeneity. Third, the limitation of simultaneous testing of PPP and IRP theories in one dynamic system for Indonesia. This research is here to fill the three gaps with the main novelty. First, the study uses data for the period 1985–2024 which includes two Indonesian exchange rate regimes, namely managed floating, and free floating, so as to be able to capture changes in exchange rate dynamics in various policy phases and economic crises. Second, in order to provide a more thorough explanation of dynamic relationships, the Vector Error Correction Model (VECM) technique enables the investigation of both short-term and long-term relationships between cointegrated variables. These three studies integrate testing the theory of PPP, IRP, and the role of current accounts in explaining the dynamics of the rupiah exchange rate. Based on the inconsistencies of the results of previous empirical studies, this research employs the Vector Error Correction Model (VECM) methodology to examine how the current account balance, GDP growth, inflation, and interest rates affect the rupiah exchange rate in Indonesia over the 1985–2024 period.

2. Research Method

This research aims to analyze how macroeconomic factors influence the rupiah exchange rate. This study applies a quantitative approach. The quantitative method will focus on testing the hypothesis with existing data, so that it will show generalizable results. This study also aims to discuss and interpret all independent variable data to dependent variables, which will later be concluded in this research. The data utilized is secondary data obtained directly from the World Bank, and the data series consists of annual time series covering Indonesia (at the national level) for the period from 1985 to 2024. The study's variables include dependent variables, namely the rupiah exchange rate, while the independent variables utilized in this research include, current account balance, GDP growth, inflation, and interest rates.

The analysis model that will be utilized in this research is the Vector Error Correction Model (VAR) approach by utilizing Eviews 10. The VECM method was chosen because all research variables have the same degree of integration and are integrated in the long term. Through the Error Correction Term (ECT), VECM can explain the relationship between the adjustment process at once and the long equilibrium period.

Table 1 outlines the operational definitions of the investigated variables. The variables used are as bellow:

Table 1. Research Variables and Data Sources

Symbols	Data Description	Definition
LnER	Exchange rate (%)	The proportion of local currency to the US dollar. An average throughout the reference period is used to calculate this indicator.
CA	Balance of Transactions (%)	The Current Transaction Balance is a record of the flow of money in and out of export-import activities of goods/services, income receipts, and transfers, excluding the buying and selling of financial assets.
GR	GDP growth (%)	A percentage variation in the total value of a country's output of goods and services annually that indicates how quickly or sluggishly that country's economy is expanding.
INF	Inflation (%)	The annual percentage growth of the Consumer Price Index (CPI) reflects average price changes amount consumers must spend to purchase goods and services, represents a sustained and widespread upward movement in aggregate consumer price index levels.
GO	Interest rate (%)	An interest rate is a number that shows a percentage of the principal amount of the loan for a given period, set by the owners of different types of financial assets in exchange for handing over those assets to another party.

In this economic model estimation, the nominal exchange rate variable of Rupiah (ER) is transformed into the form of a natural logarithm (LnER). The transformation is based on methodological considerations to equalize the measurement scale among all research variables. Considering that nominal exchange rate data is at the absolute price level (thousands of rupiah per US dollar), while other macroeconomic variables are current account balance (CA),

GDP growth (GDP), inflation (INF), and interest rate (IR) – overall percentage-based (%).

The Vector Error Correction Model (VECM) method is analyzed as follows:

1. The collected data can be transformed before it is analyzed.
2. Perform unit root tests to analyze data stationarity.
3. The identification of the optimal lag length relies on several criteria, including the Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC), Final Prediction Error (FPE), and Hannan-Quinn Information Criterion (HQ).
4. Performed Johansen cointegration tests. If cointegration exists, data analysis applies the VECM method.
5. Perform VECM estimation to identify long-term cointegration vectors and short-term adjustments.
6. Perform a VECM model stability test.
7. Conduct Granger causality tests to determine the directional relationships among variables.
8. Perform Impulse Response Function (IRF) analysis and Forecast Error Decomposition Variance (FEDV) analysis.

3. Result and Discussion

In this section, we discuss the determinants of exchange rates through macroeconomic variables in the period 1985 to 2024 with an approach. The things that will be discussed in this chapter include the results of data processing with the statistical application used, namely EViews 10 and the interpretation of each data processing step results produced in this study.

Table 2. Descriptive Statistic (Common Sample)

	LnER	CA	GR	INF	GO
Red	8.774861	-0.430310	4.855595	8.220880	6.145709
Median	9.122527	-1.173090	5.174292	6.406563	7.281955
Max	9.671272	4.843065	8.220007	58.45104	18.70734
Min	7.012638	-4.891558	-13.12673	1.560130	-24.60017
Std. Dev	0.835231	2.638904	3.451751	9.017634	7.141714
Observation	39	39	39	39	39

Source: Author's EViews Processed

Table 2 explains that the rupiah exchange rate (LnER) has an average of 8.774861 with a higher median of 9.122527. This value indicates that most of the data is above average, meaning that the Rupiah tends to weaken throughout the 1985-2024 period. The maximum value of LnER is 9.671272 which occurs in 2024 and the minimum value is 7.012638 in 1985. The wide range of exchange rates was driven by a 244% surge in the exchange rate during the 1997-1998 crisis, which was a phase of sharp depreciation and marked the rupiah's transition to a new, weaker equilibrium point. The current account balance (CA) averages -0.430310% of GDP with a median of -1.173090%, indicating that the current account deficit is structural within the Indonesian economy. The highest deficit occurred in 1986 at -4.891558 and the highest surplus was 4.843065 in 2000, meaning that the balance sheet is closely related to the exchange rate because a worsening deficit tends to go hand in hand with the weakening of the Rupiah. GDP growth (GR) averaged 4.855595 with a median of 5.174292 slightly higher, but there was a contraction in 1998 with -13.12673, indicating that Indonesia's economic growth is positive but very sensitive to external and internal shocks.

Inflation (INF) averaged 8.220880 with an extreme spike in 1998 of 58.45104, while the median was 6.406563 much lower, indicating that 1998 was an extreme value that was far from average. The inflation minimum value of 1.560130 in recent years indicates the success of price control. During the crisis, there was a sharp drop in the value of the Rupiah and an surge in inflation, aligning with Purchasing Power Parity (PPP) theory. The interest rate (IR) averaged 6.145709 with a median of 7.281955. The maximum value of the interest rate, which reached 18.70734 in 1986, reflects monetary policy to respond to inflationary pressures and the severe current account deficits of the mid-1980s. Thus, the sustained current account deficit and high inflation volatility are the fundamental drivers of the structural weakening of the rupiah, while the contribution of GDP growth and interest rates to exchange rate stability is limited only to economic conditions that are not disrupted by the crisis.

Table 3 displays the outcomes of the stationarity tests for each variable. Out of the five variables examined in this research, only three are stationary at their levels, whereas all variables achieve stationarity at their first differences. Consequently, the non-stationary variables at level are differenced until stationarity is attained. Thus, the final results show that all variables used in this research are stationary, namely the rupiah exchange rate (LnER), current account balance (CA), GDP growth (GR), inflation (INF), and interest rate (IR). Therefore,

the variable in this study does not have a unit root problem so that it is free from bias problems. After the stationarity test is carried out, the optimum lag for each variable is determined.

Table 3. Data Stationarity Test Results

Var	ADF		PP	
	Ket.		Ket.	
	Level			
LnER	0.4331	No	0.4292	No
CA	0.1332	No	0.1166	No
GR	0.0011***	Stationary	0.0012***	Stationary
INF	0.0005***	Stationary	0.0005***	Stationary
GO	0.0000***	Stationary	0.0000***	Stationary
FirstDifference				
D(LnER)	0.0000***	Stationary	0.0000***	Stationary
D(CA)	0.0000***	Stationary	0.0000***	Stationary
D(GR)	0.0000***	Stationary	0.0001***	Stationary
D(INF)	0.0000***	Stationary	0.0001***	Stationary
D(IR)	0.0000***	Stationary	0.0001***	Stationary

Source : Author's Processed Results

Table 4 demonstrates that lag one is selected by one method, while lag three is selected by four methods, namely Sequential Modified LR Test, Final Prediction Error (FPE), Akaike Information Criterion (AIC), and Hannan-Quinn Criterion (HQ). Lag 3 is determined to be the ideal lag based on the preceding table. In the VECM model, selecting the appropriate lag length is critical because it affects both the estimation of short- and long-term relationships between variables and the outcomes of the cointegration study. The use of inappropriate lag has the potential to reduce important information in the system, and lag that is too far can reduce the degree of freedom and efficiency of estimation due to the limited number of observations. Therefore, lag 3 is used in the Johansen cointegration test and the estimation of the VECM model.

Table 4. VAR Lag Order Selection Criteria Test Results

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-425.0007	OR	16311.29	23.88893	24.10886	23.96569
1	-299.6643	208.8939	62.86530	18.31469	19.63428*	18.77526
2	-271.5700	39.01991	57.63879	18.14278	20.56204	18.98717
3	-233.1777	42.65814*	34.55276*	17.39876*	20.91769	18.62696*

Source: Author's Processed Results

Referring on Table 5, the outcome of the Johansen cointegration test show that the Trace Statistic values for hypotheses 'None,' 'At most 1,' and 'At most 2'

exceed the five percent critical threshold, with probability values less than 0.05. This offers robust proof to dismiss the null hypothesis (H_0), which implies that no cointegration relationship exists. Therefore, it indicates that the exchange rate (LnER), current account (CA), GDP growth (GR), inflation (INF), and interest rate (IR) variables have a long-run equilibrium relationship.

Cointegration connections indicate that while individual variables may fluctuate in the near term, they tend to gravitate toward the same equilibrium point over time. At a 5% significance level, the Trace statistic indicates the presence of three cointegrating equations. Hence, analyzing the short-run and long-run dynamic interactions among the variables is highly feasible in this research utilizing the Vector Error Correction Model (VECM) model.

Table 5. Cointegration Test Results

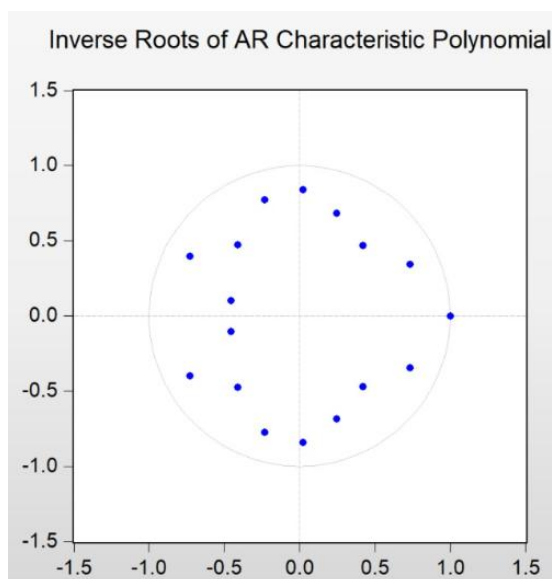
Hypothesized No. or CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.730630	119.1695	76.97277	0.0000
At most 1 *	0.649731	73.26103	54.07904	0.0004
At most 2*	0.464760	36.54410	35.19275	0.0355
At most 3	0.266465	14.66768	20.26184	0.2460
At most 4	0.103446	3.821905	9.164546	0.4393

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the null hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

The stability of the Vector Error Correction Model (VECM) model is determined by analyzing its polynomial characteristics (roots of characteristic polynomial). The stability condition is met when all the non-imposed characteristic roots have a modulus value below one, which geometrically means that all roots are located within the unit circle. In Figure 2, all the blue dots are inside the circle, which means that all the values of the root AR polynomial are worth less than one (Appendix B). Thus, it can be inferred that the VECM model estimated in this research is stable and valid for use in analysis.

Figure 2. VECM Model Stability Test Diagram Results


The results of the Roots of Characteristic Polynomial test in Table 6 show that all characteristic roots have a modulus value (Absolute Unit Root) of less than one (<1). The entire value of the Absolute Unit Root ranges from 0.467341 to 0.841037. This condition indicates that the VECM model meets the stability requirements, so the estimated dynamic processes are convergent towards long-term equilibrium. Consequently, the selected empirical model exhibits strong statistical adequacy to capture complex dynamic interactions, providing highly consistent and statistically reliable outputs for both Impulse Response Functions (IRF) and Forecast Error Variance Decompositions (FEVD)

Table 6. Results of the VECM Model Stability Test Table

No.	Root (x, y)	Absolute Unit Root
1.	0.024153, $-0.840690i$	0.841037
2.	0.024153, $+0.840690i$	0.841037
3.	-0.729735 , $-0.396288i$	0.830397
4.	-0.729735 , $+0.396288i$	0.830397
5.	-0.230640 , $-0.774359i$	0.807977
6.	-0.230640 , $+0.774359i$	0.807977
7.	0.731619, $-0.342587i$	0.807857
8.	0.731619, $+0.342587i$	0.807857
9.	0.245056, $-0.683002i$	0.725634
10.	0.245056, $+0.683002i$	0.725634

No.	Root (x, y)	Absolute Unit Root
11.	0.419220, -0.470929i	0.630492
12.	0.419220, +0.470929i	0.630492
13.	-0.413249, -0.472663i	0.627841
14.	-0.413249, +0.472663i	0.627841
15.	-0.455696, -0.103676i	0.467341
16.	-0.455696, +0.103676i	0.467341

Source: Author's Processed Results

Table 7 displays the empirical VECM estimation results for all investigated macroeconomic variables, including the current account (CA), GDP growth (GR), inflation (INF), and interest rates (IR) which show a significant long-run relationship with the rupiah exchange rate. This is demonstrated by the t-statistic values for each variable, which exceed the critical threshold of 1.96 at the 5% significance level.

Table 7. Long-Run Cointegration Equation Estimation Test Results

Variable	Coefficients	t-Statistic
	Long-Term	
CA(-1)	0.356487	[2.60207]
GR(-1)	0.378952	[3.04845]
INF(-1)	0.135819	[2.06529]
IR(-1)	0.331933	[7.65856]
C	-13.61396	-

Source: Author's Processed Results

The t-statistic for the current account balance (CA) variable is 2.60207, indicating a substantial long-term impact on the exchange rate. These findings demonstrate that one of the elements influencing the exchange rate balance is the state of the current account balance. These outcome are consistent with the External Balance Theory, which explains that a country's current account balance reflects the resilience of its external sector (Krugman et al., 2018). Furthermore, GDP growth (GR) exerts a significant impact on the exchange rate long-term, showing a coefficient value of 0.378952 and t-statistic 3.0485. This supports the Balassa-Samuelson theory which states that increased productivity and economic

growth can affect exchange rate appreciation through increased economic competitiveness (Krugman et al., 2018).

Inflation (INF) with value t-statistic by 2.06529, which indicates a long-term relationship with the exchange rate. This finding supports Purchasing Power Parity theory, which posits that international inflation differentials drive exchange rate movements to maintain cross-border real currency valuation (Krugman et al., 2018). This is also consistent with research analyzing the rupiah exchange rate (Latifah & Michael, 2022). Meanwhile, exchange rates are influenced by interest rates (IR), which is consistent with the Interest Rate Parity (IRP) theory, which states that variations in interest rates affect international capital flows, which ultimately influence changes in exchange rates (Krugman et al., 2018).

Table 8 shows the estimated VECM in the short term. Value Error Correction Term (RCT) which shows a negative coefficient that is in accordance with the VECM theory, but is not statistically significant. These results imply that during the sample period, the error correction mechanism was unable to entirely drive the variables back to their long-run equilibrium path. The current account (CA), GDP growth (GR), inflation (INF), and interest rate (IR) variables across the lag do not have a significant influence on short-term exchange rate changes because the overall value t-statistic is below 1.96. Although the first-lag inflation carries a t-statistic of -1.73805, it merely signals a weak, statistically insignificant negative influence on the exchange rate, but the influence is not strong enough to be declared significant at the significance level of 5%.

Overall, the VECM estimation results indicate that short-term fluctuations in the rupiah exchange rate are influenced more by the internal dynamics of the exchange rate itself than by changes in the current account balance, GDP growth, inflation, and interest rates. These results suggest that these macroeconomic factors have a greater impact on the long-term equilibrium than on short-term exchange rate fluctuations.

Table 8. Short-Run Error Correction Model Estimation Test Results

Variable	Coefficients	t-Statistic
Short Term		
CointEq1	-0.029281	[-0.40024]
D(LNER(-1))	0.964552	[1.48179]
D(LNER(-2))	-0.408758	[-0.63047]
D(LNER(-3))	-0.180587	[-0.19366]
D(CA(-1))	-0.001977	[-0.03637]
D(CA(-2))	-0.012241	[-0.29321]
D(CA(-3))	-0.019479	[-0.41568]
D(GR(-1))	0.000621	[0.01618]
D(GR(-2))	0.008257	[0.23383]
D(GR(-3))	0.009486	[0.25256]
D(INF(-1))	-0.031794	[-1.73805]
D(INF(-2))	0.006548	[0.32044]
D(INF(-3))	-0.002211	[-0.14642]
D(IR(-1))	-0.006161	[-0.30925]
D(IR(-2))	0.003527	[0.20336]
D(IR(-3))	-0.001128	[-0.11288]
C	0.040652	[0.60700]

Referring on the outcome of the Granger causality test in Table 9 at a significance level of 5%, most variable pairs do not show a causal relationship. This is demonstrated by a p-value exceeding 0.05, preventing rejection of the null hypothesis. Consequently, the current account (CA), GDP growth (GR), inflation (INF), and interest rate (IR) do not exhibit short-term causal relationships with the rupiah exchange rate (LNER).

In the current account (CA) variable, the absence of a causal relationship indicates that external sector adjustments take time before affecting the exchange rate. This condition indicates that during the study period, the movement of the rupiah exchange rate was dominated by financial factors rather than trade factors, so that the influence of the current account balance (CA) on the exchange rate occurred indirectly through the macroeconomic adjustment mechanism.

Meanwhile, in the GDP growth variable, there is no causality because the characteristics of the Indonesian economy are more supported by domestic consumption, so that an increase in GDP growth is not always followed by an increase in foreign exchange revenues. Then within the interest rate variable, no causality relationship was detected, suggesting that the transmission of monetary policy to the exchange rate is affected by other elements, like market expectations and capital flows, so the impact is not always apparent short-term. These findings indicate that changes in these macroeconomic variables have not been able to explain changes in exchange rates directly in the short term.

Nevertheless, there are two significant causal relationships. First, the exchange rate (LNER) to interest rate (IR) with a probability value of 0.0152 and inflation (INF) to interest rate (IR) with a probability value of 0.0001. These results demonstrate short-run predictive causality, confirming that both exchange rate fluctuations and inflation dynamics effectively forecast future interest rate movements. However, this right does not directly prove the existence of a cause-and-effect relationship in structural economic analysis.

Table 9. Granger Causality Test Results

Null Hypothesis (H_0)	Chi-sq	Prob.	Conclusion at $\alpha=5\%$
D(CA) does not affect D(LNER)	0.3291	0.9545	Accept H_0
D(GR) does not affect D(LNER)	0.1028	0.9915	Accept H_0
D(INF) does not affect D(LNER)	3.3946	0.3347	Accept H_0
D(IR) does not affect D(LNER)	0.3515	0.9501	Accept H_0
D(LNER) does not affect D(CA)	6.4663	0.0910	Accept H_0
D(GR) does not affect D(CA)	1.0337	0.7931	Accept H_0
D(INF) does not affect D(CA)	6.6539	0.0838	Accept H_0
D(IR) does not affect D(CA)	2.7118	0.4382	Accept H_0
D(LNER) does not affect D(GR)	1.0563	0.7876	Accept H_0
D(CA) does not affect D(GR)	0.9516	0.8130	Accept H_0
D(INF) does not affect D(GR)	2.2495	0.5223	Accept H_0
D(IR) does not affect D(GR)	0.7225	0.8679	Accept H_0
D(LNER) does not affect D(INF)	4.0546	0.2556	Accept H_0
D(CA) does not affect D(INF)	0.8974	0.8261	Accept H_0
D(GR) does not affect D(INF)	0.0561	0.9965	Accept H_0
D(IR) does not affect D(INF)	1.9747	0.5777	Accept H_0

Null Hypothesis (H_0)	Chi-sq	Prob.	Conclusion at $\alpha=5\%$
D(LNER) does not affect D(IR)	10.4399	0.0152	Minus H_0
D(CA) does not affect D(IR)	3.2277	0.3578	Accept H_0
D(GR) does not affect D(IR)	2.7490	0.4320	Accept H_0
D(INF) does not affect D(IR)	21.1028	0.0001	Minus H_0

Source: Author's work

Figure 3 shows the Impulse Response Function (IRF) results. Over the ten-period observation period, the rupiah exchange rate (LNER) responded to shocks from each variable in different ways. In general, all responses converge toward equilibrium by the end of the horizon, demonstrating that the system stabilizes in the medium term and that the impacts of the shocks are merely transitory.

The exchange rate response to the exchange rate shock itself (LnER) shows the greatest positive response in the initial period and peaks around the 4th to 5th period before gradually declining until the 10th period. This condition shows that exchange rate fluctuations are still dominated by shocks that come from themselves. These findings indicate a persistence in exchange rates, where changes in the previous period still affect exchange rate movements in the following periods.

The exchange rate's response to current account (CA) shocks shows a negative pattern of relatively small amounts. The response reaches a low point around the 4th period, then gradually returns to the equilibrium point. These findings indicate that the exchange rate is merely temporarily affected by the current account shock. This outcome lends support to the External Balance hypothesis, which maintains that variations in the current account drive exchange rate movements through external sector transmission channels, subject to specific macroeconomic conditions. These results are also consistent with research (Mustofa, 2025) which shows that the influence of the current account in the exchange rate tends to take place gradually through external adjustment mechanisms.

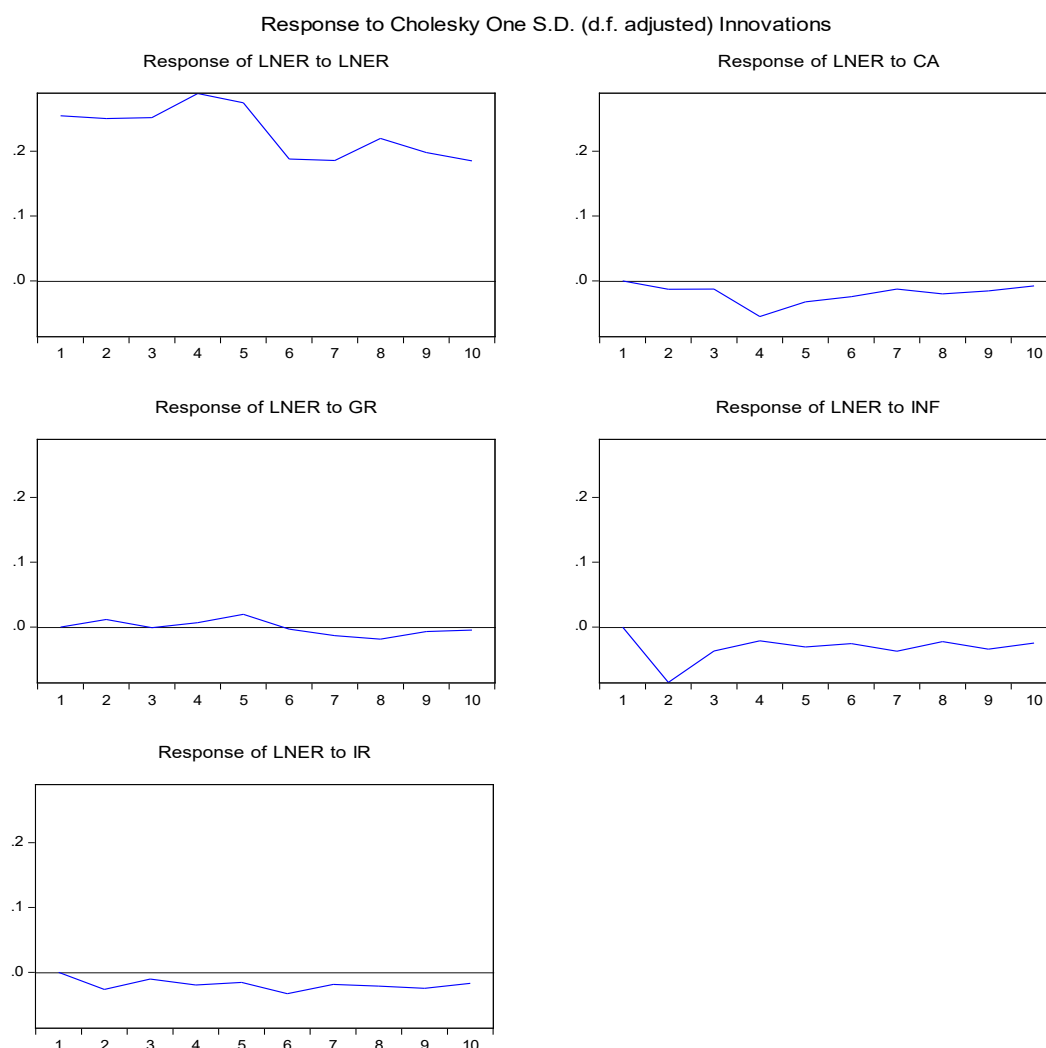
The exchange rate's response to GDP growth (GR) shocks shows relatively small fluctuations around the balance line. The response had moved positively in the initial few periods, then turned negative before returning to stability at the end of the period. "These findings demonstrate that GDP growth shocks failed to induce substantial exchange rate volatility throughout the analyzed period. This

finding is in line with Balassa-Samuelson's theory which explains that GDP growth can affect exchange rates through increased productivity, but the magnitude of the influence is greatly influenced by the fundamental conditions of the economy and the structure of international trade (Krugman et al., 2018).

Meanwhile, the exchange rate's response to inflation shocks (INF) shows a clearer negative pattern than current account and GDP growth. The response decreases in the initial period, then gradually returns to equilibrium. These findings validate Purchasing Power Parity theory, demonstrating that domestic inflationary pressures diminish export competitiveness, consequently driving exchange rate depreciation. However, referring on the outcome of the IRF, the effect is temporary as the response returns to close to the equilibrium point in subsequent periods. These findings are supported by (Latifah & Michael, 2022) which shows that the effect of inflation on exchange rates can vary depending on economic characteristics and observation periods.

The exchange rate's response to interest rate shocks (IR) also shows a relatively small negative pattern and fluctuates around the balance line. This indicates that interest rate shocks have not provided a strong response to exchange rates during the observation horizon. Theoretically, this situation can be explained through Interest Rate Parity (IRP), which posits that changes in interest rates can influence exchange rates through the movement of international capital flows. However, this study demonstrates that short-run interest rate shock transmission to exchange rates remains highly constrained. These empirical results corroborate previous literature (Murdo et al., 2025) which indicates that the effectiveness of interest rate transmission to exchange rates is influenced by financial market conditions and other external factors.

Figure 3. Impluse Response Function



Overall, the IRF outcome demonstrates that exchange rate shocks are the most dominant source of shocks, while shocks stemming from current accounts, GDP growth, inflation, and interest rates result in only a relatively small and temporary response. These outcomes corroborate Granger causality and VECM estimation findings, demonstrating that macroeconomic determinants exert marginal short-run influences on exchange rate dynamics. These findings are additionally backed by the outcomes of the Forecast Error Variance Decomposition (FEVD) analysis, which indicate that shocks arising from the exchange rate itself still dominate the variation in exchange rate forecast errors, whereas other macroeconomic variables provide a relatively minor contribution throughout the observation period.

The results of the Forecast Error Variance Decomposition (FEVD) in Table 10, the rupiah exchange rate (LnER) show that the variation in exchange rate prediction errors is still dominated by exchange rate shocks themselves. In the first period, the contribution of exchange rate shocks itself reached 100%, then decreased to 93.89% in the 2nd period and increased again to 95.48% in the 10th period. This means that internal dynamics have a greater influence on exchange rate fluctuations than other macroeconomic variables.

Among independent variables, inflation (INF) contributed the largest to exchange rate variations, which was 5.38% in the 2nd period and decreased to 2.53% in the 10th period. This outcome supports Purchasing Power Parity theory, demonstrating that price level fluctuations systematically drive exchange rate movements. Meanwhile, the contribution of the current account (CA) increased gradually from 0.12% to 1.03%, while the interest rate (IR) increased from 0.52% to 0.74% in the 10th period. GDP growth (GR) has the smallest contribution, which is less than 0.25% throughout the observation horizon.

Overall, the FEVD results indicate that the exchange rate shock itself accounts for a greater portion of the volatility in the rupiah exchange rate than inflation, current accounts, interest rates, and GDP growth. These outcome are in line with those of the VECM, the Granger causality test, and the IRF, which demonstrate that macroeconomic factors still have a limited short-term impact on exchange rate movements.

Table 10. Variance Decomposition

Period	S.E.	LNER	CA	GR	INF	GO
1	0.254589	100.0000	0.0000	0.0000	0.0000	0.0000
2	0.368581	93.8851	0.1214	0.1004	5.3775	0.5156
3	0.448165	95.0505	0.1627	0.0683	4.3168	0.4018
4	0.537005	95.2025	1.1597	0.0638	3.1612	0.4127
5	0.605321	95.5114	1.1994	0.1553	2.7434	0.3905
6	0.635657	95.3472	1.2362	0.1430	2.6502	0.6232
7	0.663791	95.2634	1.1691	0.1717	2.7454	0.6505
8	0.700479	95.4011	1.1327	0.2240	2.5667	0.6755
9	0.729334	95.3698	1.0906	0.2159	2.5854	0.7383
10	0.753119	95.4849	1.0331	0.2060	2.5330	0.7430

The empirical findings of this research robustly demonstrate that dynamic macroeconomic interactions among the current account balance, GDP growth, inflation, interest rates, and the rupiah exchange rate throughout the 1985–2024 observation period are comprehensively elucidated by the Vector Error Correction Model (VECM) estimations, the Granger causality tests, the Impulse Response Functions (IRF), and the Forecast Error Variance Decompositions (FEVD).

Initially, the Granger causality test reveals a unidirectional link running from inflation to the exchange rate, corroborated by IRF analysis where the currency reacts negatively to inflationary shocks. These findings align with Purchasing Power Parity (PPP) theory, which posits that rising domestic prices depreciate the exchange rate by reducing export competitiveness and eroding the purchasing power of the currency. These results are also consistent with the findings (Latifah & Michael, 2022) and (Jaya et al., 2025).

Second, the Granger causality test demonstrates that inflation and interest and exchange rates are causally related. These results show that the dynamics of interest rate adjustments in the Indonesian economy are connected to changes in inflation and currency rates. However, the lack of a causal link between interest rates and exchange rates implies that interest rates do not directly affect changes in exchange rates. This outcome is consistent with Interest Rate Parity (IRP), which is actually impacted by global capital mobility and financial market conditions (Febrianto et al., 2025) and (Murdo et al., 2025).

Third, the exchange rate and current account balance exhibit no direct causal relationship, suggesting that short-term transaction fluctuations do not immediately influence currency values. Nevertheless, the VECM estimations confirm that the current account and exchange rate maintain a stable, long-run equilibrium link. Thus its impact is more indicative of the economy's process of fundamental adjustment than of the short-term reaction. These findings are consistent with (Kuncoro & Fafurida, 2023) and (Velic, 2024)

Overall, the outcome of the research demonstrates that the dynamics of the rupiah exchange rate are the result of the interaction between monetary, real, and external factors. Based on the results of the FEVD, exchange rate variation is still dominated by exchange rate shocks themselves, while among macroeconomic variables, inflation makes the largest contribution in explaining exchange rate variations even though they are relatively small. Therefore, exchange rate

stability is not only affected by domestic fundamental conditions, but also by the internal dynamics of the foreign exchange market as well as external factors that affect the economy.

4. Conclusion

This study shows that although their effects are relatively small in the short term, the current account balance, GDP growth, inflation, and interest rates maintain a long-term relationship with the rupiah exchange rate. Furthermore, the outcomes of the Impulse Response Function (IRF) and Forecast Error Variance Decomposition (FEVD) analyses indicate that shocks arising from the exchange rate itself possess a greater impact on exchange rate fluctuations, with inflation contributing relatively more than other macroeconomic variables. These findings contribute to the exchange rate determination literature by strengthening the evidence that the Purchasing Power Parity (PPP) mechanism is more relevant in explaining the dynamics of the exchange rate in Indonesia than the Interest Rate Parity (IRP) mechanism on the short term. In addition, this study enriches the study of exchange rate determinants in developing countries through the Vector Error Correction Model (VECM) approach that integrates long-term relationships, causality, and dynamic responses between macroeconomic variables.

The policy implications of this study indicate that inflation control must continue being a priority to preserve exchange rate stability. On the external side, efforts to reduce the current account deficit through increasing export competitiveness and diversifying foreign exchange sources need to be strengthened to increase the resilience in the external sector. In addition, the stability of capital flows needs to be maintained through strengthening the credibility of macroeconomic policies and deepening the domestic financial market. Therefore, close coordination between Bank Indonesia and the government is needed so that monetary, fiscal and real sector policies support each other in maintaining exchange rate stability in a sustainable manner.

However, the results of this study are limited to current account variables, GDP growth, inflation, and interest rates, so they do not include other external factors such as foreign exchange reserves, international capital flows, global financial risks, commodity prices, and world economic uncertainty that also have the potential to affect exchange rates. In addition, the research period (1985–2024)

includes changes in exchange rate regimes, the 1997/1998 Asian economic crisis, the 2008 global financial crisis, and the COVID-19 pandemic, which has the potential to cause structural breaks in the data. Therefore, the outcomes of the research need to be interpreted by considering these limitations. The next research is recommended to include external variables and use methods that are able to accommodate structural changes on order to obtain more comprehensive understanding of the rupiah exchange rate dynamics.

Another limitation to consider is the relatively small number of observations 39 in total used to estimate the VECM with three endogenous variables. This limited number of observations may reduce the degrees of freedom and the structural stability of the estimated parameters; therefore, the results of this study should be interpreted with caution. Future research is encouraged to use data with higher frequency such as quarterly data to increase the number of observations and improve the accuracy of model estimates.

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