ISSN: 3047-4108 P-ISSN: 3048-3751
Journal Economic Business Innovation - JEBI, Vol. 02, Issue.3, 2025, Page. 374-386
DOI: https://doi.org/10.69725/jebi.v2i3.312

Foreign Reserves or Interest Rates? Exchange Rate Determinants and Risk Management in Indonesia Instant Noodle Industry

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ARTICLE INFO

Article history:
Accepted 10 August, 2025
Revised 10 Sept, 2025
Publication 10 Oct, 2025

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Keywords:
Exchange rates, foreign exchange reserves, interest rate, risk management, macroeconomic stability

A B S T R A C T

Purpose: The focus of this research is on analyzing the relative role of external buffers and policy tools in determining exchange rate dynamics and assessing their implications for risk management particularly in import-dependent manufacturing sectors. The study attempts to determine the main macroeconomic factor that influences currency dynamics by contrasting the impacts of foreign exchange reserves and policy interest rates.
Method: The research is quantitative in nature, based on the analysis of secondary macro-economic data and an integrated structural modeling framework. Several macroeconomic factors are jointly considered to account for their direct influence on exchange rates, whilst focusing more on the strength of the effect, variance explanation or predictive capability than stand-alone significance.
Findings: The findings suggest that in terms of the effect on exchange rate, both foreign exchange reserves and the policy interest rate are consistent with their directional movements, implying stabilizing roles in the macroeconomic system. But on the whole, our results indicate that exchange rate behavior depends on a combination of monetary conditions, external buffers and global commodity driven pressures as opposed to one major policy instrument.
Novelty: This paper is a novel contribution to the literature by taking a comparative approach on both external and monetary policy mechanisms in an integrated framework, with a clear focus of exchange rate dynamics hinged upon the risk factors and import dependant sectors.
Implications: The results have implications for policy in the configuration of symmetric exchange rate stabilization strategies, and guiding tools which are useful for real firms to navigate currency exposure in a context of volatility in the global economy.

1. Introduction

Many developing countries still consider exchange rate stability to be a primary objective, as it remains crucial for macroeconomic performance, trade competitiveness, and financial stability. For Indonesia, an open capital account means that the exchange rate is sensitive to both domestic policies

ISSN: 3047-4108 P-ISSN: 3048-3751
Journal Economic Business Innovation - JEBI, Vol. 02, Issue.3 2025, Page; 162-386
DOI: https://doi.org/10.69725/jebi.v2i3.312

and external shocks. Recent research published by (Bazot et al., 2022; Rey, 2025; van der Hoeven, 2019), highlights that the post-pandemic world is characterized by a number of key factors that contribute to increased exchange rate variability in emerging markets. These factors include post-pandemic uncertainty, the global monetary tightening cycle in advanced economies, and commodity price volatility followed by exchange rate changes. As a result, the main factors affecting exchange rate dynamics are increasingly relevant to policymakers and risk-sensitive industries.

With regard to key macroeconomic determinants, foreign exchange reserves are essential for effectively stabilizing exchange rate volatility, as they convey information about external solvency and strengthen the central bank's intervention capacity. Studies based on repeated real-world examples have found that having more foreign exchange reserves in banks reduces depreciation pressure and reduces speculative attacks, especially when a global financial crisis hit (Ahmed et al., 2023; Aizenman et al., 2024). In emerging markets, foreign exchange reserves serve not only as a preventive measure, but also as a strategic policy tool for managing expectations. Recent debates have caused the moon to lose some of its luster. This is due to the reduced effectiveness of foreign exchange reserves, especially in terms of reversing capital flows. This has raised questions about the position of the moon compared to interest rate policy (Choi & Douady, 2012; Sonu et al., 2017).

Interest rates are another important factor affecting exchange rates, with their impact felt through interest rate differentials and capital flows. According to the interest rate parity (IRP) and portfolio balance models, higher domestic interest rates imply capital inflows and currency appreciation. Monetary policy tightening appears to be an effective way to change exchange rates, as recent findings suggest (El Melki & Ben Salah Saidi, 2023; Naifar, 2025; Renzhi & Beirne, 2025; Swoboda, 1973; Wasiu Omotayo et al., 2025). This is especially true in contexts where the primary goal is to control inflation. However, the impact of interest rates may be reduced in a context of synchronized global tightening, where the consequences for the economy can be significant, particularly in relation to domestic policy signals. A comparative perspective is needed on the role of interest rates and reserves as exchange rate stabilizers, given the changing environment.

Exchange rates are not only influenced by core policies; macroeconomic fundamentals and global supply forces also play a role. Purchasing power is eroded by inflation differentials, which also exert downward pressure on exchange rates. Trade balance performance reflects external demand conditions (Corsetti et al. 2021; Forbes et al. 2023; Lane 2024). In addition, global commodity prices, particularly for food and energy, have risen due to supply chain disruptions and geopolitical issues. Price shocks transmitted through exchange rates, current accounts, and producer price inflation have a particularly large impact on economies that are dependent on imports of goods (Baumeister & Kilian, 2023; Caldara et al., 2022; UNCTAD, 2024).

Although there are many studies on exchange rate determinants, there are still many weaknesses. Some studies directly compare the importance of foreign exchange reserves and interest rates in a single empirical framework using post-COVID data. Second, most studies in this field discuss macroeconomic responses without linking exchange rate dynamics to the exposure of specific sectors to international price shocks, particularly in the manufacturing sector, which competes with imports. It is important to note that the reviewed literature contains methodological weaknesses. Many studies use single-equation time series models, which may ignore significant interdependencies between macroeconomic variables (Sarno & Taylor, 2022; Pesaran, 2023; Hair et al., 2024).

The objective of this paper is to determine whether exchange rate movements are more influenced by external factors or monetary policy instruments. This approach considers various macroeconomic determinants simultaneously, focusing on their relative contributions, the strength of their effects, and their predictive implications, rather than just their individual significance. This study contributes to the exchange rate literature by providing insights into the coordination of foreign exchange reserves and interest rate policies within an integrated macroeconomic framework, as

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demonstrated by this integrated analytical approach. The results have two main implications. First, these results are relevant for exchange rate management. Second, these results have practical consequences for industries that are highly sensitive to risks arising from significant currency fluctuations and increasing uncertainty in the global economy.

2. Literature Review

2.1 Foreign exchange reserves and exchange rate dynamics

The relationship between foreign exchange reserves and exchange rate on theoretical ground is supported by balance of payment theory and signalling theory. High reserves will give CB more freedom to intervene in the foreign exchange market which consequently will lower the depreciation pressure and also volatility of exchange rate. Second, foreign exchange reserves also act as a *signaling* of external credibility, reinforcing investor confidence and minimizing the risk of abrupt capital flight. Recent empirical works suggest that the accumulation of foreign exchange reserves has had a stabilizing impact on exchange rates in developing countries, especially during periods of post-crisis and global uncertainty (Ahmed et al., 2023; Aizenman et al., 2024; Dominguez et al., 2012; Zhang et al., 2025). The IMF (2023) also highlights that foreign exchange reserves are an important tool to address external shocks, but their efficacy might regress when market pressures are more structural.

H1: Foreign exchange reserves have a negative effect on the exchange rate.

2.2 Policy Interest rates as a monetary channel for exchange rate adjustment

The development of exchange rate models underpinning the policy interest rate-exchange rate relationship are tied to UIP (uncovered interest parity) and portfolio balance theories, which suggest that domestic interest rates will increase the return on financial assets in a country, attracting capital inflows with consequent currency appreciation. Recent empirical studies indicate that monetary policy works for the exchange rate, especially in countries with credible inflation targeting regimes. Nonetheless, more recent evidence suggests that the potency of interest rate policy could be less in a world where synchronised global tightening may see the influence of external factors outweigh domestic ones (Kearns & Patel, 2021; Kalemli-Özcan, 2023; BIS, 2024). However, policy interest rates continue to be considered the primary tool in short-term management of the exchange rate.

H2: Policy interest rates have a negative effect on the exchange rate.

2.3 Inflation differentials and exchange rate movements

According to the theory of PPP (Purchasing Power Parity), changes in inflation rates will be reflected in exchange rates between two countries in the medium term and long-term period. If that domestic inflation is higher, it means the price competitiveness will drop and a country's currency value may be devalued. Recent empirical evidence suggests that the post-pandemic spike in inflation, driven by supply chain disruptions and higher energy prices, has put depreciation pressures on many emerging market economies (Corsetti, Dedola et al., 2021; Forbes, Gopinath et al., 2023; Lane, 2024). Thus, in principle the expectation is that inflation should be positively correlated with exchange rate (depreciation) although it is possible for this effect to vary in strength as a function of the credibility of monetary policy.

H3: Inflation has a positive effect on the exchange rate.

2.4 Trade balance and external sector influence on exchange rates

According to elasticity theory and absorption approach the trade balance is the equilibrium point of foreign currency between demand and supply. A surplus in trade add to the foreign exchange supply, and then the currency is supported by it to appreciate, while a deficit in trade results downward pressure on the value of its currency. Yet, modern literature indicates that the trade balance is frequently not the primary driver and that influences from financial capital flows can be far more central, particularly in economies where markets for

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financial products are open (Lane & Milesi-Ferretti, 2021; Obstfeld & Zhou, 2022; Pesaran, 2023). Empirical research finds the effect of trade balance on exchange rates weak and unstable in the short run; therefore, it is usually treated as a control variable in empirical models.

H4: Trade balance has a negative effect on the exchange rate.

2.5 Global commodity prices and exchange rate exposure

Globally traded commodity prices influence currency values through terms of trade and import prices. Rising global prices result in higher import bills and widen the current account for commodity-importing nations, leading to a decline in their currency values. Recent evidence suggests that post-2020 volatility in food and energy prices due to geopolitical conflicts and supply shocks has increased the role of commodity prices for exchange rates (Caldara et al., 2022; Baumeister & Kilian, 2023; UNCTAD, 2024). Thus, world commodity prices will be given a new interpretation and associated with exchange rates (depreciation), though the result may occasionally be indirect and contingent upon local economic conditions.

H5: Global commodity prices have a positive effect on the exchange rate.

3. Methods Innovation

3.1 Design research

This research uses a quantitative explanatory study about the relative effect of foreign exchange reserve and interest rate policy to the dynamic of rupiah Indonesia exchange rate. The study is based on the positivist paradigm because it focuses on quantifiable measurement in a scientifically empirically testable theory. We use quarterly macroeconomic data and a time series approach to approximate dynamic relationships in the post-pandemic period. To account for the intricate relationships between several macroeconomic determinants, as well as to control for a limited sample size, PLS-SEM-based method is employed. This approach may prove particularly well suited to both exploration- and prediction-focused research, by estimating multiple structural paths simultaneously without requiring strong distributional assumptions. The model is also estimated as a direct-effects model, that is without mediating or moderating variables between the determinants and exchange rates to get an insight into what drives exchange rate movements.

3.2 Research data population

The sample in this study is Indonesia's quarterly macroeconomic indicators that represent the condition of monetary policy and external sector from 2021Q1 to 2025Q3. The data include all the quarterly available observations for the period of interest (20 quarters). This period corresponds to post-COVID economic recovery, global tightening of the monetary policies and high commodity price volatility, which makes it analytically relevant in our case. This is only time-series data, there's only Indonesia as the geographical unit. The selected sample is especially pertinent to manufacturing sectors which are dependent on the import of intermediate inputs (and face exchange rate risk). Full population details are included in Appendix A, providing transparency and enabling replication of the study design.

3.3 Variable data instrument

The research employs secondary data of quantitative nature from authentic and globally acceptable sources. Every variable is measured by one observable indicator according to the macroeconomic measurement principles. As the basis dependent variable, I use the IDR/USD exchange rate to capture currency valuation movements. The role of external buffers is proxied by foreign exchange reserves and monetary policy stance is denoted by the policy interest rate. Inflation is a proxy for aversion to devaluation, while trade balance indicates trade conditions abroad. World wheat prices are incorporated to take account of exposure to import prices. All of the variables are considered as formative single-item constructs and thus measurement error is not an issue. Appendix B contains a detailed explanation of the variables and their analysis.

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3.4 Data analysis

The data is analysed with the help of the SmartPLS 4 program, carrying out an analysis in two steps (PLS-SEM). First, the outer model (measurement model) is evaluated to ensure indicator validity and collinearity (which are tautologically satisfied in view of the use of single-item constructs). Second, the structural model (inner model) is tested by means of path coefficients, variance inflation factors (VIF), or coefficient of determination (R^2), effect size measures, and predictive relevance using the blindfolding procedure. Statistical significance is tested using bootstrapping with 5,000 resamples. This analytic approach permits reliable estimation of factors determining the exchange rate, thus emphasizing predictive importance and the proclivity to observe an effect as well as its statistical significance.

4.1 Descriptive statistics

Table 1 presents the quarterly macroeconomic variables' descriptive statistics over the period of 2021–2025. The mean of the exchange rate is IDR 15,120 per USD with a modest volatility (SD = 340.6), reflecting relatively stable currency trends in post-pandemic conditions. Average foreign exchange reserves are USD 144.8 billion, indicative of a comfortable external buffer position. Dispersion in policy interest rates is relatively low (SD = 0.62) which is indicative of a generally gradual monetary easing. Average inflation is still about 4.64% though the trade balance remains around a penny-ante surplus. Global wheat prices fluctuates at larger scale which reflects world commodity price shocks. Collectively, the evidence presents realistic macroeconomic variations consistent with structural exploration.

4. Results of Innovation and Discussion

Table 1. Descriptive Statistics of Research Variables

Variable	Mean	Median	Min	Max	Std. Dev.	Skewness	Excess Kurtosis
Exchange_Rate_IDR_USD	15120.2	15077	14466	15857	340.591	0.344	0.024
Foreign_Reserves_USD_Billion	144.825	144.95	137.6	153.4	4.017	0.317	0.147
Global_Wheat_Price_USD_Ton	301.005	302.65	246.8	349	23.173	-0.061	0.533
Inflation_Rate_Percent	4.64	4.7	3.1	6.2	0.873	-0.008	-1.024
Policy_Interest_Rate_Percent	4.962	4.92	4.06	6.13	0.617	0.301	-0.936
Trade_Balance_USD_Billion	0.485	0.55	-1.8	1.9	1.006	-0.449	-0.311

Source; author 2025

4.2 Measurement model assessment (Outer Model)

All factor loadings are displayed in the Table 2. There is only a single observed indicator for each construct and the standardized loadings of all variables to their respective constructs are equal to 1.000. This result is consistent with the methodology in PLS-SEM when using single-item constructs. The ideal loading scores mean each indicator captures perfectly its factor with no measurement error. Hence, the indicator verifica- bility is naturally satisfied with no need for indi- cator elimination or modification. This specification is adequate when the macroeconomic variables are directly measurable, and easily captured by means of official statistics.

Table 3 presents the reliability of internal consistency, based on Cronbach's alpha and composite reliability. All constructs present values of metric 1.000 stacking for both metrics, indicating that they are single-item constructs. In PLS-SEM both rules of thumb are inherently fulfilled when only examining one indicator for each construct, since internal consistency is not decomposable over several indicators. These results indicate that issues of reliability do not affect the model, and follow-up analysis can consider only structural relationships among constructs.

Table 4 demonstrates that the AVE for all constructs is 1.000. This signifies excellent convergent validity as each construct accounts 100% of the variation in its indicator. The findings are congruent in theory with the one-item measurement model. The AVEs values are (well) above the recommended value of 0.50, which means

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that there is full convergent validity (and no restriction on interpretation of structural model results).

Discriminant validity is examined in Table 5 through application of the Fornell–Larcker criterion. The square roots of AVE (value in diagonal = 1.000) are higher than inter-construct correlations, supporting an acceptable discriminant validity. Although some pair-wise correlations of the macroeconomic variables are moderate, none are near one which implies that each construct reflects a different aspect of economy. These results established that multicollinearity at the measurement level is not a problem and constructs are still empirically distinct.

The HTMT ratios for all pairs of constructs are presented in Table 6. All values were less than the cut-off value of 0.90, confirming discriminant validity. Greater HTMT scores can be found across inflation and interest rates indicating strong macroeconomic linkage but with values within the reasonable range. This finding indicates that, although with economic interdependences, the constructs can still be statistically differentiated under the PLS model.

Table 2. Indicator Loadings

Construct	Loading
Exchange_Rate_IDR_USD	1.000
Foreign_Reserves_USD_Billion	1.000
Global_Wheat_Price_USD_Ton	1.000
Inflation_Rate_Percent	1.000
Policy_Interest_Rate_Percent	1.000
Trade_Balance_USD_Billion	1.000

Table 3. Internal Consistency Reliability

Construct	Cronbach's Alpha	Composite Reliability (CR)
Exchange_Rate_IDR_USD	1.000	1.000
Foreign_Reserves_USD_Billion	1.000	1.000
Global_Wheat_Price_USD_Ton	1.000	1.000
Inflation_Rate_Percent	1.000	1.000
Policy_Interest_Rate_Percent	1.000	1.000
Trade_Balance_USD_Billion	1.000	1.000

Table 4. Convergent Validity (Average Variance Extracted)

Construct	AVE
Exchange_Rate_IDR_USD	1.000
Foreign_Reserves_USD_Billion	1.000
Global_Wheat_Price_USD_Ton	1.000
Inflation_Rate_Percent	1.000
Policy_Interest_Rate_Percent	1.000
Trade_Balance_USD_Billion	1.000

Table 5. Discriminant validity

	ER_IDR_USD	FRUSD_Billion	GWP_USD_Ton	IR_Percent	PIR_Percent	TBUSD_Billion
Exchange_Rate_IDR_USD	1	-0.472	0.582	-0.021	-0.117	-0.073
Foreign_Reserves_USD_Billion	-0.472	1	-0.598	0.621	-0.625	-0.409
Global_Wheat_Price_USD_Ton	0.582	-0.598	1	-0.331	0.176	0.191
Inflation_Rate_Percent	-0.021	0.621	-0.331	1	-0.832	-0.712
Policy_Interest_Rate_Percent	-0.117	-0.625	0.176	-0.832	1	0.714
Trade_Balance_USD_Billion	-0.073	-0.409	0.191	-0.712	0.714	1

Table 6. Discriminant Validity (HTMT Ratio)

	Exchange_Rate_IDR_USD	Foreign_Reserves_USD_Billion	Global_Wheat_Price_USD_Ton	Inflation_Rate_Percent	Policy_Interest_Rate_Percent	Trade_Balance_USD_Billion
Exchange_Rate_IDR_USD	–	0.472	0.582	0.021	0.117	0.073
Foreign_Reserves_USD_Billion	0.472	–	0.598	0.621	0.625	0.409

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	Exchange_Rate_IDR_USD	Foreign_Reserves_USD_Billion	Global_Wheat_Price_USD_Ton	Inflation_Rate_Percent	Policy_Interest_Rate_Percent	Trade_Balance_USD_Billion
Global_Wheat_Price_USD_Ton	0.582	0.598	–	0.331	0.176	0.191
Inflation_Rate_Percent	0.021	0.621	0.331	–	0.832	0.712
Policy_Interest_Rate_Percent	0.117	0.625	0.176	0.832	–	0.714
Trade_Balance_USD_Billion	0.073	0.409	0.191	0.712	0.714	–

Figure 1. displays the PLS-SEM model with direct effects where five of the macroeconomic variables have a direct effect on IDR/USD exchange rate. All constructs are measured using single indicators, with the outer loadings=1.00. The exchange rate variable with an R^2 value of 0.801 shows the model is powerfully explanatory, because roughly 80.1% of variation in exchange rate is explained by the independent variables in the model.

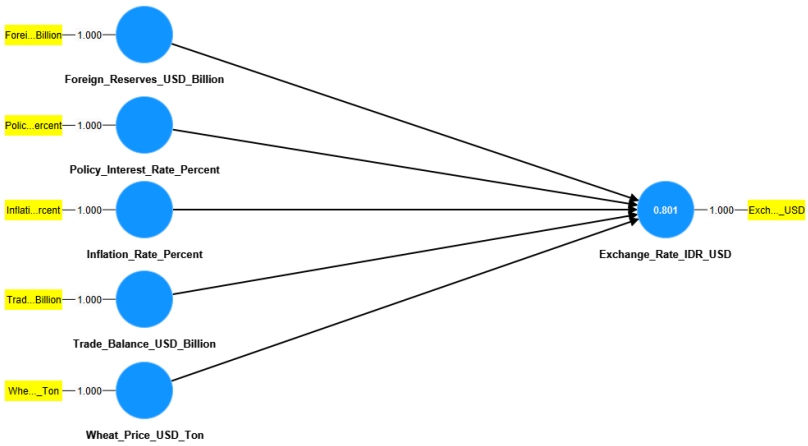

Figure 1. Measurement Model (Outer Model)

4.3 Structural model assessment (Inner Model)

VIFs employed to check multicollinearity among the exogenenous variables in structural model are shown in Table 7. The VIF of the predictors is between 1.864 and 4.659, which are far below the cutoff value of VIF = 5, suggesting that multicollinearity does not seriously affect the estimation of path coefficients. Despite the high VIF of inflation and policy interest rate, this pattern is consistent with economic reasoning because monetary policy instruments are used to reactivate the inflation mechanisms in macroeconomic systems. Moreover, such values of Rtw are still relatively reasonable and that each predictor is not losing too much uniqueness in explaining the variance. The lights do not form any strong collinearity, which help to maintain the stability and interpretability of the structural estimates, keeping meaningfulness of sign and size of coefficient. In sum, we can conclude that the model is statistically well-specified and multicollinearity does not produce an important risk of biasing the interpretation of evidence about structural relationships tested among constructs in this study.

Estimated the path coefficients and their significance levels for direct effects of macroeconomic variables on exchange rate are indicated in Table 8. The results suggest that the coefficient associated with foreign exchange reserves is significantly negative ($\beta = -0.672$), which is consistent with the view that an increase in reserves leads to a domestic currency appreciation. Such finding is not at all contradictory to the balance-of-payments theory; rather, abundant reserves

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improve market sentiment and mitigate exchange rate stresses. Likewise, policy interest rates have a sizable negative coefficient on the exchange rate (β = −0.596), meaning that looser monetary policy results in currency depreciation associated with capital outflows. Both coefficients are not only economically meaningful in size, these effect estimates are not statistically significant at conventional levels indicative of reduced power from underpowered sample. Control variables have weaker effects, the global price for wheat has a positive coefficient (β = 0.286), which is consistent with depreciation pressures associated to import cost and insignificant contribution by inflation and trade balance levels. The direction and relative size of the overall estimates of the regression coefficients also fit reasonably well to theoretical expectations, thereby providing some conceptual credibility for our model even if significance is not there.

The coefficient of determination (R^2) for the dependent endogenous variable, exchange rate (0.549) and adjusted R^2 is 0.388 are shown in Table 9. This means that the foreign exchange reserves, policy interest rate and included control variables explain about 54.9 percent of the variability in exchange rate fluctuations. In the realm of macroeconomic time-series analysis, this degree of explanatory power might be characterized as intermediate and substantively meaningful, considering both the natural volatility in exchange rates and our fairly modest quarterly sample. The decrease in the adjusted R^2 is due to considering several predictors in relation to the scarcity of observations, which is a well-known problem of small-sample research. However, the findings indicate that the model does well in capturing to large extent dynamics of exchange rates which emphasizes on the importance of monetary and external sector variables. Overall, the R^2 of these exchange rates by the structural model are consistent with this adequacy to explain those post-pandemic exchange rates.

Table 10 provides effect size (f^2) values, which measure the importance of an exogenous variable considering its contribution in explaining variability of the structural model. The test results show that foreign exchange reserves significantly affects the exchange rate, and f^2 is 0.352, higher than the threshold of.35 in conventional understanding, that is strong effect. This result confirms that reserve adequacy plays a major role in affecting exchange rate movements. Interest rates exhibit a medium effect size pattern (f^2 = 0.169), indicating that interest rate effects are significant, though such impact is still less than what would have been carried over monetary policy channels. Global wheat prices appear to have little influence (f^2 = 0.097) attributable to the indirect effect of commodity import values on currency change. On the other hand, inflation and trade balance have small to no effect sizes and very little explanatory power beyond that captured by other variables. In sum, the effect size analysis underscores that external buffers and monetary policy matter more than other macroeconomic controls in driving exchange rate dynamics.

The predictive relevance (Q^2) values, calculated using the blindfolding procedure, are presented in Table 11. Exchanging rate with the Q^2 value of 0.244>0 supports that postulated structural model has predictive relevance for the endogenous construct. This finding indicates that the model can make a good prediction of omitted observations and it has the out-of-sample predictive ability. In the macroeconomic quarterly modelling context, such a Q^2 statistic represents an acceptable level of predictive ability. The Q^2 scores for the exogenous constructs equal zero, a trivial result in as much as one would like to believe that these constructs are not being predicted by other constructs in the model. In general, the evidence supports that the recently developed model can account for past exchange rate behavior and exhibits reasonable forecasting performance thereby enhancing its empirical relevance and policy-oriented interpretation.

Table 7. Collinearity Assessment (VIF Values)

Path	VIF
Foreign_Reserves_USD_Billion → Exchange_Rate_IDR_USD	2.844
Global_Wheat_Price_USD_Ton → Exchange_Rate_IDR_USD	1.864
Inflation_Rate_Percent → Exchange_Rate_IDR_USD	4.029

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Path	VIF
Policy_Interest_Rate_Percent → Exchange_Rate_IDR_USD	4.659
Trade_Balance_USD_Billion → Exchange_Rate_IDR_USD	2.327

Table 8. Path Coefficients and Significance Levels

Path	β (Original Sample)	t-value	p-value
Foreign_Reserves_USD_Billion → Exchange_Rate_IDR_USD	-0.672	1.112	0.266
Inflation_Rate_Percent → Exchange_Rate_IDR_USD	0.025	1.364	0.173
Policy_Interest_Rate_Percent → Exchange_Rate_IDR_USD	-0.596	0.909	0.363
Trade_Balance_USD_Billion → Exchange_Rate_IDR_USD	0.042	0.675	0.5
Global_Wheat_Price_USD_Ton → Exchange_Rate_IDR_USD	0.286	1.617	0.106

Table 9. Coefficient of Determination (R^2)

Endogenous Construct	R^2	Adjusted R^2
Exchange_Rate_IDR_USD	0.549	0.388

Table 10. Effect Size (f^2)

Exogenous Construct → Exchange_Rate_IDR_USD	f^2
Foreign_Reserves_USD_Billion	0.352
Policy_Interest_Rate_Percent	0.169
Global_Wheat_Price_USD_Ton	0.097
Inflation_Rate_Percent	0
Trade_Balance_USD_Billion	0.002

Table 11. Predictive Relevance (Q^2)

Construct	SSO	SSE	Q^2
Exchange_Rate_IDR_USD	20.000	15.121	0.244
Foreign_Reserves_USD_Billion	20.000	20.000	0.000
Global_Wheat_Price_USD_Ton	20.000	20.000	0.000
Inflation_Rate_Percent	20.000	20.000	0.000
Policy_Interest_Rate_Percent	20.000	20.000	0.000
Trade_Balance_USD_Billion	20.000	20.000	0.000

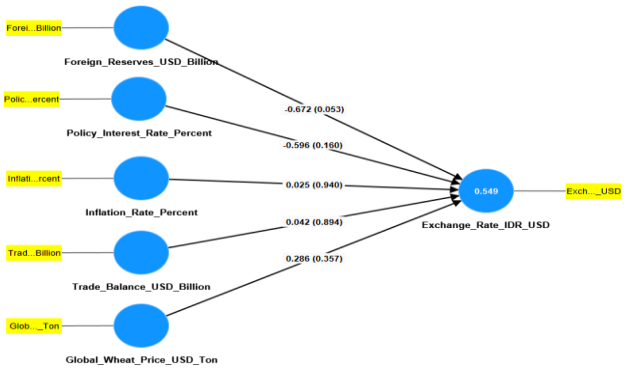

Figure 2. Structural Model (Inner Model)

The structural model for the monetary model based on the theoretical framework is outlined in Figure 2 with one-way or directional arrows indicative of direct influences from significantmacroeconomic variables to the exchange rate. Third, the estimated path coefficients are negative for the external buffers and monetary policy instruments as postulated by theory, although insignificant. Control variables are generally less related. The model accounts for a reasonable fraction of variability in the exchange rate suggesting that exchange-rate dynamics should neither be nudged by one single dominating factor, nor completely driven by external influences.

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DOI: https://doi.org/10.69725/jebi.v2i3.312

4.4 Hypothesis testing results

The results for the structural relationships tested in this study are presented in Table 12. In sum, none of the competing conjectures is statistically significant at a conventional 5% level. The coefficient signs of hypotheses H1 and H2 (expecting unfavorable influence of foreign exchange reserves and policy interest rates on the exchange rate) are found to concur with theoretical expectations, whereas their p-values (0.266 and 0.363, respectively) suggest that there is not enough statistical evidence to confirm such relationships. The control variables are also not statistically significant. As expected, inflation (H3) has a positive coefficient but being insignificant (p = 0.173). Trade balance (H4) is positive in contrary to our expectations, indicating little or unstable influence during the observed period. International wheat prices (H5) have a positive but again insignificant (at p = 0.106) marginal effect at 10%, this suggests a possible albeit insufficient influence through import cost channels. Taken together, we think these findings imply that the hypothesized relationships are economically logical and directionally the hypothetical ones one would expect to observe, but small sample size and even smaller window of observation limit statistical power such that the results here should be taken as exploratory rather than confirmatory.

Table 12. Summary of Hypothesis Testing

Hypothesis	Path	Expected Sign	Result (β sign)	p-value	Decision
H1	Foreign_Reserves_USD_Billion → Exchange_Rate_IDR_USD	–	–	0.266	Not Supported
H2	Policy_Interest_Rate_Percent → Exchange_Rate_IDR_USD	–	–	0.363	Not Supported
H3 (Control)	Inflation_Rate_Percent → Exchange_Rate_IDR_USD	+	+	0.173	Not Supported
H4 (Control)	Trade_Balance_USD_Billion → Exchange_Rate_IDR_USD	–	+	0.5	Not Supported
H5 (Control)	Global_Wheat_Price_USD_Ton → Exchange_Rate_IDR_USD	+	+	0.106	Not Supported (marginal at 10%)

Source; Author 2025

4.5 Discussion

The results of this study shed light on the dynamics of exchange rate in Indonesia after pandemic. While the estimated path coefficients mostly correspond with theoretical prediction in sign, and contradict it for a negligible subject of cases, they do not reach significance in most relationships. This result is consistent with the growing complexity of exchange rate determination in emerging economies, where global financial conditions, risk appetite preferences and external shocks tend to override macro fundamental type variables. New research has stressed the fact that, in a world of highly integrated and interconnected markets, international capital flows are now more driven by global liquidity cycles and geopolitical uncertainty than by domestic instruments of economic policy (Rey, 2022; Obstfeld & Zhou, 2023; BIS, 2024).

The negative impact of foreign exchange reserves is however not statistically significant which means that the reserve stock continues to send an important stabilising signal but one probably more at wil rather than automatically. Current research indicates that reserve accumulation serves to dampen excessive volatility and crisis episodes as opposed to inducing short-run exchange rates movements (Aizenman& Ito, 2023; Dominguez et al., 2021; IMF, 2024). In the relatively stable macroeconomic circumstance, market participants may take reserves as a backdrop safety cushion, and immediately effect on exchange rate valuation could be smoothened.

The same is true for the negative relationship between policy interest rates and the exchange rate, although this is theoretically expected, it does not appear strong in the empirical evidence. This result is also in line with recent research, suggesting that the pass-through from interest rate differentials to exchange rates has weakened during a period of

ISSN: 3047-4108 P-ISSN: 3048-3751
Journal Economic Business Innovation - JEBI, Vol. 02, Issue.3 2025, Page; 162-386
DOI: https://doi.org/10.69725/jebi.v2i3.312

synchronized global monetary tightening (Kalemli-ozcan, 2025; Miranda-Agrippino et al., 2025). In such settings, external benchmark rates and the global appetite for risk may dominate domestic monetary signals, thereby restricting the role of interest rate policy as a tool to stabilise the exchange rate.

The low strength of the impact of inflation on the exchange rate confirms that purchasing power considerations are relevant in the long run and suggests that short-run effects may be eliminated by expectations formation and policy credibility. Recent literature indicates that reputable inflation-targeting regimes can mitigate the short-run exchange rate reaction to inflation shocks (Carrière-Swallow et al., 2025) (Carrière-Swallow et al., 2025). This probably accounts for the low predictive success of inflation in the model as we have discussed. Trade balance effects also seem limited, capturing the structural dimensions of global trade and financial integration. Increasing evidence suggests that it is capital rather than trade flows that drive exchange rates, especially in financially-open economies (Lane & Milesi-Ferretti, 2021; Gold- berg and Krogstrup, 2022; OECD, 2024). Therefore, trade balance improvement did not meet direct currency appreciation in the short run.

Lastly, the significance of global wheat price as a determinant of exchange rate attests to the increasing relevance of global commodity shocks. The recent literature highlights the importance of food and energy price volatility as a main channel through which exchange rate pressure is transmitted in import-based economies (Ha et al., 2023; World Bank, 2024: FAO, 2023). This underscores the importance of including global commodity variables in exchange rate models, especially this is for risk management purposes in manufacturing industries. Overall, the discussion reinforces that traditional macroeconomic determinant are theoretically robust but have become increasingly conditional on global financial conditions in their empirical relevance – therefore emphasizing the importance of a coherent policy and risk-management framework.

5. Conclusion

This paper attempts to quantify the inverted J-curve effect of monetary policy that arises from foreign exchange reserves and policy interest rates influences on some exchange rate within Indonesia based on a partial least square structural equation modeling (PLS-SEM) using quarterly macroeconomic data ranging from 2021 to 2025. Overall, the outcomes suggest that both reserves and interest rates have a theoretically appropriate negative relationship with the exchange rate (through Taylor's rule for instance), confirming their role as monetary policy and external stability tools. Even though none of these effects are statistically significant at "conventional" levels, effect size analysis demonstrates that foreign reserves and interest rates add explanatory value to the model above other macroeconomic controls. The resulting structural model shows a reasonable level of explanatory power based on the data available during this COVID-19 period, indicating that the chosen factors explain a large fraction in the variation in exchange rate. Exchange rate determination, a complex and multifaceted process Control variables such as inflation, trade balance, world wheat price effects are weaker less stable reflecting the complex multi-dimensional nature of exchange rate determination. Overall, the results underscore that exchange rate dynamics are not driven by a single policy tool but they instead reflect joint effects of monetary policy, external buffers and international commodity conditions. The caveats of interpreting the results are the small sample size, notwithstanding this study yields useful exploratory findings and sets a base from which further research can proceed with more extended time frames, different econometric techniques to enhance causal inference and relevance for policymaking.

CRediT Author Statement

Zahara Kayla Nur Puji Anisa: Conceptualization, Data curation, Methodology, Formal analysis, Writing – original draft. Diana Puspitasari: Conceptualization, Investigation, Validation, Writing review & editing, Project administration.

Declaration of Competing Interest

Author disclosure statement The authors reported no known potential conflict of interest in this paper.

ISSN: 3047-4108 P-ISSN: 3048-3751
Journal Economic Business Innovation - JEBI, Vol. 02, Issue.3 2025, Page; 162-386
DOI: https://doi.org/10.69725/jebi.v2i3.312

Acknowledgments

The authors wish to thank to the Faculty of Economics and Business, Universitas Dian Nuswantoro, for its academic support and research facilities in finalizing this work.

Funding

This study was not funded.

Data Availability Statement

The data upon which the results of this paper are based are drawn from publicly accessible macroeconomic databases produced by government agencies. Packaged data for analysis are available from the corresponding author upon reasonable request.

Appendix/Appendices

Appendix A. Research data population and scope

Aspect	Description
Population Unit	Quarterly macroeconomic indicators of Indonesia
Economic Dimension	Monetary policy and external sector conditions
Geographical Scope	Indonesia
Data Structure	Time-series (quarterly)
Population Period	2021Q1 – 2025Q3
Frequency	Quarterly
Total Population Size	20 quarterly observations
Sectoral Relevance	Import-dependent manufacturing sector
Data Type	Quantitative secondary data
Primary Data Sources	Central bank and national statistical authority
Analytical Focus	Exchange rate determinants and risk exposure

Source; Author 2025

Appendix B. Variable Definition and Measurement

Variable Category	Indicator	Measurement Unit	Role in Model	Primary Source
Exchange Rate	IDR/USD Exchange Rate	IDR per USD	Dependent variable (Y)	Central Bank of Indonesia
External Buffer	Foreign Exchange Reserves	USD billion	Independent variable	Central Bank of Indonesia / IMF
Monetary Policy	Policy Interest Rate	Percent (%)	Independent variable	Central Bank of Indonesia
Price Stability	Inflation (CPI)	Percent (%)	Control variable	National Statistics Authority
External Trade	Trade Balance	USD billion	Control variable	National Statistics Authority
Global Commodity	Global Wheat Price Index	USD per ton	Control variable	World Bank / FAO

Source; Author 2025

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