

GEOPOLITICAL RISK AND MACROECONOMIC VARIABLES ON RUPIAH EXCHANGE RATE DYNAMICS IN INDONESIA: EVIDENCE FROM 2020-2025

Meuthia Nurul Soraya^{1*}, Dede Ruslan², Eko Wahyu Nugrahadi³

¹Postgraduate Program in Economics, Universitas Negeri Medan, Medan, Indonesia

²Faculty of Economics, Universitas Negeri Medan, Medan, Indonesia

³Faculty of Economics, Universitas Negeri Medan, Medan, Indonesia

E-mail: Mutianurulsoraya@gmail.com, Drasruslan@unimed.ac.id

Received: 01/06/2026 | Revised : 11/06/2026 | Accepted: 05/07/2026 | Published :20/07/2026

Abstract

This study analyzes the effect of geopolitical risk and macroeconomic variables on the dynamics of the rupiah exchange rate in Indonesia during 2020-2025. The variables comprise the rupiah exchange rate, geopolitical risk, inflation, interest rate, world oil price, and foreign exchange reserves. Monthly secondary data were examined using the Vector Error Correction Model (VECM), supported by the Phillips-Perron unit root test, optimal lag selection, VAR stability test, Johansen cointegration test, Impulse Response Function (IRF), Forecast Error Variance Decomposition (FEVD), and Block Exogeneity Wald Test. The findings show two cointegrating relationships, indicating a long-run equilibrium among the variables. In the short run, geopolitical risk significantly affects rupiah exchange rate dynamics. In the long run, inflation, interest rate, world oil price, and foreign exchange reserves are associated with the rupiah exchange rate. IRF results indicate that geopolitical risk shocks initially generate a negative response, then a positive response, before gradually stabilizing. FEVD results show that in the tenth period, rupiah exchange rate variation is mainly explained by its own shock (71.52%), followed by geopolitical risk (14.01%) and world oil price (12.81%).

Keywords: Foreign Exchange Reserves; Geopolitical Risk; Macroeconomic Variables; Rupiah Exchange Rate; VECM.

INTRODUCTION

The exchange rate is a strategic indicator in an open economy because it reflects macroeconomic stability and influences monetary policy, fiscal policy, international trade, investment decisions, and external resilience. In Indonesia, where the rupiah moves under a floating exchange rate system, the value of the domestic currency is determined by demand and supply in the foreign exchange market. This makes the rupiah sensitive not only to domestic fundamentals but also to external shocks that alter global investor expectations and capital flows (Mankiw, 2010; Warjiyo & Juhro, 2020).

During the 2020-2025 period, the rupiah experienced substantial pressure. The data show that depreciation began to intensify in March 2020, a period associated with the COVID-19 shock, and became more persistent from the end of 2022 to 2025. This pattern is consistent with the argument that exchange rate movements in emerging economies are vulnerable to global uncertainty, commodity price changes, and changes in international financial conditions (Candra et al., 2024).

One external factor that has become increasingly relevant is geopolitical risk. Geopolitical risk refers to threats or tensions related to war, terrorism, international political conflict, and strategic competition among countries. Caldara and Iacoviello (2022) explain that geopolitical risk can be measured through the intensity of newspaper coverage related to adverse geopolitical events. When geopolitical risk rises, investors tend to move funds toward safe-haven assets, especially the US dollar, which can place depreciation pressure on emerging market currencies. This mechanism is important for Indonesia because global geopolitical events can affect portfolio flows, commodity prices, and foreign exchange expectations.

Nevertheless, the exchange rate is not determined only by non-economic shocks. Inflation, interest rates, world oil prices, and foreign exchange reserves also shape exchange rate dynamics through purchasing power, capital flows, trade costs, and central bank intervention capacity. The empirical issue addressed in this study is whether geopolitical

risk has a distinct role in rupiah exchange rate dynamics after considering these macroeconomic fundamentals. Therefore, this article aims to examine the short-run and long-run effects of geopolitical risk and macroeconomic variables on the rupiah exchange rate in Indonesia using monthly data from 2020 to 2025 and a VECM-based empirical framework.

LITERATURE REVIEW

Exchange Rate Determination

Exchange rate determination can be explained through several open-economy approaches. Purchasing Power Parity (PPP) states that exchange rate movements are related to relative price levels across countries. In its relative form, PPP implies that the currency of a country with higher inflation tends to depreciate in the long run because its purchasing power declines relative to foreign currencies. Warjiyo and Juhro (2020) describe PPP as an early theoretical foundation of exchange rate determination based on the law of one price and international goods arbitrage.

Another relevant approach is the Mundell-Fleming model, which links the goods market, money market, and foreign exchange market in an open economy. Under flexible exchange rates, monetary expansion may lower domestic interest rates, encourage capital outflow, and lead to currency depreciation. Conversely, a higher interest rate can attract capital inflows and strengthen the domestic currency, although the effect depends on capital mobility, expectations, and risk conditions (Mankiw, 2010; Warjiyo & Juhro, 2020).

Geopolitical Risk and Exchange Rate Dynamics

Geopolitical risk is a form of external uncertainty that can influence economic activity, financial markets, and exchange rates. Caldara and Iacoviello (2022) show that higher geopolitical risk is associated with weaker economic activity and greater uncertainty. In financial markets, geopolitical shocks may increase risk aversion and lead investors to reallocate portfolios from emerging market assets into safer currencies and assets.

Empirical studies provide support for this channel. Khaliq (2022) finds that both global and country-specific geopolitical risk can predict rupiah-US dollar exchange rate volatility, with Indonesia-specific risk having stronger predictive power. Yilmazkuday (2025) also reports that geopolitical risk affects exchange rates across countries, especially when the analysis controls for oil prices, inflation, and other macroeconomic variables. These findings suggest that geopolitical risk should be considered together with domestic macroeconomic fundamentals when analyzing exchange rate movements.

Macroeconomic Fundamentals

Inflation affects exchange rates through the purchasing power channel. A sustained increase in domestic prices reduces the relative value of the domestic currency and may weaken the exchange rate in the long run. Interest rates influence exchange rates through the return on domestic financial assets and the direction of capital flows. Higher interest rates can support the domestic currency if they increase the attractiveness of domestic assets, but the effect may be weakened when uncertainty is high (Mankiw, 2010; Mishkin, 2019).

World oil prices influence exchange rates through trade balances, production costs, inflation expectations, and external financing needs. Beckmann, Czudaj, and Arora (2020) emphasize that the relationship between oil prices and exchange rates is theoretically and empirically important. For Indonesia, Narayan, Falianty, and Tobing (2019) show that oil price movements are relevant to exchange rate dynamics. Foreign exchange reserves also matter because they provide central bank liquidity to stabilize the currency during external shocks. The IMF (2005) explains that foreign exchange reserves are used to support confidence, external transactions, and exchange rate stability.

METHOD

This study uses a quantitative empirical design with monthly time-series data for Indonesia from January 2020 to December 2025. The dependent variable is the rupiah exchange rate against the US dollar, while the independent variables are global geopolitical risk, inflation, interest rate, world oil price, and foreign exchange reserves. The data were collected from Bank Indonesia, Badan Pusat Statistik, Investing.com, and the geopolitical risk index database developed by Caldara and Iacoviello.

The research model applies Vector Autoregression (VAR) and Vector Error Correction Model (VECM). VAR is appropriate for examining dynamic interactions among endogenous time-series variables, while VECM is used when the variables are integrated of order one and have cointegrating relationships. The empirical procedure begins with the Phillips-Perron unit root test, continues with optimal lag selection, VAR stability testing, Granger causality/Block Exogeneity Wald Test, Johansen cointegration testing, VECM estimation, IRF analysis, and FEVD analysis (Stock & Watson, 2001).

Table 1. Operational Definition and Data Sources

Code	Variable	Operational Definition	Data Source
LKURS	Rupiah exchange rate	Nominal rupiah exchange rate against the US dollar, transformed into logarithmic form.	Bank Indonesia
LGPR	Geopolitical risk	Global geopolitical risk index based on news coverage of war, terrorism, and international political tension, transformed into logarithmic form.	matteoiacoviello.com
INF	Inflation	Monthly inflation rate derived from the Consumer Price Index.	Badan Pusat Statistik
SB	Interest rate	Monthly policy rate represented by BI Rate/BI-7 Day Reverse Repo Rate.	Bank Indonesia
LOIL	World oil price	Monthly Brent crude oil closing price per barrel, transformed into logarithmic form.	Investing.com
LCD	Foreign exchange reserves	Official foreign exchange reserves held by the monetary authority, transformed into logarithmic form.	Bank Indonesia

The VECM framework is selected because the empirical results indicate that most variables are non-stationary at level but stationary at first difference, and Johansen testing confirms cointegrating relationships. In general form, the VECM represents the short-run changes in the endogenous variables as a function of lagged changes and the error correction term. The error correction coefficient measures the speed at which deviations from long-run equilibrium are corrected.

RESULTS AND DISCUSSION

Pre-estimation Tests

The Phillips-Perron unit root test shows that LKURS, LGPR, SB, LOIL, and LCD are not stationary at level, while INF is stationary at level. After first differencing, all variables become stationary. This result indicates that the variables can be analyzed within a VAR first-difference framework, and VECM can be applied when cointegration is present.

The optimal lag test indicates that lag 1 is the most appropriate lag length because four selection criteria support this lag. The VAR stability test also confirms that all modulus values are below one, meaning that the model satisfies the stability condition and can be used for Johansen cointegration, VECM, IRF, and FEVD analysis.

Table 2. Summary of Preliminary Tests

Test	Main Finding	Interpretation
Unit root test	Most variables are non-stationary at level; all variables are stationary at first difference.	The variables meet the integration requirement for cointegration-based modeling.
Optimal lag	Lag 1 is selected by four criteria.	Lag 1 is used in the Johansen cointegration and VECM estimation.
VAR stability	All modulus values are below one.	The dynamic model is stable and suitable for further analysis.
Block Exogeneity Wald Test	GPR, interest rate, and oil price significantly affect the rupiah exchange rate.	Exchange rate dynamics are sensitive to geopolitical risk, monetary policy, and energy-market shocks.

Cointegration and VECM Estimation

The Johansen cointegration test confirms the existence of two cointegrating relationships. In the Trace Test, the null hypothesis of no cointegration is rejected because the Trace Statistic for "none" is 136.3228 with probability 0.0000, and the statistic for "at most 1" is 75.04248 with probability 0.0180. In the Maximum Eigenvalue Test, the corresponding results also indicate two cointegrating equations. These findings show that the rupiah exchange rate, geopolitical risk, inflation, interest rate, world oil price, and foreign exchange reserves have a long-run equilibrium relationship.

The long-run VECM estimation indicates that inflation, interest rate, world oil price, and foreign exchange reserves are statistically significant in explaining the rupiah exchange rate. Inflation and interest rate have significant long-run relationships with LKURS, while world oil price is also significant and operates as an important external variable. Foreign exchange reserves are significant, confirming that reserve adequacy is relevant to exchange rate stability.

In the short run, the lag of geopolitical risk is significant for LKURS with a t-statistic of -2.37185. The lag of foreign exchange reserves is also significant with a t-statistic of -2.73768. By contrast, the short-run lags of inflation, interest rate, and oil price are not statistically significant. This means that geopolitical risk and reserve movements are more immediate drivers of rupiah exchange rate adjustment, whereas the other macroeconomic variables operate more strongly in the long run.

Table 3. Main VECM and FEVD Findings

Aspect	Empirical Result	Meaning
Cointegration	Two cointegrating relationships are found.	There is a long-run equilibrium among exchange rate, geopolitical risk, and macroeconomic variables.
Short-run effect	D(LGPR(-1)) is significant for D(LKURS), with t-statistic -2.37185.	Geopolitical risk affects rupiah exchange rate dynamics in the short run.
Foreign exchange reserves	D(LCD(-1)) is significant for D(LKURS), with t-statistic -2.73768.	Reserve movement contributes to short-run exchange rate adjustment.
Long-run macro fundamentals	Inflation, interest rate, oil price, and reserves are significant in the long run.	Macroeconomic fundamentals shape long-run rupiah exchange rate stability.
FEVD period 10	Own shock 71.52%; geopolitical risk 14.01%; oil price 12.81%; inflation, interest rate, and reserves relatively small.	Exchange rate variation remains dominated by internal shock, but external geopolitical and energy shocks are important.

Impulse Response Function and FEVD

The IRF analysis focuses on the response of variables to a shock in geopolitical risk. The rupiah exchange rate initially responds negatively in the early period, then the response turns positive and reaches its highest point around the fifth period before gradually stabilizing. This pattern indicates that geopolitical risk shocks can create short-run exchange rate pressure before the system adjusts toward a more stable path.

Inflation responds positively to geopolitical risk shocks in the early periods, implying that geopolitical uncertainty can transmit to domestic price dynamics through supply disruption, commodity prices, and exchange rate channels. The interest rate response is relatively small but persistent, which may reflect gradual monetary policy adjustment. Oil prices respond positively and quickly, while foreign exchange reserves respond negatively, indicating that geopolitical risk can increase energy-market pressure and reduce reserve buffers.

The FEVD results reinforce the IRF findings. In the first period, rupiah exchange rate variation is fully explained by its own shock. By the tenth period, own shock still explains the largest share at 71.52%, but geopolitical risk contributes 14.01% and world oil price contributes 12.81%. Inflation, interest rate, and foreign exchange reserves contribute relatively small shares. This result implies that exchange rate dynamics are not driven solely by domestic macroeconomic variables, but also by external uncertainty and global energy-market shocks.

Discussion

The significant short-run effect of geopolitical risk supports the flight-to-quality argument. When global political uncertainty rises, international investors tend to reduce exposure to riskier emerging market assets and shift toward safe-haven assets. This behavior changes capital flows and foreign exchange demand, thereby affecting the rupiah. The finding is consistent with Caldara and Iacoviello (2022), who emphasize the macroeconomic relevance of geopolitical risk, and with Khaliq (2022), who finds that geopolitical risk predicts rupiah-US dollar exchange rate volatility.

The long-run significance of inflation is in line with PPP theory. Inflation affects the purchasing power of the domestic currency and, over time, can influence exchange rate equilibrium. However, the relatively small FEVD contribution of inflation suggests that during the 2020-2025 period, rupiah fluctuations were more strongly associated with direct exchange rate shocks and external variables than with inflation alone. This reflects the complex nature of exchange rate formation in an open economy facing global uncertainty.

Interest rate significance in the long run supports the open-economy monetary transmission channel. A change in the policy rate influences the return on rupiah-denominated assets and can shape capital flows. Nevertheless, its limited short-run contribution suggests that monetary policy may not immediately offset external risk shocks when investor sentiment is dominated by geopolitical uncertainty or oil-market volatility. Therefore, interest rate policy should be complemented by credible communication, reserve management, and broader macroeconomic coordination.

World oil price is an important determinant because energy prices affect import costs, inflation expectations, fiscal pressure, and the trade balance. The FEVD contribution of 12.81% shows that oil-market shocks are among the most relevant external factors for the rupiah after geopolitical risk. This is consistent with Beckmann et al. (2020) and Narayan et al. (2019), who highlight the relationship between oil prices and exchange rates. For Indonesia, oil price movements can influence exchange rate expectations through energy import payments and inflationary pressures.

Foreign exchange reserves are also significant because they represent the capacity of the monetary authority to intervene in the foreign exchange market and maintain confidence. The short-run significance of reserves indicates that reserve movement is directly connected with exchange rate stabilization. However, the small FEVD contribution suggests that reserves function more as a stabilizing buffer than as the primary source of exchange rate fluctuation. This supports the IMF (2005) view that reserves are important for liquidity, confidence, and external stability.

CONCLUSION

This study concludes that geopolitical risk and macroeconomic variables jointly explain the dynamics of the rupiah exchange rate in Indonesia during 2020-2025. The Johansen cointegration test confirms two long-run equilibrium relationships, making VECM an appropriate method. In the short run, geopolitical risk significantly affects rupiah exchange rate dynamics, while foreign exchange reserves also contribute to short-run adjustment. In the long run, inflation, interest rate, world oil price, and foreign exchange reserves are associated with rupiah exchange rate stability.

IRF analysis shows that geopolitical risk shocks produce a dynamic response in the rupiah exchange rate and other macroeconomic variables. FEVD analysis further shows that although exchange rate variation is dominated by its own shock, geopolitical risk and world oil price are the most important external contributors by the tenth period. The policy implication is that rupiah stabilization requires not only sound domestic macroeconomic fundamentals, but also systematic monitoring of global geopolitical risk and energy-market developments. Future research may extend the sample period, include domestic political risk or global monetary policy variables, and compare VECM findings with alternative econometric models.

REFERENCES

- Beckmann, J., Czudaj, R. L., & Arora, V. (2020). The relationship between oil prices and exchange rates: Revisiting theory and evidence. *Energy Economics*, 88, 104772. <https://doi.org/10.1016/j.eneco.2020.104772>
- Bekaert, G., & Hodrick, R. (2012). *International financial management* (2nd ed.). Pearson Education.
- Bloom, N. (2009). The impact of uncertainty shocks. *Econometrica*, 77(3), 623-685. <https://doi.org/10.3982/ECTA6248>
- Caldara, D., & Iacoviello, M. (2022). Measuring geopolitical risk. *American Economic Review*, 112(4), 1194-1225. <https://doi.org/10.1257/aer.20191823>
- Candra, R. P., Wulandari, T., Septian, D., Asderi, E., & Hayatulmillah, N. S. (2024). Perbandingan nilai tukar rupiah terhadap dollar AS tahun 2022-2023. *Jurnal Multidisiplin West Science*, 3(10), 1526-1531. <https://doi.org/10.58812/jmws.v3i10.1388>
- Connolly, M. (2007). *International business finance*. Routledge.
- Dodds, K. (2007). *Geopolitics: A very short introduction*. Oxford University Press.
- International Monetary Fund. (2005). *Guidelines for foreign exchange reserve management*. International Monetary Fund. <https://doi.org/10.5089/9781589062610.069>
- International Monetary Fund. (2009). *Balance of payments and international investment position manual* (6th ed.). International Monetary Fund.

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- Khalik, A. (2022). Global and country-specific geopolitical risks and exchange rate volatility: New empirical evidence from Indonesia. *Jurnal Ekonomi Kuantitatif Terapan*, 15(2), 225. <https://doi.org/10.24843/JEKT.2022.v15.i02.p05>
- Kumar, S., & Rao, A. (2024). Assessing and mitigating the impact of geopolitical risk uncertainty on the Indian financial sector: A policy perspective. *Buletin Ekonomi Moneter dan Perbankan*, 27(3), 483-526. <https://doi.org/10.59091/2460-9196.2278>
- Mankiw, N. G. (2010). *Macroeconomics* (7th ed.). Worth Publishers.
- Mishkin, F. S. (2019). *The economics of money, banking, and financial markets* (Global ed.). Pearson Education.
- Narayan, S. W., Falianty, T., & Tobing, L. (2019). The influence of oil prices on Indonesia's exchange rate. *Buletin Ekonomi Moneter dan Perbankan*, 21(3), 303-322. <https://doi.org/10.21098/BEMP.V21I3.1007>
- Stock, J. H., & Watson, M. W. (2001). Vector autoregressions. *Journal of Economic Perspectives*, 15(4), 101-115.
- Warjiyo, P., & Juhro, S. M. (2020). *Kebijakan bank sentral: Teori dan praktik*. Rajawali Pers.
- Yilmazkuday, H. (2025). Geopolitical risks and exchange rates. *Finance Research Letters*, 74, 106769. <https://doi.org/10.1016/j.frl.2025.106769>