



Global Liquidity Spillovers and Foreign Exchange Reserve Resilience: Evidence from Indonesia

Ali Syahbana¹, Amin Hou^{2*}, Yosua Parhorasan Manullang³, Debora Tambunan⁴,
Arwin⁵

Universitas Mahkota Tricom Unggul

Article Info	ABSTRACT
Keywords: Federal Reserve balance sheet; trade balance; foreign exchange reserves; Indonesia; monetary spillovers	Global monetary expansion and external trade dynamics have become increasingly important in understanding foreign exchange reserve accumulation in emerging economies. However, empirical evidence on the joint association of US monetary liquidity and domestic trade performance with reserve holdings remains limited, particularly across periods of global financial instability and unconventional monetary policy. This study investigates the relationships between the US Federal Reserve balance sheet, Indonesia's merchandise trade balance, and foreign exchange reserves using 216 monthly observations from January 2008 to December 2025. Employing descriptive statistics and multiple ordinary least squares regression, the analysis reveals a positive association between the Federal Reserve balance sheet and Indonesia's foreign exchange reserves ($B = 0.011$; $t = 19.887$; $p < 0.001$), while the merchandise trade balance exhibits a negative conditional association ($B = -2.469$; $t = -3.599$; $p < 0.001$). The model explains 69.2% of the observed variation in foreign exchange reserves ($R^2 = 0.692$). Nevertheless, diagnostic tests identify heteroskedasticity and substantial positive serial correlation, indicating that conventional OLS significance estimates require further validation. These findings provide preliminary evidence that Indonesia's reserve dynamics are associated with both global monetary conditions and domestic external-sector performance. By integrating global liquidity and trade-related indicators within a unified empirical framework, the study contributes to discussions of external-sector vulnerability in emerging economies and underscores the importance of robust time-series estimation for evaluating monetary spillovers and reserve management policies.
This is an open access article under the CC BY-NC license 	Corresponding Author: Amin Hou Universitas Mahkota Tricom Unggul aminh0951@gmail.com

INTRODUCTION

International reserves are a central component of external-sector resilience. For monetary authorities, reserve assets provide liquidity for balance-of-payments needs, foreign-exchange operations, and confidence during episodes of volatile capital flows. In a financially open emerging market such as Indonesia, reserve dynamics reflect more than export and import transactions: portfolio flows, official financing, valuation changes, and interventions in foreign-exchange markets can alter the stock of reserve assets. IMF guidance emphasizes the

importance of distinguishing reserve adequacy from the mere size of reserves, since exposure to external financing risks and the structure of liabilities also matter (IMF, 2025).

The global setting is relevant because the US Federal Reserve's monetary policies affect international financial conditions. Changes in its balance sheet arise from asset purchases, maturities, liquidity facilities, and operational measures; they interact with policy-rate decisions but are not identical to them. In the quantitative-easing periods after the 2008 financial crisis and during the COVID-19 shock, purchases of securities increased the Federal Reserve's asset holdings. During balance-sheet normalization and quantitative tightening, holdings contracted through runoff and other adjustments. The official H.4.1 statistical release documents the consolidated asset and liability positions of the Reserve Banks (Board of Governors of the Federal Reserve System, 2026); St. Louis Fed, 2023).

The literature identifies several mechanisms through which US monetary conditions may affect emerging economies. Miranda-Agrippino & Rey (2020) found that US monetary contraction can tighten global credit and financial conditions even when destination economies operate flexible exchange-rate regimes. Fratzscher et al. (2018) show that different rounds of US quantitative easing produced heterogeneous portfolio-flow responses across regions and financial assets. More recent evidence suggests that the global financial cycle strengthened as an explanation of exchange-rate and capital-flow movements during the pandemic, but country responses were far from uniform (Davis & Zlate, 2023; Cerutti & Claessens, 2024). These studies provide a rationale for considering Federal Reserve assets as an international financial-condition indicator, not a mechanical determinant of Indonesian reserves.ss

Changes in the Federal Reserve balance sheet may signal abundant or restricted dollar liquidity and thus alter investors' willingness to hold emerging-market assets. Yet the transmission depends on interest-rate expectations, domestic vulnerability, risk sentiment, and portfolio allocation. Evidence from Canada suggests that US quantitative easing can ease foreign borrowing costs through financial channels even with currency appreciation (Kabaca & Tuzcuoglu, 2024). Lastauskas & Nguyen (2024) find that the effects of US monetary tightening on emerging markets intensify with uncertainty and exposure to cross-border trade. Gál & Juhasz (2025) further discuss the consequences of Federal Reserve quantitative tightening for selected emerging-market bond yields. Each finding cautions against treating a change in the level of Federal Reserve assets as an exogenous, uniformly transmitted shock.

Indonesia's domestic trade balance is another candidate explanatory factor. In accounting terms, merchandise exports less imports form only part of the current account, which is itself one component of the balance of payments. A trade surplus may generate foreign-exchange receipts without leading automatically to a rise in official reserves: receipts can remain in private hands, fund payments for services and income, service liabilities, or be offset by financial-account transactions. The distinction is illustrated by the 2025 data: Statistics Indonesia reports an annual merchandise trade surplus of US\$41.05 billion (Badan Pusat Statistik, 2025), while Bank Indonesia attributed the December increase in reserves not only to receipts but also to sovereign issuance and foreign borrowing (Bank Indonesia, 2026).

Empirical work on reserve determinants likewise offers reasons to avoid a simple one-for-one surplus interpretation. Karimi et al. (2025) find that Indonesia's net exports are positively but not significantly associated with reserves in their sample, while exchange rates and foreign direct investment have more pronounced estimated associations. Goldberg & Krogstrup (2023) document how risk sentiment and intervention-related pressures influence international capital-flow pressures differently across countries and periods. This broader evidence motivates treating reserves as an outcome of both trade and financial channels rather than as an arithmetic accumulation of merchandise surplus alone.

Prior work has often emphasized the US policy rate, individual capital-flow variables, or trade performance without placing the level of Federal Reserve assets alongside Indonesia's monthly trade balance in one parsimonious equation. The present study therefore asks whether these two contemporaneous indicators are associated with Indonesia's observed official reserve stock during 2008–2025. Its contribution lies in a transparent comparison of the external monetary proxy and the domestic merchandise balance, combined with an explicit assessment of the statistical limitations of using ordinary least squares on persistent monthly macroeconomic data.

This article develops three questions: first, how Federal Reserve total assets are associated with Indonesia's reserves after controlling for merchandise trade; second, how Indonesia's trade balance is associated with reserves conditional on the Federal Reserve series; and third, how much of the variation in reserves the two-predictor model explains. The study does not claim a structural causal estimate. The empirical estimates are interpreted as sample associations, with special attention to residual dependence and potential time-series misspecification.

Recent Indonesian evidence suggests that the domestic component of reserve accumulation deserves a more differentiated treatment. Basuki & Mulyani (2024) report that exports, imports, inflation, and external debt enter reserve dynamics differently across short and long horizons in their vector error-correction analysis. Bake et al. (2024) likewise analyze exports, the exchange rate, and foreign borrowing in a dynamic framework, making the case that contemporaneous trade data may omit relevant adjustment periods. A subsequent examination of Indonesia's monthly series over 2014–2024 found meaningful associations with exchange rates, interest rates, inflation, and exports (Prihantini & Sekarningsih, 2025). These studies do not estimate the same two-variable equation used here, but demonstrate the importance of comparing model scope, horizon, and transformation before treating apparently conflicting signs as errors.

More recent evidence expands this point. Tirtana et al. (2025) find positive associations between foreign borrowing, exports, exchange rates, and reserves in their specification. Kumar et al. (2026), using quarterly data through 2024 and several long-run estimators, emphasize precautionary and capital-account motives, including short-term external debt and exchange-rate volatility, whereas current-account indicators appear less prominent. The distinction between precautionary and merchandise-driven reserve accumulation is particularly relevant when interpreting the present study's negative trade coefficient. Such

evidence points to omitted financial-account channels rather than providing a causal explanation for the original OLS sign.

METHODS

Research Design and Period

The study employs a quantitative, observational design using a monthly time-series dataset comprising 216 observations between January 2008 and December 2025. The analytical unit is the month, not an individual firm or survey respondent. The observation window includes the global financial crisis, successive phases of large-scale Federal Reserve asset purchases, the COVID-19 shock, and the subsequent normalization of monetary conditions. The source thesis compiled secondary series from the Federal Reserve, Bank Indonesia, and BPS and analyzed them using SPSS. The revised paper retains the original observations and reported regression output; it does not purport to re-estimate coefficients from independently downloaded raw data.

Variables and Data Sources

Three variables enter the empirical specification. The dependent variable (RES) is Indonesia's official foreign-exchange reserve stock in billions of US dollars. Federal Reserve total assets (FED) are the indicator of the US central-bank balance sheet, and Indonesia's merchandise trade balance (TB) equals goods exports minus goods imports, also expressed in US dollars. The units reported by the source tables must be used consistently: FED is presented in US\$ billions after conversion, RES in US\$ billions, and TB in US\$ billions. The original paper describes monthly values compiled from Federal Reserve H.4.1/total-asset information, BPS trade statistics, and Bank Indonesia reserve data. The Federal Reserve's primary total-assets series is published at weekly frequency, so a final submission should specify whether its monthly measure uses an end-month Wednesday observation, average, or another documented aggregation (Board of Governors of the Federal Reserve System, 2026; BPS, 2026; Bank Indonesia, 2026).

Model Specification and Estimation

The source thesis estimates the following static multiple-linear-regression model:

$$RES_t = \alpha + \beta_1 FED_t + \beta_2 TB_t + \varepsilon_t$$

In this specification, α is the intercept, β_1 and β_2 measure partial level associations, and ε_t is the model error. The regression describes conditional differences in the reserve stock associated with a one-unit difference in the regressors while the other variable is held fixed. The source estimates are reported using conventional OLS output, including the coefficient table, overall F statistic, and R^2 . The statistical diagnostics available from the thesis encompass a residual normality test, variance inflation factors, a Glejser heteroskedasticity test, and the Durbin–Watson measure of first-order error dependence (Wooldridge, 2020).

The measurement design also creates a comparability issue. A weekly Federal Reserve stock must be converted to a monthly series before it can be aligned to end-of-month Indonesian reserve positions and monthly export–import flows. Alternative choices such as a

month-end observation and a monthly average are not interchangeable when assets change rapidly around financial crises. Data release revisions could also influence the exact input observations. This draft preserves the source thesis results and flags those choices rather than constructing undocumented monthly values. Future replication should provide a data dictionary, original release links, vintage of extraction, and a machine-readable analysis file.

Diagnostic Strategy and Inference

Because the dataset is monthly, diagnostic scrutiny is central. A low variance inflation factor can alleviate concerns about linear collinearity but does not address stochastic trends. A non-significant normality test cannot establish independence or constant variance of errors. In particular, serially correlated residuals can make conventional OLS standard errors misleading even when the coefficient estimates and R^2 can still be calculated. The heteroskedasticity-and-autocorrelation-consistent covariance approach of Newey and West (1987), unit-root testing as described by Phillips and Perron (1988), and cointegration analysis introduced by Engle and Granger (1987) are possible follow-up procedures. An ARDL bounds-testing strategy can be considered if variable integration orders and specification assumptions justify it (Pesaran et al., 2001). These are recommendations only; no unreported tests are presented as completed.

The study's observational design and parsimonious contemporaneous equation mean that an estimated coefficient should not be equated with the effect of a policy intervention. The Federal Reserve balance sheet may respond endogenously to global financial crises, and both reserve holdings and Federal Reserve assets may trend over time. In addition, the stock–flow distinction between reserve assets and the trade balance requires careful economic interpretation. Findings below therefore distinguish reported numerical output from what can be inferred reliably from that output.

RESULTS AND DISCUSSION

Descriptive Statistics

Table 1. Descriptive Statistics

Variables	N	Minimum	Maximum	Mean	SD
Federal Reserve total assets (US\$ bn)	216	884.78	8949.53	4783.09	2242.26
Indonesia merchandise trade balance (US\$ bn)	216	–2.50	7.56	1.397	1.816
Indonesia official reserve assets (US\$ bn)	216	50.18	157.10	114.71	27.18

Table 1 indicates substantial changes in the size of Federal Reserve assets across the sample. The gap between the minimum and maximum, along with a standard deviation of 2,242.26 (US\$ billions), reflects the different policy regimes and major crisis responses embedded in the 2008–2025 period. Indonesia's merchandise trade balance alternates between negative and positive values. Its mean is positive, but the standard deviation of 1.816 exceeds that mean, pointing to considerable month-to-month variation around the average surplus. Official

reserve assets range from US\$50.18 billion to US\$157.10 billion, with a sample mean of US\$114.71 billion.

The descriptive values capture distinct economic concepts. Federal Reserve total assets and Indonesia's official reserves are financial stocks recorded at particular dates; the merchandise trade balance is a transaction flow measured over each month. Their raw standard deviations are consequently not directly comparable indicators of relative importance. Reinterpreting the variables as rates of change, deviations from trends, or lagged flows could produce different statistical properties and economic conclusions.

Comparison with other domestic research offers context for the descriptive trade range. Rustami & Septriani (2024) examine external debt, exports, imports, and the exchange rate as drivers of reserve fluctuations, finding statistically important relationships for international trade and external financing indicators. Nurhasanah et al. (2025) similarly report positive associations of government and private foreign debt with reserves, while export values are not significant in their partial test. The differing results reinforce that the overall trade balance alone may underrepresent variations in financing sources. Accordingly, high levels of explanatory fit in a simple two-predictor model should not discourage examination of theoretically relevant excluded variables.

Economic Developments Across the Observation Window

The sampled period contains several global regime shifts that are relevant to interpreting the estimated relationships. Following the 2008 financial crisis, the Federal Reserve acquired substantial long-duration securities and used facilities intended to stabilize markets. Later quantitative-easing programs, followed by the COVID-19 emergency response, produced large expansionary episodes in asset holdings. Since 2022, policy normalization involved balance-sheet contraction through reduced reinvestment and maturities. These shifts provide a plausible macroeconomic background for the positive comovement with reserve assets, but policy regimes also coincide with exchange-rate disturbances and changes in risk appetite (Fratzscher et al., 2018; Miranda-Agrippino & Rey, 2020; Gál & Juhasz, 2025).

The Indonesian trade series shows another pattern: trade deficits occurred in some years in the earlier period, whereas the more recent years included sustained merchandise surpluses. The BPS annual release reports a large positive merchandise balance in 2025, notwithstanding different movements in oil-and-gas and non-oil-and-gassss components (BPS, 2026). Meanwhile, reserve assets depend partly on activities outside trade. In particular, Bank Indonesia's statement on December 2025 reserves associates the month-on-month increase with government-related flows as well as other receipts (Bank Indonesia, 2026). This historical coexistence helps explain why a regression of reserve levels on a contemporaneous trade balance may not mirror a simple accounting expectation.

Regression Assumption Diagnostics

The diagnostic assessment includes residual normality, multicollinearity, heteroskedasticity, and serial correlation. Because the sample contains 216 monthly

observations, the independence of disturbances is particularly important for interpreting ordinary least squares inference.

Table 2. Multicollinearity Test

Regressor	Tolerance	VIF
Federal Reserve balance sheet (FED)	0.687	1.456
Indonesia merchandise trade balance (TB)	0.687	1.456

Table 2 reports tolerance values of 0.687 and variance inflation factors (VIFs) of 1.456 for both regressors. These values exceed the customary tolerance cutoff of 0.10 and remain below the commonly used VIF threshold of 10. The two predictors therefore do not show severe linear multicollinearity. This result, however, does not establish that the time-series regression satisfies its other assumptions.

Residual normality was first reviewed using the original Detrended Normal Q–Q Plot, reproduced in Figure 1. The chart visualizes departures of the residual quantiles from their expected normal positions.

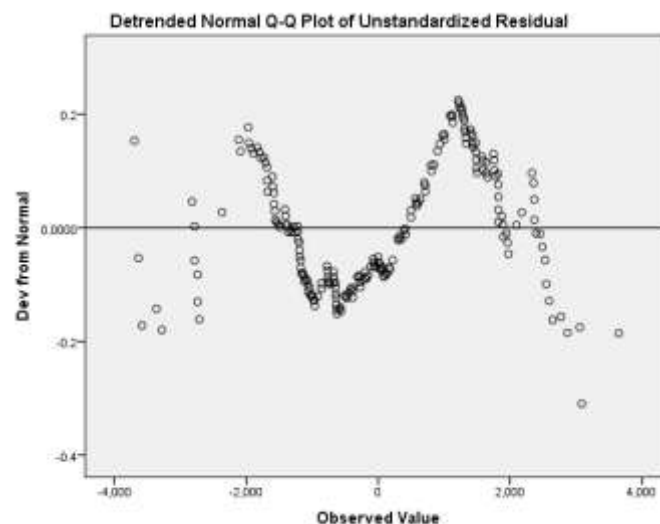


Figure 1. Detrended Normal Q–Q Plot of Unstandardized Residuals

The plot does not show a completely random scatter around the zero reference line. Instead, several curved and clustered departures occur, especially across the middle quantiles. A visual conclusion of perfect normality would therefore be unwarranted. The formal Kolmogorov–Smirnov test, however, reports $D = 0.064$ and $p = 0.327$; accordingly, the null hypothesis of normality is not rejected at the 5% significance level. This result should be read together with, rather than as a substitute for, the other regression diagnostics.

Table 3. Residual Diagnostic Tests

Diagnostic / Predictor	Test statistic	p-value	Interpretation
Kolmogorov–Smirnov	D = 0.064	0.327	Normality not rejected
Glejser: FED	t = -6.131	<0.001	Heteroskedasticity indicated
Glejser: TB	t = 4.888	<0.001	Heteroskedasticity indicated
Durbin–Watson	0.121	—	Strong indication of positive

As shown in Table 3, the Glejser test indicates heteroskedasticity for both FED ($t = -6.131$, $p < 0.001$) and TB ($t = 4.888$, $p < 0.001$). Moreover, the Durbin–Watson value of 0.121 is strongly suggestive of positive serial correlation in the monthly residual series. Although the normality test is not statistically significant, the constant-variance and disturbance-independence assumptions are not supported by these diagnostics.

Serial dependence is unsurprising in a level equation involving persistent macro-financial stocks, but it is not innocuous. Heteroskedasticity and autocorrelation can distort conventional standard errors and confidence intervals, while common trends can produce apparently persuasive sample fit even without a stable economic relation. The diagnostic findings therefore do not justify the statement that all classical assumptions have been met. Before treating reported t and F probabilities as definitive, the data should be checked for stationarity and structural breaks, then evaluated using defensible dynamic specifications and autocorrelation-robust inference (Newey & West, 1987; Phillips & Perron, 1988; Engle & Granger, 1987).

Multiple Linear Regression and Hypothesis Testing

Table 4. Multiple Linear Regression and Hypothesis Testing

Regressor	B	Std. error	Beta (β)	t	Reported p
Constant	65.221	2.498	—	26.112	<0.001
FED total assets	0.011	0.001	0.913	19.887	<0.001
Indonesia trade balance	-2.469	0.686	-0.165	-3.599	<0.001

The reported coefficients in Table 3 imply a positive conditional association between Federal Reserve total assets and Indonesia's reserve stock and a negative conditional association for the merchandise trade balance. Expressed in the same level units as the thesis tables, the displayed regression equation is $RES = 65.221 + 0.011FED - 2.469TB + \varepsilon$. If FED and TB are measured in US\$ billions, a difference of US\$1 billion in Federal Reserve assets corresponds to approximately US\$0.011 billion in the predicted reserve stock, holding the merchandise balance constant. This is a sample regression association, not a causal multiplier or a forecast of a proposed Federal Reserve policy action.

The displayed standard errors are rounded, so dividing the rounded B by the rounded standard error may not reproduce the reported t statistics exactly. The coefficient signs, standardized betas, and t statistics are retained as presented by the underlying SPSS table. Importantly, the thesis abstract contains different coefficient numbers from the main regression table. In a final manuscript the full-precision output should be retrieved from the

original SPSS file and used consistently in the abstract, results, and conclusion. No new inferential precision is implied by the display rounding in this draft.

Model Fit and Explanatory Power

Table 5. Regression Model Summary

Model statistic	Reported value
R	0.832
R ²	0.692
Adjusted R ²	0.689
Standard error of the estimate	15.135
F statistic	239.064
Model degrees of freedom	(2, 213)
Conventional model p	<0.001
Number of observations	216

The two-predictor equation has a reported R² of 0.692 and adjusted R² of 0.689, corresponding to 69.2% of the in-sample dispersion in reserves explained by the fitted values. The nominal overall F statistic is 239.064 with two and 213 degrees of freedom. A substantial R² may be expected when highly persistent series are regressed on each other, however, and it is not evidence of a stable policy-transmission effect by itself. Nor should the complement, 30.8%, be presented as a measured causal influence of omitted variables. It is the fraction of sample variation not accounted for by the fitted specification.

The standardized coefficient of FED (0.913) exceeds the absolute standardized coefficient of TB (0.165), implying a larger partial standardized association in this model. Nevertheless, these standardized associations depend on the dispersion of the included variables and on how the model treats its temporal structure. The conclusion that Federal Reserve assets are the “dominant causal driver” would be premature: observed common trends, simultaneity, and omitted variables could influence the result. A time-series re-estimation, potentially including lagged changes and relevant controls, is needed to assess whether that relative ranking persists.

Discussion

The Association between the Federal Reserve Balance Sheet and Indonesian Reserves

The positive reported FED coefficient can be interpreted against a background of global financial integration. Large-scale asset purchases can lower long-term yields and alter the incentives of global investors, while changes in monetary expectations influence funding conditions and risk-taking. Fratzscher et al. (2018) documented different portfolio-flow patterns across QE episodes, and Miranda-Agrippino & Rey (2020) linked US monetary conditions to the global credit and financial cycle. Such mechanisms offer a plausible setting in which Federal Reserve asset holdings and Indonesian reserve assets move in a similar direction over extended periods.

Cross-country evidence, however, does not imply that every expansion in the Federal Reserve balance sheet mechanically increases Indonesia's official reserves. Kabaca and Tuzcuoglu (2024) demonstrate that spillovers can work through borrowing costs, risk premia, and the exchange rate; their empirical setting is Canada rather than Indonesia. Lastauskas and Nguyen (2024) find that the effects of US tightening vary with uncertainty and country exposure. Gál and Juhasz (2025) also highlight heterogeneity in emerging-market responses to quantitative tightening. These studies support discussion of possible channels while underlining that the estimated Indonesian association cannot be transported to other periods without additional tests.

The Federal Reserve assets variable may also proxy a collection of crisis and trend effects. Both the 2008 shock and the pandemic led to extraordinary policy responses, including interventions by domestic authorities in Indonesia. A country may accumulate reserves because of sovereign financing, valuation effects, capital inflows, or policy purchases even when its trade balance remains unchanged. Bank Indonesia's official 2025 communications provide a concrete example of multiple simultaneous financing sources affecting reserves. As a result, the level coefficient should be described as a conditional statistical association, not as proof of direct liquidity transmission from the Federal Reserve to the Indonesian reserve portfolio.

A useful robustness strategy would replace the raw FED level with its log change, a policy-surprise measure, or identified changes in holdings, while introducing controls such as domestic policy rates, exchange-rate movements, and global risk appetite. If both reserve and Federal Reserve asset levels have unit roots, a cointegration analysis could establish whether a meaningful long-run relationship exists before a levels regression is interpreted. A small collection of well-justified dynamic models would deliver more information than repeated interpretation of the current OLS p-values (Engle & Granger, 1987; Pesaran et al., 2001).

The Association between Indonesia's Merchandise Trade Balance and Reserves

The negative TB coefficient is noteworthy because a merchandise surplus is often described as a source of foreign-exchange earnings. Yet trade flows and official reserve stocks answer different accounting questions. A positive goods trade balance does not require Bank Indonesia to purchase the foreign currency earned by exporters. Firms may retain receipts in commercial-bank deposits, the earnings may finance services or investment-income outflows, or they may be offset by portfolio outflows and valuation changes. The BPM7 statistical framework and IMF reserve guidance make clear that reserve assets belong within a broader external accounts system, not the merchandise trade table alone (IMF, 2016, 2025).

The contrast is supported by Indonesian empirical work rather than explained away by speculation. Karimi et al. (2025), using a different historical window and additional regressors, found that net exports had a positive but statistically insignificant association with reserves, while exchange rates and foreign direct investment displayed significant relationships. Their specification and results differ from those reported in this source thesis. That divergence is evidence that the sign of a trade variable is sensitive to the period, measurement, and other

controls, and that the present negative coefficient should not be converted into a policy recommendation to reduce exports or trade surpluses.

Balance-of-payments dynamics are further affected by international risk sentiment. Goldberg & Krogstrup (2023) show that changes in risk appetite and intervention pressures differ across currencies and country circumstances. Davis and Zlate (2023) find that global factors were particularly important to exchange rates and capital flows during the pandemic. These findings clarify why reserve stocks can move differently from the contemporaneous merchandise trade balance, especially during financial disturbances. The monthly stock-flow mismatch also raises questions about the timing of any effects: merchandise receipts may lead, lag, or never be converted into changes in official reserves.

A more informative subsequent model would evaluate trade flows with lags and include the broader current account and financial account where data permit. Price effects, valuation of non-dollar assets, and reserve interventions should be considered explicitly. The statistical result currently shows a negative partial association within one static level equation. It does not establish that an improvement in Indonesia's trade balance reduces foreign exchange reserves. That stronger claim would require appropriately specified time-series analysis and a credible mechanism for identification.

Several recent studies adopt designs that more directly represent the timing of trade and reserve adjustments. Bake et al. (2024) distinguish long-run and short-run coefficients for exports, exchange rates, and external debt. Basuki and Mulyani (2024) use a vector error-correction framework to separate short-run fluctuations from long-run relations. Syahrullah et al. (2026), studying export performance rather than reserve accumulation as the dependent variable, apply an ARDL model and show that export activity can itself be affected by imported inputs and reserve conditions. These differences in causal ordering and lag structure demonstrate why a static trade-balance coefficient cannot by itself settle the direction of the economic mechanism.

Evidence from distinct datasets also gives opposing signs or significance decisions. Prihantini and Sekarningsih (2025) find that exports are positively related to Indonesian reserves in their monthly model. Karimi et al. (2025) report a positive but statistically insignificant net-export coefficient over a much longer annual sample. Nasution & Nasution, (2026) find that palm-oil exports are not significantly associated with reserves in either the short or long run, while external debt is positively related. Rather than select only supportive research, the present study locates its negative association among these heterogeneous published results and identifies model specification as a plausible source of difference.

Joint Interpretation and Economic Implications

The value of placing FED and TB in the same model is that it highlights two different domains of external-sector exposure. Federal Reserve assets are a proxy for an international financial environment, while the trade balance captures a domestic real-economy flow. The relatively high reported R^2 suggests substantial sample comovement, not that these two quantities exhaust the forces shaping Indonesia's reserve holdings. Reserve adequacy must

be evaluated against external liabilities, likely shocks, access to financing, and intervention needs rather than by a single fitted statistic (IMF, 2016; Goldberg & Krogstrup, 2023).

The current results also demonstrate why a policy narrative should respect the distinction between direct control and statistical association. Bank Indonesia cannot determine the Federal Reserve's balance-sheet policy, and Indonesia's merchandise balance is not an instrument that maps directly into the central bank's reserve stock. The analysis is useful for identifying potentially informative indicators for external monitoring. It is not sufficient to recommend that policymakers increase or decrease a trade surplus or expect a certain reserve gain after a US asset-purchase announcement.

For policy analysis, the next step is to strengthen the evidence rather than merely enlarge the OLS narrative. Weekly Federal Reserve assets should be aligned transparently with the monthly sample, official reserve-stock dates should be checked against the Bank Indonesia release calendar, and each monthly trade figure should be reproduced from BPS source data. The interpretation could then be assessed against independently measured global financial stress, domestic exchange-rate pressure, sovereign external financing, and changes in foreign direct investment. Official data make this reproducible exercise feasible (Board of Governors of the Federal Reserve System, 2026; Bank Indonesia, 2026; BPS, 2026).

A broader ASEAN perspective supports the same interpretation. Septya et al. (2026) examine macroeconomic indicators and international reserves across eight Southeast Asian economies, including exports, imports, the exchange rate, and investment variables, suggesting that macroeconomic and labour-market environments influence the associations observed. An Indonesian study by Alqorni et al. (2026) highlights indirect pathways from foreign investment and exchange rates through exports. These analyses cannot be substituted mechanically for the present monthly dataset, but they reinforce that future models should account for more than the merchandise surplus and Federal Reserve asset stock.

Research Limitations and Robustness Agenda

Several limitations affect the statistical strength of this study. First, the observation window includes major global crises, implying possible breaks in variable means, volatility, or structural relationships. Second, there is no documented unit-root or cointegration testing in the material used for this draft. Third, the residual tests report heteroskedasticity and strong autocorrelation. Fourth, contemporaneous OLS cannot distinguish feedback, omitted macroeconomic channels, and common trends. These restrictions make the conventional p-values unsuitable as final publication-level proof of a causal mechanism.

A reproducible revision should conduct unit-root tests in levels and first differences, evaluate break dates, assess any cointegrating relationship, and estimate an econometrically appropriate dynamic specification. Depending on the data properties, an error-correction or ARDL representation may be justified; Newey–West standard errors can be useful for inference if the regression framework and asymptotic conditions warrant them (Newey & West, 1987; Phillips & Perron, 1988; Engle & Granger, 1987; Pesaran et al., 2001). Neither a change of standard errors nor a transformation of variables should be made solely to force

statistical significance. The reanalysis should also retain precise data documentation and resolve the discrepancy between the thesis abstract and Chapter IV outputs.

CONCLUSION

Using 216 monthly observations for 2008–2025, the source thesis reports a positive conditional association of Federal Reserve total assets with Indonesia's official reserves ($B = 0.011$; $t = 19.887$) and a negative conditional association of the merchandise trade balance ($B = -2.469$; $t = -3.599$). The model reports $F(2,213) = 239.064$ and $R^2 = 0.692$, with the Federal Reserve asset series having the larger standardized coefficient. These are descriptive statements about the estimated sample equation and should not be conflated with identified structural effects.

The diagnostics are integral to the conclusion: both Glejser tests signal heteroskedasticity, and the Durbin–Watson value of 0.121 indicates substantial positive error autocorrelation. The conventional t and F probabilities therefore require re-evaluation after the time-series properties of the data have been investigated. The results suggest that external financial conditions and domestic merchandise trade are worthwhile indicators for further examination, but they do not demonstrate direct policy causation or provide a validated forecasting rule.

Future research should verify the monthly series against the Federal Reserve, BPS, and Bank Indonesia; state the exact frequency-aggregation and unit conversions; test for nonstationarity, possible cointegration, and breaks; and estimate appropriate dynamics with valid inference. These improvements would clarify whether the signs and relative strengths of the observed associations remain after the econometric assumptions are satisfied. A broader balance-of-payments approach including capital flows, exchange-rate pressures, and reserve valuation changes would also yield a more defensible account of Indonesia's external resilience.

REFERENCE

- Alqorni, F., Syapsan, S., & Widayatsari, A. (2026). The influence of foreign direct investment and exchange rate on foreign exchange reserves through exports in Indonesia from 2003 to 2023. *International Journal of Economics and Management Research*, 5(1). <https://doi.org/10.55606/ijemr.v5i1.633>
- Bake, P. A., Hodijah, S., & Nurjanah, R. (2024). Analisis pengaruh ekspor, kurs dan utang luar negeri terhadap cadangan devisa Indonesia. *E-Journal Perdagangan Industri Dan Moneter*, 12(1), 36–50. <https://doi.org/10.22437/pim.v12i1.35840>
- Basuki, A. T., & Mulyani, P. (2024). Analisis faktor-faktor yang mempengaruhi cadangan devisa Indonesia. *EKOMA: Jurnal Ekonomi, Manajemen, Akuntansi*, 3(3). <https://doi.org/10.56799/ekoma.v3i3.3335>
- Cerutti, E., & Claessens, S. (2024). *The global financial cycle: Quantities versus prices*. <https://doi.org/10.5089/9798400282867.001>
- Davis, J. S., & Zlate, A. (2023). The global financial cycle and capital flows during the COVID-19 pandemic. *European Economic Review*, 156, 104477.

<https://doi.org/10.1016/j.euroecorev.2023.104477>

- Engle, R. F., & Granger, C. W. J. (1987). Co-integration and error correction: Representation, estimation, and testing. *Econometrica*, 55(2), 251–276.
- Fed, S. L. (2023). Assets and liabilities on the Fed's balance sheet. In *FRED Blog*. <https://fredblog.stlouisfed.org/2023/02/assets-and-liabilities-on-the-feds-balance-sheet/>
- Fratzscher, M., Lo Duca, M., & Straub, R. (2018). On the international spillovers of US quantitative easing. *The Economic Journal*, 128(608), 330–377. <https://doi.org/10.1111/eoj.12435>
- Fund, I. M. (2025). *Integrated Balance of Payments and International Investment Position Manual, Seventh Edition (BPM7)* (7th ed. (white-cover, pre-edited version)). International Monetary Fund. <https://data.imf.org/-/media/iData/External-Storage/Documents/5B776E0E552E4881AF24042EAE7D049B/en/1-BPM7-White-Cover.pdf>
- Gál, H., & Juhasz, A. (2025). Quantitative tightening: Theory, research, and impact on selected emerging market economies. *Journal of Central Banking Theory and Practice*, 14(1), 163–181. <https://doi.org/10.2478/jcbtp-2025-0009>
- Goldberg, L. S., & Krogstrup, S. (2023). International capital flow pressures and global factors. *Journal of International Economics*, 146, 103749. <https://doi.org/10.1016/j.jinteco.2023.103749>
- Indonesia, B. (2026). *Official reserve assets increased in December 2025*. https://www.bi.go.id/en/publikasi/ruang-media/news-release/Pages/sp_280426.aspx
- Kabaca, S., & Tuzcuoglu, K. (2024). International transmission of quantitative easing policies: Evidence from Canada. *Journal of Economic Dynamics and Control*, 162, 104849. <https://doi.org/10.1016/j.jedc.2024.104849>
- Karimi, A. F., Maryanti, M., & Karimi, K. (2025). Pengaruh net ekspor, kurs, foreign direct investment dan wisatawan asing terhadap cadangan devisa di Indonesia. *Jurnal Akuntansi Dan Ekonomika*, 14(2), 223–232. <https://doi.org/10.37859/jae.v14i2.7389>
- Kumar, S., Prabheesh, K. P., & Gunadi, I. (2026). Unravelling the factors behind Indonesia's international exchange reserves. *Journal of Asian Economics*. <https://doi.org/10.1016/j.asieco.2025.102105>
- Lastauskas, P., & Nguyen, A. D. M. (2024). Spillover effects of US monetary policy on emerging markets amidst uncertainty. *Journal of International Financial Markets, Institutions and Money*, 92, 101956. <https://doi.org/10.1016/j.intfin.2024.101956>
- Miranda-Agrippino, S., & Rey, H. (2020). U.S. monetary policy and the global financial cycle. *The Review of Economic Studies*, 87(6), 2754–2776. <https://doi.org/10.1093/restud/rdaa019>
- Nasution, K. F. D., & Nasution, A. R. (2026). The effect of palm oil exports, machinery imports, and foreign debt on foreign exchange reserves in Indonesia 2005–2024. *Economic Education Analysis Journal*, 15(2). <https://doi.org/10.15294/eeaj.v15i2.49565>
- Newey, W. K., & West, K. D. (1987). A simple, positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix. *Econometrica*, 55(3), 703–708.

- Nurhasanah, N., Iskandar, I., & Ridha, A. (2025). The influence of foreign debt, exchange rate and export values on Indonesia's foreign exchange reserves. *International Review of Economics and Financial Issues*, 1(3). <https://doi.org/10.62941/irefi.v1i3.25>
- Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, 16(3), 289–326. <https://doi.org/10.1002/jae.616>
- Phillips, P. C. B., & Perron, P. (1988). Testing for a unit root in time series regression. *Biometrika*, 75(2), 335–346.
- Prihantini, N., & Sekarningsih, R. B. (2025). Analisis faktor-faktor yang mempengaruhi cadangan devisa di Indonesia periode 2014–2024. *Jurnal Ilmiah Ekonomi Dan Manajemen*, 3(5). <https://doi.org/10.61722/jiem.v3i5.4829>
- Rustami, D., & Septriani, S. (2024). The economic determinants of foreign exchange reserve fluctuations in Indonesia. In *Nusantara Science and Technology Proceedings* (Vol. 2024, Issue 46, pp. 15–28). <https://doi.org/10.11594/nstp.2024.4603>
- Septya, C. R., Riyanto, W. H., & Sulistyono, S. W. (2026). The relationship between macroeconomic factors and ASEAN foreign exchange reserves with the unemployment rate as a moderating variable. *Jurnal Ilmu Ekonomi JIE*, 10(2). <https://doi.org/10.22219/jie.v10i02.41754>
- Statistik, B. P. (2025). *Statistik Penyediaan Makanan Minuman 2024*. Badan Pusat Statistik. <https://www.bps.go.id/id/publication/2025/12/31/e46a55af756331ede8016b91/statistik-penyediaan-makanan-minuman-2024.html>
- Syahrullah, A. F., Effendi, A. D., & Sutanto, H. (2026). The role of imports, exchange rates, and reserve stability in driving Indonesia's export performance. *Optimum: Jurnal Ekonomi Dan Pembangunan*, 16(1). <https://doi.org/10.12928/optimum.v16i1.15536>
- System, B. of G. of the F. R. (2026). *H.4.1: Factors affecting reserve balances of depository institutions and condition statement of Federal Reserve Banks*. <https://www.federalreserve.gov/releases/h41/>
- Tirtana, D., Miftarova, A., Fauzi, F., & Gimnastiar, R. M. (2025). The role of foreign debt, exports, and exchange rates in increasing Indonesia's foreign exchange. *Business and Economic Analysis Journal*, 5(2). <https://doi.org/10.15294/beaj.v5i2.25291>
- Wooldridge, J. M. (2020). *Introductory econometrics: A modern approach* (7th ed.). Cengage Learning.