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Determinants of Rupiah Depreciation: Inflation, GDP Growth, Money Growth, and the Real Interest Rate, 1990–2025

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Abstract

Main Objectives: This study examines the determinants of the annual depreciation rate of the Rupiah against the US dollar in 1990–2025, namely inflation, GDP growth, broad money growth, and the real interest rate, within the monetary approach to the exchange rate.

Background Problems: Indonesian growth has been stable at around 5% since 2014 while the Rupiah kept weakening, which raises the question of whether macroeconomic fundamentals still explain exchange rate movements.

Novelty: Earlier Indonesian studies use short samples (2013–2022 or 2015–2024) and level variables. This study uses 36 years of growth-rate indicators, tests stationarity explicitly, and controls for the 1997–1998 Asian financial crisis.

Research Methods: Annual World Development Indicators data (36 observations; 35 after differencing) are analysed with Augmented Dickey–Fuller tests and multiple linear regression (OLS) with a 1998 crisis dummy, classical assumption tests, and Newey–West robust standard errors.

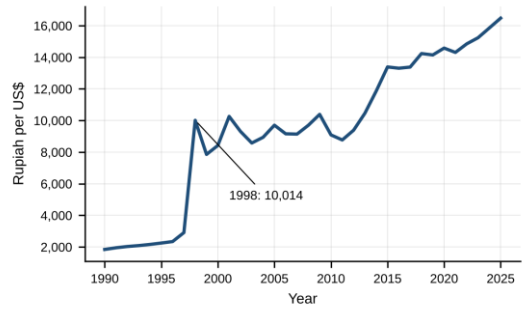
Finding/Results: The exchange rate level is non-stationary (ADF = −1.01) whereas the four regressors are stationary, and a level regression (R^2 = 0.771) is outperformed by a time trend alone (R^2 = 0.885). Without the crisis control, GDP growth has a significant negative and money growth a significant positive effect on depreciation. With the 1998 dummy, only inflation is significant, with a negative sign (5% under OLS, 10% under robust standard errors).

Conclusion: The link between fundamentals and Rupiah depreciation in 1990–2025 is dominated by the 1998 crisis episode, so the results should be interpreted with caution and call for higher-frequency data and dynamic models.

INTRODUCTION

The exchange rate is an important macroeconomic indicator because it reflects the price of the domestic currency in terms of foreign currency and is linked to international trade, import prices, production costs, inflation, and capital flows. For Indonesia, the Rupiah–US dollar rate is closely watched because its changes affect the domestic economy. Exchange rate stability is still prominent in 2026 policy: on 18 June 2026 Bank Indonesia raised the BI-Rate by 25 basis points to 5.75% to strengthen Rupiah stability amid global uncertainty while keeping inflation under control (Bank Indonesia, 2026).

The long-run movement of the Rupiah has been large. World Development Indicators show that the official exchange rate rose from about IDR 1,843 per USD in 1990 to about IDR 10,014 per USD in 1998, reflecting the pressure of the Asian financial crisis. It then fluctuated further, including during the global financial crisis and the COVID-19 pandemic, and reached IDR 15,855 per USD in 2024 and IDR 16,478 per USD in 2025 (World Bank, 2026a).



Source: World Bank (WDI), processed 2026

Figure 1
Official Exchange Rate of the Rupiah against the US Dollar, 1990–2025

Figure 1 shows that the largest change occurred in 1997–1998, when the rate rose from about IDR 2,909 to IDR 10,014 per USD. Since then the Rupiah has traded at a markedly higher level than before the crisis.

Macroeconomic conditions also changed. Indonesian GDP contracted by about 2.07% in 2020 because of the pandemic, then grew 3.70% in 2021 and 5.31% in 2022. Apart from the pandemic year, growth has stayed close to 5% since 2014, and it reached 5.11% in 2025 (Badan Pusat Statistik, 2026) compared with 5.03% in 2024 (World Bank, 2026c). Over the same period, however, the average exchange rate weakened from about IDR 11,865 per USD in 2014 to about IDR 16,478 in 2025, or roughly 39%. Stable growth accompanied by a persistently weaker Rupiah raises the question of whether fundamentals such as growth are still related to exchange rate movements.

Inflation is one such fundamental. In its relative form, purchasing power parity (PPP) states that the depreciation rate of the domestic currency equals the difference between domestic and foreign inflation (Cassel, 1918) so inflation higher than that of trading partners tends to be followed by depreciation. PPP therefore links inflation to the change in the exchange rate, not to its level.(Angin et al., 2025) studied Indonesia in 2013–2022 and found a negative and significant effect of inflation on the Rupiah, which they related to PPP. December 2025 inflation was 2.92% year on year (BPS, 2026b).

GDP growth can also be related to the exchange rate. In the monetary approach, higher real income raises the demand for domestic money so that, for a given money supply, the domestic currency tends to appreciate(Frenkel, 1976).The relationship is not always unambiguous, because exchange rate changes affect export competitiveness while depreciation raises the cost of imported inputs, so it must be tested empirically. (Rahman et al., 2020) included economic growth together with inflation, interest rates, and the trade balance as determinants of the Rupiah, and the relationship merits re-examination over a longer sample.

Monetary factors, represented here by broad money growth, are also central. According to the quantity theory of money (Fisher, 1911) and the monetary approach (Frenkel, 1976), money growth in excess of output growth raises prices and the domestic currency tends to depreciate. (Prayoga, 2018) found a positive and

significant effect of the money supply on the Rupiah for 2006–2016, in line with this theory, and (Situmorang et al., 2025) found a significant relationship for 2015–2024. (Marina & Amiruddin, 2016), however, found that only inflation was significant in the partial tests while the money supply was not, so the evidence is mixed.

The real interest rate measures the interest rate net of inflation. In the real interest differential model (Frankel, 1979) and in interest rate parity, what matters is the gap between domestic and foreign rates: a higher domestic real rate relative to abroad attracts capital inflows and affects the exchange rate. The World Bank provides a real interest rate indicator for Indonesia (World Bank, 2026b), computed from the lending rate adjusted by the GDP deflator. Because GDP-deflator inflation and consumer price inflation are related, part of the inflation information enters both variables. This study also uses the domestic real rate rather than its gap with the United States, which is acknowledged as a limitation. Evidence on interest rates is itself divided: Ansar et al. (2024) found that inflation and interest rates were significant but the money supply was not (2013–2022), whereas (Mengkilo et al., 2025), who studied US monetary policy and the Rupiah, found that the real interest rate is not always significant. Because their focus and interest rate definitions differ, comparison with this study must be made with care.

Three gaps emerge. First, results on inflation, growth, money, and interest rates remain mixed. Second, several studies use short samples such as 2013–2022 or 2015–2024. Third, most use money in levels or nominal interest rates, whereas this study uses broad money growth and the real interest rate. This study therefore combines monetary and real factors in the monetary approach to the exchange rate (Frankel, 1979)(Frenkel, 1976)(Dornbusch, 1976) which places the money supply, real income, inflation, and interest rates in one exchange rate equation. The 1990–2025 sample covers the Asian crisis, the 2008 global financial crisis, the pandemic, and the recovery, and the use of growth-rate variables with a crisis control, after testing stationarity, is the contribution of the study.

Based on the monetary approach and PPP, and with the dependent variable defined as the Rupiah depreciation rate (an increase means a weaker Rupiah), the hypotheses are:

H1: Inflation has a positive effect on Rupiah depreciation.

H2: GDP growth has a negative effect on Rupiah depreciation (appreciation).

H3: Broad money growth has a positive effect on Rupiah depreciation.

H4: The real interest rate has a negative effect on Rupiah depreciation.

Accordingly, the objective is to analyse the determinants of Rupiah depreciation against the US dollar in 1990–2025 by testing the stationarity of the data first and controlling for the 1998 crisis.

METHODOLOGY

Data and Variables

The study uses annual secondary time series data for Indonesia for 1990–2025 (36 observations) from the World Bank's World Development Indicators (WDI) (World Bank, 2026c): PA.NUS.FCRF (official exchange rate), FP.CPI.TOTL.ZG (inflation), NY.GDP.MKTP.KD.ZG (GDP growth), FM.LBL.BMNY.ZG (broad money growth), and FR.INR.RINR (real interest rate). All series, including 2025 broad money growth and real interest rate, were available in WDI when accessed on 20 October 2026. The approach is quantitative and measures associations, not causality.

Trending time series can produce spurious regressions when variables are non-stationary (Granger & Newbold, 1974). Augmented Dickey–Fuller (ADF) tests (Dickey & Fuller, 1979) are therefore applied to every variable with an intercept and with an intercept and trend. Lag length is chosen by the Schwarz information criterion (maximum four lags), and the statistics are compared with (MacKinnon, 1996)critical values at 5%. The null hypothesis is a unit root.

The dependent variable is the Rupiah depreciation rate (DEP). The independent variables are inflation (INF), GDP growth

(GDPG), broad money growth (BM), and the real interest rate (RIR), plus a 1998 crisis dummy (D98). Table 1 defines the variables.

Table 1
Variable Definitions and Data Sources

Variable (symbol)	Definition and measurement	WDI code
Depreciation (DEP)	Annual percentage change in the official exchange rate (LCU per US$, period average): 100 × Δln NT. Positive values mean a weaker Rupiah.	PA.NUS.FCRF
Inflation (INF)	Inflation, consumer prices (annual %).	FP.CPI.TOTL.ZG
GDP growth (GDPG)	GDP growth (annual %).	NY.GDP.MKTP.KD.ZG
Broad money growth (BM)	Broad money growth (annual %).	FM.LBL.BMNY.ZG
Real interest rate (RIR)	Lending interest rate adjusted for inflation as measured by the GDP deflator (%).	FR.INR.RINR
1998 dummy (D98)	1 for 1998 and 0 otherwise; controls for the extreme crisis observation.	Processed 2026

Source: World Bank (WDI), processed 2026

Model and Estimation

The model is estimated by ordinary least squares (OLS) in EViews 12 (Gujarati & Porter, 2009). OLS on time series shows statistical association, not causality. Based on the stationarity results reported below, the dependent variable is the depreciation rate, and the model is:

$$DEP_t = \beta_0 + \beta_1 INF_t + \beta_2 GDPG_t + \beta_3 BM_t + \beta_4 RIR_t + \beta_5 D98_t + e_t \quad (1)$$

where β0 is the constant, β1–β5 are regression coefficients, e is the error, and t is time. The variables follow the monetary approach to the exchange rate and are supported by earlier empirical work. The D98 dummy is included because 1998 is an extreme observation in a small sample: inflation of 58.45%, GDP growth of −13.13%, a real interest rate of −24.60%, and an exchange rate that jumped from IDR 2,909 to IDR 10,014 per USD.

The t-test examines whether each regression coefficient has a significant effect on the dependent variable (Gujarati & Porter, 2009)at α = 5%: H0 is rejected if the t-statistic exceeds the critical value. The F-test examines the joint significance of the independent variables, which are jointly significant if the probability of the F-statistic is below 0.05. The adjusted R^2 measures the share of variation in the dependent variable explained by the model after accounting for the number of regressors.

Classical assumption tests are a statistical prerequisite for OLS (Gujarati & Porter, 2009), although on non-stationary time series they do not guarantee freedom from spurious regression ((Granger & Newbold, 1974), which is why stationarity is tested first. Normality of the residuals is tested with the Jarque–Bera test (Jarque & Bera, 1980), with residuals normal if the probability exceeds 0.05. Multicollinearity is assessed with the variance inflation factor (VIF), with values above 10 indicating a problem. Heteroskedasticity is tested with the White test , with homoskedasticity not rejected if the probability exceeds 0.05. Serial correlation is tested with the Breusch–Godfrey LM test, with no autocorrelation if the probability exceeds 0.05. Where there is evidence of heteroskedasticity or autocorrelation, inference is supplemented with Newey–West (HAC) standard errors.

RESULT AND DISCUSSION

Results

Descriptive Statistics

Table 2 reports descriptive statistics. The exchange rate in levels (NT) ranges from IDR 1,842.81 to IDR 16,477.87 per USD, with a mean of IDR 9,399.76 and a standard deviation of IDR 4,566.00; the other variables are in percent. The depreciation rate (DEP) averages 6.26% per year with a standard deviation of 22.12 percentage points; its maximum of 123.60% occurred in 1998 and its minimum of −24.28% in 1999. Inflation, money

growth, and the real interest rate also reached their extremes in 1998 (58.45%, 62.76%, and −24.60%), and GDP growth fell to −13.13%. These simultaneous extremes show that 1998 is a highly influential observation.

Table 2
Descriptive Statistics

Variable	Mean	Std. dev.	Min.	Max.
NT (IDR/US $)	9,399.76	4,566.00	1,842.81	16,477.87
DEP (%)	6.26	22.12	−24.28	123.60
INF (%)	8.14	9.44	1.56	58.45
GDPG (%)	4.73	3.56	−13.13	8.22
BM (%)	15.83	11.26	3.50	62.76
RIR (%)	5.48	6.94	−24.60	15.61

Source: World Bank (WDI), processed 2026. N = 36 (DEP: 35 because of differencing).

Stationarity Tests

Table 3 reports the ADF tests. The exchange rate in levels (NT) and its logarithm (ln NT) are non-stationary: the ADF statistics of −1.01 and −1.78 (intercept) and −2.82 and −1.92 (intercept and trend) are higher than the 5% critical values, so the unit root null is not rejected. By contrast, the depreciation rate (DEP = 100 × Δln NT), inflation, GDP growth, money growth, and the real interest rate are stationary at 5% under both specifications.

Table 3
Augmented Dickey–Fuller Unit Root Tests

Variable	ADF (intercept)	ADF (intercept + trend)	5% critical value	Decision
NT	−1.01	−2.82	−2.95 / −3.54	Non-stationary
ln NT	−1.78	−1.92	−2.95 / −3.54	Non-stationary
DEP	−6.14	−6.24	−2.95 / −3.55	Stationary
INF	−4.45	−5.18	−2.95 / −3.54	Stationary
GDPG	−4.36	−4.28	−2.95 / −3.54	Stationary
BM	−4.57	−5.61	−2.95 / −3.54	Stationary
RIR	−5.98	−5.88	−2.95 / −3.54	Stationary

Source: World Bank (WDI), processed 2026. Lag length by the Schwarz criterion (maximum 4 lags); the first critical value is for the intercept specification and the second for intercept and trend. NT is the level of the exchange rate.

The exchange rate is therefore I(1) while the four regressors are I(0). A level regression of the exchange rate on these rate variables is unbalanced in its order of integration and risks spurious regression (Granger & Newbold, 1974). An ADF test on the residuals of the level regression (t = −4.05) also does not reach the 5% Engle–Granger critical value (about −4.4 or more negative) (Engle & Granger, 1987; MacKinnon, 1996), so there is no evidence of cointegration. The main analysis therefore uses the depreciation rate (DEP) as the dependent variable.

Regression Estimates

The depreciation rate (DEP) is the dependent variable, and inflation, GDP growth, broad money growth, and the real interest rate are the independent variables. As a benchmark, the level regression of NT on the four variables (the original specification) gives $R^2 = 0.771$, lower than the R^2 of NT regressed on a time trend alone (0.885), with all four coefficients negative; this is the typical pattern of a spurious regression caused by a non-stationary NT, so the level specification is not used. Table 4 reports two models with DEP as the dependent variable: Model 1 without the crisis dummy and Model 2 with the 1998 dummy (D98). Inference for Model 2 is supplemented with Newey–West (HAC, lag 2) probabilities because of indications of autocorrelation and heteroskedasticity in the classical tests.

Table 4
Regression Results (Dependent Variable: DEP)

Variable	M1 Coef.	M1 Prob.	M2 Coef.	M2 Prob.	M2 HAC Prob.
C	6.233	0.381	2.032	0.713	0.563

Variable	M1 Coef.	M1 Prob.	M2 Coef.	M2 Prob.	M2 HAC Prob.
INF	0.019	0.966	−0.842	0.037	0.070
GDPG	−2.342	0.012	0.288	0.745	0.676
BM	0.949	0.005	0.388	0.162	0.091
RIR	−0.648	0.088	−0.062	0.842	0.839
D98	–	–	148.651	0.000	0.000
R-squared	0.791		0.880		
Adjusted R-squared	0.763		0.860		
F-statistic	28.364		42.676		
Prob(F-statistic)	0.000		0.000		
Durbin-Watson	1.622		1.838		
Observations	35		35		

Source: World Bank (WDI), processed 2026. M1 = Model 1, M2 = Model 2; Prob. = probability from OLS; HAC = Newey–West standard errors (lag 2).

Based on Table 4, Model 2 (the main model) gives:

$$DEP_t = 2.032 - 0.842INF_t + 0.288GDPG_t + 0.388BM_t - 0.062RIR_t + 148.651D98_t + e_t \quad (2)$$

In Model 1, GDP growth has a negative and significant effect on depreciation (coefficient −2.342; probability 0.012), money growth a positive and significant effect (0.949; 0.005), the real interest rate a negative effect significant only at 10% (−0.648; 0.088), and inflation is not significant (0.019; 0.966). The signs for GDP, money, and the real interest rate match the hypotheses. However, Model 1 fails the normality, homoskedasticity, and no-autocorrelation tests (see the classical assumption tests below) and is strongly influenced by the 1998 observation.

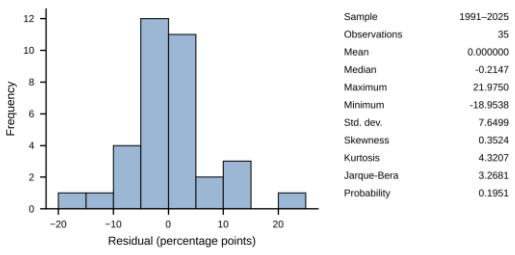
After the 1998 dummy is added (Model 2), the D98 coefficient of 148.651 (probability 0.000) shows that depreciation in 1998 was about 149 percentage points higher than explained by the other variables. With OLS standard errors, inflation has a negative and significant effect at 5% (−0.842; 0.037): a one percentage point rise in inflation is associated with a depreciation rate 0.84 percentage points lower (a relatively stronger Rupiah), contrary to H1. With Newey–West standard errors, the significance of inflation falls to 10% (probability 0.070). GDP growth (0.288; 0.745), money growth (0.388; 0.162), and the real interest rate (−0.062; 0.842) are not significant, so H2, H3, and H4 are not supported in Model 2. The constant (2.032; 0.713) is not significant and is not interpreted.

The F-test for Model 2 gives an F-statistic of 42.676 with Prob(F-statistic) 0.000 < 0.05, so inflation, GDP growth, money growth, the real interest rate, and the crisis dummy are jointly significant. The adjusted R^2 of 0.860 means that about 86% of the variation in depreciation is explained by the model and about 14% by factors outside it. The rise from the adjusted R^2 of Model 1 (0.763) comes mainly from the 1998 dummy, not from the macroeconomic variables. The standard error of the Model 2 regression is 8.28 percentage points, large relative to the mean depreciation rate (6.26%).

Classical Assumption Tests

The classical assumption tests are applied mainly to Model 2. In Model 1 (without D98), the Jarque–Bera (probability 0.003) and White (probability 0.008) tests reject normality and homoskedasticity, and the Breusch–Godfrey test at lag 2 (probability 0.048) indicates autocorrelation, so Model 1 is not suitable for inference.

Normality is tested with the Jarque–Bera test on the model residuals: residuals are normal if the JB probability exceeds 0.05. The result is shown in Figure 2.



Source: World Bank (WDI), processed 2026

Figure 2
Residual Normality Test (Model 2)

Figure 2 shows a Jarque–Bera statistic of 3.268 with a probability of 0.195 > 0.05 (α

= 5%), so the residuals are normally distributed. The residual standard deviation of 7.65 percentage points is large relative to the mean depreciation rate (6.26%), in line with the finding that the fundamentals explain little of the variation outside the 1998 effect.

Heteroskedasticity is tested with the White test, for which the probability should exceed 0.05. The results are in Table 5.

Table 5
White Heteroskedasticity Test (Model 2)

Indicator	Probability	Decision
Prob. F(15,19)	0.3517	> 0.05
Prob. Chi-Square(15) (Obs*R-squared)	0.3191	> 0.05
Prob. Chi-Square(15) (Scaled explained SS)	0.0202	< 0.05

Source: World Bank (WDI), processed 2026

The White test gives a Prob. F of 0.3517 and a Prob. Chi-Square (Obs*R-squared) of 0.3191, both above 0.05, so homoskedasticity is not rejected. However, the Scaled explained SS statistic has a probability of 0.0202 < 0.05, which points to weak heteroskedasticity that is sensitive to extreme observations. Because the evidence is not uniform, inference for Model 2 is supplemented with Newey–West (HAC) standard errors, which are robust to heteroskedasticity and autocorrelation.

Multicollinearity is assessed with the VIF, which should be below 10 for the centered VIF. The results are in Table 6.

Table 6
Multicollinearity Test (Model 2)

Variable	Coefficient variance	Uncentered VIF	Centered VIF
C	29.8522	15.2283	NA
INF	0.1477	11.7138	6.7139
GDPG	0.7664	13.3825	4.8829
BM	0.0734	12.2763	3.8412
RIR	0.0956	3.6988	2.3113
D98	1018.9037	14.8505	14.4262

Source: World Bank (WDI), processed 2026

The four macroeconomic variables have centered VIF values below 10 (highest 6.71 for inflation), so they do not suffer from multicollinearity. The D98 dummy has a centered VIF of 14.43 (> 10); this is natural because a single-observation dummy is mechanically correlated with the extreme values of all regressors in 1998. It may widen the standard error of D98 but does not change the conclusion because D98 remains significant.

Autocorrelation is tested with the Breusch–Godfrey Serial Correlation LM test, for which the probability should exceed 0.05. The results are in Table 7.

Table 7
Breusch–Godfrey Serial Correlation LM Test (Model 2)

Indicator	Probability	Decision
Lag 1: Prob. F(1,28)	0.6184	> 0.05
Lag 1: Prob. Chi-Square(1)	0.5751	> 0.05
Lag 2: Prob. F(2,27)	0.0079	< 0.05
Lag 2: Prob. Chi-Square(2)	0.0051	< 0.05

Source: World Bank (WDI), processed 2026. Durbin–Watson = 1.838.

There is no autocorrelation at lag 1 (Prob. Chi-Square 0.5751 > 0.05), and the Durbin–Watson statistic of 1.838 is close to 2. At lag 2, however, the Prob. Chi-Square is 0.0051 < 0.05, which indicates autocorrelation, possibly because the extreme 1998 depreciation was followed by a correction in 1999 (−24.28%). The conclusion of no autocorrelation therefore holds only at lag 1, and inference for Model 2 is supplemented with Newey–West (HAC) standard errors in Table 4.

Discussions

Inflation

In Model 2, inflation has a negative effect on depreciation, with a coefficient of −0.842 and a probability of 0.037 (OLS) or 0.070 (Newey–West), so it is significant at 5% under OLS standard errors but only at 10% after the HAC correction. Holding other variables constant, a one percentage point rise in inflation is associated with a depreciation rate 0.84 percentage points lower, that is, a relative strengthening of the Rupiah, not the weakening predicted by relative PPP (Cassel, 1918; Krugman et al.,

2018). H1 is therefore not supported. In Model 1 the inflation coefficient is close to zero (0.019; probability 0.966), so the negative sign in Model 2 appears only once the 1998 observation is controlled for. The negative direction is in line with (Angin et al., 2025), who also found a negative and significant effect of inflation on the Rupiah in 2013–2022. (Ansar et al., 2024) found inflation significant in 2013–2022, but the direction is not described in the source cited, so it cannot be compared.

Several explanations are possible. First, policy response: since Bank Indonesia adopted inflation targeting in 2005, policy rates have tended to rise when inflation rises, so inflationary pressure can be followed by Rupiah strengthening or stabilisation. Second, reverse causality: depreciation raises import prices so that inflation responds to the exchange rate and not the reverse (exchange rate pass-through). Third, relative PPP relates depreciation to the inflation differential ($\pi - \pi^*$), whereas this model uses only domestic inflation. Because OLS on time series shows only association, these explanations are not tested formally here.

GDP growth

In Model 2, GDP growth has no significant effect on depreciation (0.288; probability 0.745), so H2 is not supported. This differs from Model 1, where GDP growth has a negative and significant effect (−2.342; probability 0.012): one percentage point higher growth is associated with 2.34 percentage points lower depreciation. The negative sign in Model 1 matches the monetary approach, in which higher real income raises money demand and strengthens the domestic currency (Frenkel, 1976). The difference between the models shows that the negative relationship comes mainly from 1998, when GDP growth of −13.13% coincided with depreciation of about 124%; this single observation is enough to produce a strong negative correlation.

The Balassa–Samuelson hypothesis can serve as secondary support, but it explains the real exchange rate through productivity differentials between tradable and non-tradable sectors across countries (Balassa, 1964), not the nominal exchange rate through GDP growth. Evidence from emerging markets shows that productivity growth differentials contribute to real exchange rate movements and inflation differentials (Verma et al., 2025). Because the dependent variable here is nominal depreciation, the fit with that hypothesis is only indirect. Reverse causality is also possible: the 1998 crisis shows that large depreciation can depress growth, so the direction of the relationship does not run only from growth to the exchange rate, and a single-equation OLS model cannot separate the two effects.

Broad money growth

In Model 2, money growth has no significant effect on depreciation (0.388; probability 0.162 under OLS and 0.091 under Newey–West), although the sign is positive as the quantity theory and the monetary approach predict so H3 is not supported. In Model 1, money growth has a positive and significant effect (0.949; probability 0.005): one percentage point higher money growth is associated with 0.95 percentage points higher depreciation. The Model 1 result is in line with(Prayoga, 2018) , who found a positive effect of the money supply on the Rupiah, but in Model 2 the effect loses significance once 1998 is controlled for; money growth in 1998 reached 62.76%, the highest in the sample, together with the largest depreciation. (Situmorang et al., 2025) found a significant relationship between the money supply and the exchange rate in 2015–2024, but the direction is not described in the source cited, so it cannot be compared with the sign found here. The Model 2 result is consistent with (Marina & Amiruddin, 2016) , who found no significant partial effect of the money supply.

Theoretically, money growth that is not matched by output growth can weaken the domestic currency. Alternative explanations such as financial deepening cannot be verified with this model because it contains no deepening indicator such as the M2/GDP ratio. A more relevant specification limit is that the monetary approach relates the exchange rate to the difference between domestic and foreign money supplies whereas this model has

only domestic money growth, so the effect may not be fully captured.

Real interest rate

In Model 2, the real interest rate has no significant effect on depreciation (−0.062; probability 0.842), so H4 is not supported. In Model 1 the coefficient is negative (−0.648) and significant only at 10% (probability 0.088); this direction is consistent with the real interest differential model. Three remarks apply. First, that theory uses the differential between the domestic and foreign real rates ($r - r^*$), whereas this study uses only the Indonesian real rate. Second, uncovered interest rate parity predicts that a higher domestic rate is followed by expected depreciation, while currency appreciation when rates rise is explained by overshooting, so a negative sign in annual data cannot be taken as direct evidence of UIP. Third, the 1998 real interest rate of −24.60% coincided with the largest depreciation, a single observation that can dominate the coefficient, as the loss of significance after D98 is added suggests. The Model 2 result differs from (Ansar et al., 2024), who found interest rates significant, but agrees with(Mengkilo et al., 2025), who found that the real interest rate is not always significant.In short, in the 1990–2025 sample the domestic real interest rate is not a strong determinant of depreciation once the 1998 crisis is controlled for.

CONCLUSION

The Rupiah exchange rate in levels is non-stationary, while inflation, GDP growth, money growth, and the real interest rate are stationary, so the analysis is conducted on the depreciation rate. Without controlling for the 1998 crisis (Model 1), GDP growth has a negative and money growth a positive and significant effect on depreciation, in line with H2 and H3, whereas inflation is not significant and the real interest rate is significant only at 10%. After the crisis dummy is added (Model 2), GDP growth, money growth, and the real interest rate are insignificant, and only inflation is significant (−0.842; probability 0.037, but 0.070 with Newey–West standard errors), with a negative sign contrary to H1. H1 to H4 are thus not consistently supported by the 1990–2025 data.

The variables are jointly significant (F-statistic 42.676) and explain about 86% of the variation in depreciation (adjusted R^2), but most of this comes from the 1998 dummy. Model 2 satisfies the normality and (for the macroeconomic variables) multicollinearity tests; the White test is passed on the F and Obs*R-squared statistics but not on the Scaled explained SS, and there is no autocorrelation at lag 1 but there is at lag 2, so inference uses Newey–West standard errors. The main limitations are: (i) single-equation OLS on 35 annual observations shows association, not causality; (ii) the sample is dominated by the 1998 crisis; (iii) the original level specification is invalid because the data are non-stationary, so its coefficient signs likely reflect the time trend; and (iv) inflation and the real interest rate are not expressed as differentials with the United States, as PPP and the real interest differential model require.

Policy implications follow from this. Monetary authorities should not rely only on domestic inflation, growth, money growth, and real interest rates to read pressure on the Rupiah, because their relationship with depreciation is unstable and heavily influenced by crisis episodes. Since the largest depreciation occurred during a crisis, policies that sustain market confidence and financial system resilience are important, and the government should maintain sustainable growth. Future research should use higher-frequency (quarterly or monthly) data and dynamic models such as ARDL (Pesaran et al., 2001) or VAR to analyse short-run, long-run, and shock effects, GARCH models for exchange rate volatility, inflation and real interest rate differentials with the United States, and additional variables such as the trade balance and foreign exchange reserves.

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