

# How uncertainty and investment drive Indonesia's exchange rate adjustment: An ECM model approach

Fitriyani<sup>1\*</sup>, Asri Diana<sup>1</sup>, and Anita Faiziah<sup>1</sup>

<sup>1</sup> Universitas Syiah Kuala, Banda Aceh, Indonesia

\*Corresponding author's email: [fitriyani@usk.ac.id](mailto:fitriyani@usk.ac.id)

## Abstract

This study examines how uncertainty shapes the dynamics of the Indonesian rupiah against the US dollar, emphasizing the long-run and short-run adjustment mechanisms that occur within the economy. Using quarterly data from 2000 to 2024, the research employs an Error Correction Model (ECM) to examine the influence of the Indonesia World Uncertainty and investment on the exchange rate. The long-run estimations reveal that investment and uncertainty significantly contribute to movements in the exchange rate. In the short run, changes in investment influence exchange rates, while uncertainty does not have any impact. The ECT is negative and statistically significant, confirming that deviations in the exchange rate gradually return to equilibrium over time. This study highlights that despite the turbulence of global uncertainty, Indonesia's exchange rate dynamics demonstrate a degree of resilience, driven more by domestic fundamentals than by global volatility. These findings hold meaningful implications for policymakers, underscoring the need to strengthen macroeconomic stability and investment performance as anchors of exchange-rate sustainability.

## Keywords

Uncertainty, Exchange rate, ECM model, Indonesia

## Introduction

Exchange rate dynamics occupy a central position in international macroeconomics because they serve as a key transmission channel through which external shocks affect domestic prices, output, and financial stability. For emerging market economies, exchange rate movements often carry amplified consequences due to limited financial depth, exposure to volatile capital flows, and sensitivity to global risk conditions. As a result, identifying the drivers of exchange rate fluctuations and understanding the mechanisms through which deviations from equilibrium are corrected remain critical [1], [2].

Over the past two decades, the Indonesian rupiah has experienced repeated episodes of sharp depreciation and heightened volatility, often coinciding with periods of global financial stress such as the Global Financial Crisis, the taper tantrum, and the COVID-19

**Published:**  
May 04, 2026

This work is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](https://creativecommons.org/licenses/by-nc/4.0/)

Selection and Peer-review under the responsibility of the 7<sup>th</sup> BIS-HSS 2025 Committee

pandemic [3]. Under the asset-market approach, currency values respond not only to current macroeconomic fundamentals but also to changes in returns on domestic and foreign assets. Consequently, shifts in expectations, whether driven by policy signals, financial conditions, or global uncertainty, can lead to immediate movements in exchange rates [4].

Uncertainty has emerged as a critical determinant of macro-financial dynamics. Heightened uncertainty, arising from geopolitical tensions, global financial instability, or policy ambiguity, can alter investor behavior by increasing risk aversion and encouraging precautionary portfolio rebalancing. For emerging economies, such uncertainty shocks often translate into capital outflows and exchange rate depreciation, even in the absence of significant changes in domestic fundamentals [5], [6].

The transmission of uncertainty to exchange rates is closely linked to the risk channel. When global uncertainty rises, investors typically demand higher compensation for holding assets perceived as risky, including those denominated in emerging market currencies. This increase in risk can weaken the exchange rate by reducing demand for domestic assets, thereby reinforcing currency volatility during periods of global stress [2], [7].

However, exchange rate movements are not solely driven by external uncertainty. Domestic fundamentals play a crucial role in shaping currency dynamics. Among these, investment serves a central position because it influences productive capacity, future output growth, and the sustainability of external balances [1].

Recent research on exchange-rate dynamics exchange rates often display high-frequency volatility and abrupt regime changes that are difficult to reconcile with slow-moving macro fundamentals alone. The recent research therefore treats uncertainty as a driver of risk, expectations, and one of the key factors influencing the exchange-rate dynamics. Yet, empirical findings often differ on whether uncertainty exerts primarily short-run effects, long-run effects, or both [5], [6], [8]. Similarly, evidence from emerging markets shows that uncertainty measures such as Economic Policy Uncertainty (EPU) operate as “scapegoat” variables that help rationalize currency movements in both the short and long run, implying that uncertainty may influence not only transitory fluctuations but also more persistent exchange-rate dynamics [9], [10].

Research by [11] using global VAR frameworks finds that spikes in global uncertainty coincide with immediate increases in exchange-rate volatility and depreciation pressure in emerging markets, reflecting “risk-off” reallocations toward safer assets. On the other hand, [12] also found that the effects of uncertainty shocks to different domestic variables are consistent with the supply side of the real-option channel, the demand side of the investment channel, and the precautionary channel. Different studies by [10] using Panel VAR evidence confirms meaningful transmission from EPU to exchange-rate volatility across emerging markets, supporting the interpretation that uncertainty is a systematic driver of exchange-rate risk.

This research is remarkable to be studied as the role of domestic investment is often treated indirectly (e.g., via capital flows or macro controls), rather than being as a core domestic fundamental that may anchor the exchange rate in the presence of global uncertainty. This motivates an ECM-based approach that can identify whether uncertainty shifts the long-run exchange-rate path while investment drives short-run movements and speeds of reversion to equilibrium.

Therefore, this study examines the joint roles of uncertainty and investment in shaping the dynamics of the Indonesian rupiah against the US dollar. By embedding these variables within an ECM framework, the analysis allows for explicit testing of both equilibrium relationships and adjustment mechanisms [13], [14]

Using quarterly data from 2000 to 2024, this study contributes to the literature by providing evidence on how global uncertainty and domestic investment interact to determine exchange rate behavior in Indonesia. These insights carry important policy implications, emphasizing the role of macroeconomic stability and sustained investment performance in supporting long-term exchange rate.

## Method

This study employs a time-series econometric approach to investigate how uncertainty and investment drive the adjustment dynamics of the Indonesian rupiah against the US dollar. The analysis uses an Error Correction Model (ECM) framework. The ECM is used to analyze the long-run equilibrium relationships and short-run dynamic adjustments [13], [14], [15]

This study uses quarterly data from 2000Q1 to 2024Q4, the dependent variable is the nominal exchange rate, measured as the Indonesian rupiah per US dollar and transformed into natural logarithms. Uncertainty is proxied by the Indonesia World Uncertainty Index (WUI), which captures country-specific exposure to global uncertainty derived from textual analysis of Economist Intelligence Unit country reports. Investment is measured by real gross fixed capital formation, expressed in logarithmic.

The ECM framework begins by examining the time-series using Augmented Dickey-Fuller (ADF). Unit root tests are applied to determine whether the series are stationary in levels or first differences. Following the unit root analysis, the existence of a long-run equilibrium relationship among the exchange rate, uncertainty, and investment is tested using the Johansen cointegration method [15].

Conditional on the presence of cointegration, the short-run dynamics are estimated using an ECM derived from the long-run cointegrating relationship. The general ECM specification is given by:

$$\Delta ER_t = \alpha_0 + \sum_{i=1}^p \alpha_1 \Delta ER_{t-i} + \sum_{i=1}^p \alpha_2 \Delta UNC_{t-i} + \sum_{i=1}^p \alpha_3 \Delta INV_{t-i} + \lambda ECT_{t-1} + \varepsilon_t \quad (1)$$

where  $ER_t$  denotes the logarithm of the exchange rate,  $UNC_t$  represents uncertainty,  $INV_t$  denotes investment, and  $\Delta$  is the first-difference operator. The term  $ECT_{t-1}$  is the lagged error correction term obtained from the estimated long-run equation. The coefficient  $\lambda$  captures the speed of adjustment toward long-run equilibrium, with a negative and statistically significant value indicating that deviations from equilibrium are gradually corrected over time.

## Results

The ECM framework enables simultaneous inference on both long-run and short-run relationships. Long-run coefficients reflect the persistent impact of uncertainty and investment on the equilibrium exchange rate, while short-run coefficients capture immediate responses to changes in these variables.

### Long-run estimation results

The long-run estimation results indicate the existence of a stable equilibrium relationship between the rupiah–US dollar exchange rate, investment, and uncertainty. Investment exhibits a positive and highly statistically significant coefficient, implying that higher levels of domestic investment are associated with an appreciation of the rupiah in the long run. This result suggests that capital accumulation strengthens Indonesia’s exchange rate fundamentals by improving productive capacity and long-term growth prospects [Table 1](#).

Table 1. Long-run ECM results

Variable	Coefficient	Std. Error	t-stat.	Prob.
C	-0.124459	0.606847	-0.204485	0.8384
Investment	0.467301	0.029852	15.65375	0.0000****
WUI	0.134238	0.075204	1.784983	0.0774***
R-squared	0.737700			
Adj R-squared	0.515			
F-Stat. (Prob)	140.2659 (0.00000****)			

Note: \*\*\*\*significant at 5%, \*\*\*significant at 10%, \*\*significant at 15%

Uncertainty, proxied by the Indonesia World Uncertainty Index, is also found to be statistically significant in the long run, indicating that persistent global uncertainty conditions affect the equilibrium level of the exchange rate. The positive coefficient implies that prolonged uncertainty episodes exert depreciation pressure on the rupiah, consistent with the notion that global instability raises risk premia demanded by international investors.

The overall goodness-of-fit statistics confirm that the long-run model is well specified, with the joint significance of explanatory variables supported by a highly significant F-statistic. These results provide empirical evidence that both domestic investment and global uncertainty are relevant determinants of Indonesia’s exchange rate equilibrium.

### Short-run dynamics

The short-run ECM results reveal a different pattern of exchange rate adjustment. Changes in investment are found to have a statistically significant effect on short-term exchange rate movements, indicating that fluctuations in domestic investment and related capital flows play a key role in driving short-run rupiah dynamics. In contrast, uncertainty does not exert a statistically significant effect in the short run. This suggests that uncertainty shocks do not immediately translate into exchange rate movements but instead operate through more persistent channels that affect long-run expectations rather than short-term price adjustments [Table 2](#).

**Table 2.** Short-run ECM Results

Variable	Coefficient	Std. Error	t-stat.	Prob.
C	0.002439	0.004997	0.488026	0.6267
Investment	0.361365	0.191675	1.885300	0.0624***
WUI	-0.024883	0.024813	-1.002830	0.3185
ECT	-0.080848	0.038713	-2.088388	0.0394****
R-squared	0.106724			
Adj R-squared	0.078515			
F- Stat. (Prob)	3.783361 (0.012993****)			

Note: \*\*\*\*significant at 5%, \*\*\*significant at 10%, \*\*significant at 15%

The estimated error correction term (ECT) is negative and statistically significant, confirming the presence of a valid long-run equilibrium relationship among the variables. The magnitude of the ECT indicates that deviations from long-run equilibrium are corrected gradually over time, with a portion of disequilibrium eliminated each quarter. This finding confirms that short-run misalignments in the exchange rate are not permanent and that adjustment mechanisms are active in restoring equilibrium.

### Discussion

The results highlight the long-run and short-run determinants of Indonesia's exchange rate dynamics. This reveals that while uncertainty significantly influences the exchange rate in the long run, its short-run effect is statistically insignificant, whereas investment plays a decisive role in both short-run and long-run.

The long-run significance of uncertainty supports the view that persistent global uncertainty affects exchange rates. This result is consistent with empirical evidence showing that sustained uncertainty alters investors' long-term assessments of macroeconomic stability and expected returns [5], [6]. In emerging markets, where capital flows are highly sensitive to shifts in global risk sentiment, prolonged uncertainty episodes can become embedded in exchange rate fundamentals rather than remaining transitory shocks [8]. In contrast, the absence of a short-run uncertainty effect suggests that Indonesia's exchange rate does not respond immediately to uncertainty shocks. This finding aligns with studies explaining the delayed or indirect transmission of uncertainty to exchange rates, particularly in economies with active policy interventions [16].

Furthermore, investment emerges as a key driver of exchange rate movements both in short-run and long-run. The significant short-run impact of investment changes likely reflects capital flow dynamics, financing conditions, and shifts in investor confidence associated with investment activity. Moreover, the long-run positive relationship between investment and the exchange rate further underscores the importance of domestic fundamentals as stabilizing anchors. This finding is consistent with study by [17], [18] that investment shapes exchange rate equilibrium by signalling economic strength and attracting inflows

Therefore, global uncertainty matters, while domestic investment dynamics dominate short-run movements and contribute to long-run stability. These results highlight the relative importance of domestic fundamentals over transitory global volatility, reinforcing the argument that emerging market exchange rates are not solely driven by external shocks but also by internal economic strength.

## Conclusion

This study investigates how uncertainty and investment drive the adjustment dynamics of the Indonesian rupiah against the US dollar by employing an Error Correction Model (ECM) using quarterly data from 2000 to 2024. The analysis explicitly distinguishes between long-run equilibrium relationships and short-run dynamics, allowing for a comprehensive assessment of exchange rate behavior under global uncertainty. The empirical results show that both investment and uncertainty significantly influence the exchange rate in the long run, indicating that Indonesia's exchange rate equilibrium reflects an interaction between domestic real-sector fundamentals and global financial conditions. In contrast, short-run exchange rate movements are driven primarily by changes in investment, while uncertainty does not exert an immediate effect. The negative and statistically significant error correction term confirms the existence of a stable long-run relationship and demonstrates that deviations from equilibrium are gradually corrected over time.

This study implies that strengthening macroeconomic stability and sustaining productive investment are critical for maintaining exchange rate sustainability. While global uncertainty is largely exogenous, its long-run impact can be mitigated by credible policies and robust domestic fundamentals. Future research may extend this framework by incorporating additional financial variables, nonlinear dynamics, or comparative cross-country analysis to further explore exchange rate adjustment under uncertainty.

## Acknowledgement

The author gratefully acknowledges the financial support provided by Universitas Syiah Kuala (USK) through the Institute for Research and Community Service (LPPM USK for the Lecturer Research Grant (2025), Contract Number 522/UN11.L1/PG.01.03/14999-

PTNBH/2025. The author also appreciates the institutional support and research facilities provided by Universitas Syiah Kuala that contributed to the completion of this study.

## References

1. M. Obstfeld, J. C. Shambaugh, and A. M. Taylor, "The trilemma in history: Tradeoffs among exchange rates, monetary policies, and capital mobility," *Review of Economics and Statistics*, vol. 87, no. 3, pp. 423–438, 2005, doi: 10.1162/0034653054638300.
2. P. R. Krugman, M. Obstfeld, and M. J. Melitz, *International Economics: Theory & Policy*. 2016. [Online]. Available: [http://www.biblioteca.pucminas.br/teses/Educacao\\_PereiraAS\\_1.pdf](http://www.biblioteca.pucminas.br/teses/Educacao_PereiraAS_1.pdf)[http://www.anpocs.org.br/portal/publicacoes/rbcs\\_00\\_11/rbcs11\\_01.htm](http://www.anpocs.org.br/portal/publicacoes/rbcs_00_11/rbcs11_01.htm)[http://repositorio.ipea.gov.br/bitstream/11058/7845/1/td\\_2306.pdf](http://repositorio.ipea.gov.br/bitstream/11058/7845/1/td_2306.pdf)<https://direitofma2010.files.wordpress.com/2010/>
3. C. M. Basri and S. Rahardja, "The Global Financial Crisis and Asian Economies: Impacts and Trade Policy Responses," *ASEAN Econ Bull*, vol. 27, no. 1, pp. 77–97, 2010, doi: 10.1355/ae27-le.
4. R. Dornbusch, "Expectations and Exchange Rate Dynamics," *Journal of Political Economy*, vol. 84, no. 6, pp. 1161–1176, 1976.
5. N. Bloom, "The Impact of Uncertainty Shocks," *Econometrica*, vol. 77, no. 3, pp. 623–685, May 2009, doi: 10.3982/ecta6248.
6. S. R. Baker et al., "Measuring Economic Policy Uncertainty," no. March, 2016.
7. P. R. Lane and G. M. Milesi-Ferretti, "The external wealth of nations mark II: Revised and extended estimates of foreign assets and liabilities, 1970-2004," 2007. doi: 10.1016/j.jinteco.2007.02.003.
8. H. Ahir, N. Bloom, and D. Furceri, "The World Uncertainty Index," Cambridge, Feb. 2022. Accessed: May 13, 2025. [Online]. Available: <https://worlduncertaintyindex.com>
9. A. Abid, "Economic policy uncertainty and exchange rates in emerging markets: Short and long runs evidence," *Financ Res Lett*, vol. 37, p. 101378, 2020, doi: 10.1016/j.frl.2019.101378.
10. A. Abid and C. Rault, "On the Exchange Rates Volatility and Economic Policy Uncertainty Nexus: A Panel VAR Approach for Emerging Markets," *Journal of Quantitative Economics*, vol. 19, no. 3, pp. 403–425, 2021, doi: 10.1007/s40953-021-00240-4.
11. H. G. Keefe and S. Saha, "Global Uncertainty and Exchange Rate Conditions: Assessing the Impact of Uncertainty Shocks in Emerging Markets and Advanced Economies," 2023. [Online]. Available: <https://ssrn.com/abstract=4670637>
12. M. Bicchal and S. Raja Sethu Durai, "Assessing Macroeconomic Uncertainties for an Emerging Economy," Tokyo, 1124, Apr. 2020. Accessed: May 14, 2025. [Online]. Available: <https://www.adb.org/publications/assessing-macroeconomic-uncertainties-emerging-economy>
13. R. F. ; Engle and C. W. J. Granger, "Co-Integration and Error Correction : Representation, Estimation, and Testing," *Econometrica*, vol. 55, no. 2, pp. 251–276, 1987.
14. S. Johansen, "Statistical analysis of cointegration vectors," *J Econ Dyn Control*, vol. 12, pp. 231–254, 1988, doi: 10.1016/0165-1889(88)90041-3.
15. W. Enders, *Applied Econometric Times Series: Student's Resource Guide to Accompany*. 2010. [Online]. Available: <http://books.google.com/books?id=uu-CngEACAAJ&pgis=1>
16. L. Chen, Z. Du, and Z. Hu, "Impact of economic policy uncertainty on exchange rate volatility of China," *Financ Res Lett*, vol. 32, no. 109, pp. 1–5, 2020, doi: 10.1016/j.frl.2019.08.014.
17. F. S. Ramadhani, Abd. Rahim, S. Astuty, D. R. D. Hastuti, and I. Irwandi, "Analysis of Factors Affecting Exchange Rate Fluctuations in Indonesia," *International Journal of Economics and Management Sciences*, vol. 2, no. 1, pp. 423–432, 2025, doi: 10.61132/ijems.v2i1.605.
18. M. Adnan, R. Meutia, and U. Ulya, "Analysis of the Rupiah Exchange Rate in Indonesia," in *Navigating teh Future Challenges in Liter acy: Islamic Economics, Business, and Public Policy Perspective*, 2024, pp. 656–673.