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THE EFFECT OF INTERNATIONAL TRADE ON INDONESIA'S FOREIGN EXCHANGE RESERVES

Jenny Tri Wulandari[1*], Ayu Widyana Ning Tyas[2], Rosina Isabelle Rielsia[3], Josephine Wuri[4]
[1,2,3,4]Department of Economics, Faculty of Economics, Sanata Dharma University, Indonesia
[1]jennytw0304@gmail.com, [2]ayuwidyanaa@gmail.com, [3]damarissempa@gmail.com, [4]josephine@usd.ac.id
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Abstract
Foreign exchange reserves are a fundamental indicator of a country's economic resilience in facing global market dynamics. This study aims to analyze the contribution of international trade to Indonesia's foreign exchange reserves from 2010 to 2024. The research method used is a quantitative approach with a simple linear regression model based on annual time series data sourced from the World Bank and Bank Indonesia. The results show that international trade performance, particularly exports, has a statistically significant positive impact on Indonesia's foreign exchange reserves. Every increase in export value directly contributes to an increase in national foreign exchange reserves. This finding confirms that exports are a key factor in strengthening the country's foreign exchange reserves. Policy implications emphasise the importance of optimising the added value of export products in international markets. A strengthening strategy through industrial downstreaming and global market diversification is a crucial step for the government to ensure sustainable foreign exchange reserve growth and maintain long-term macroeconomic stability.
Keywords: *Foreign exchange reserves, exports, time series data, value added, economic stability.*

1. Introduction

Foreign exchange reserves represent a vital indicator of a nation's economic resilience when navigating global uncertainties. As foreign assets controlled by monetary authorities, foreign exchange reserves serve a dual purpose: acting as a medium for settling international transactions and functioning as a buffer against external economic shocks (Bank Indonesia, 2024; Tambunan, 2022). Globally, the accumulation of foreign reserves across emerging market economies is predominantly driven by a precautionary motive, reflecting deliberate efforts to preserve external stability and mitigate vulnerability during financial crises (Ghosh et al., 2021; IMF, 2023). These dynamic shifts are strongly conditioned by international trade positioning and prevailing macroeconomic conditions globally (UNCTAD, 2023; OECD, 2022).

Indonesia's foreign exchange reserve position exhibited noticeable fluctuations throughout the 2010–2024 period. Recorded at USD 96.21 billion in 2010, reserves expanded to USD 155.71 billion by 2024. However, notable contractions occurred in 2013 and 2022, signalling that national reserve positions remain highly sensitive to external sector shifts (Bank Indonesia, 2024). Panggabean (2025) underscores that external variables, particularly international trade activity, play a critical role in shaping reserve dynamics.

Export performance is a primary and consistent foreign currency generator. Theoretically, higher export volumes enhance the current account balance and induce substantial foreign exchange inflows (Aulia & Syafri, 2021; Tambunan, 2022). Nevertheless, the empirical efficacy of exports in driving reserve accumulation remains subject to global commodity price trends, post-pandemic trading partner demand, and inflationary pressures (Sanjaya & Wianti, 2023; Simamora & Widanta, 2021).

Despite extensive research on foreign exchange reserves, a fundamental research gap persists. Prior studies frequently incorporate multiple monetary variables simultaneously, thereby obscuring the specific, isolated role of exports as a primary real-sector driver. Furthermore, existing literature often relies on constrained timeframes; for instance, Panggabean (2025) covers data only through 2021. Therefore, this study aims to examine the empirical impact of exports on Indonesia's foreign exchange reserves over the updated 2010–2024 period. Employing a simple linear regression model, this research delivers precise insights into the extent to which international trade acts as a

key anchor in safeguarding national reserve stability.

2. Literature Review

Foreign exchange reserves are external assets held and managed by monetary authorities, particularly central banks, to meet international payment obligations, address balance of payments imbalances, maintain confidence in the domestic currency, and, when necessary, intervene in the foreign exchange market. Adequate foreign exchange reserves therefore represent an important component of a country's external economic resilience, as they provide liquidity to finance imports, service external obligations, and mitigate the effects of external economic and financial shocks.

From the perspective of international economics, the relationship between exports and foreign exchange reserves can be explained through mercantilist and precautionary-mercantilist approaches to reserve accumulation. The mercantilist perspective emphasises the role of export-oriented economic activity in generating trade surpluses and accumulating foreign assets. When a country's export earnings exceed its foreign exchange requirements for imports and other external payments, the resulting net inflow of foreign currency can increase foreign exchange reserves. Accordingly, export expansion can strengthen a country's external position by increasing its capacity to generate foreign currency through real economic activity.

The precautionary perspective provides a complementary explanation for reserve accumulation. Countries may accumulate foreign exchange reserves not only as a consequence of trade surpluses but also as a form of self-insurance against external vulnerability. Adequate reserves enable monetary authorities to respond to sudden capital outflows, exchange-rate volatility, disruptions in external financing, and unexpected increases in foreign currency requirements. In economies with substantial exposure to international trade, stronger export performance can facilitate this precautionary accumulation by providing a relatively continuous source of foreign exchange earnings.

The mechanism through which exports influence foreign exchange reserves can also be understood from the balance of payments framework. Exports of goods and services generate foreign currency receipts and are recorded as credits in the current account. An increase in export earnings, ceteris paribus, improves the current account balance and increases the supply of foreign currency within the domestic economy. When these foreign exchange earnings are converted through the domestic financial system and subsequently accumulated by the monetary authority rather than being entirely offset by imports, external debt payments, or capital outflows, they can contribute to an increase in official foreign exchange reserves. Thus, the relationship between exports and reserves operates through the broader interaction between the current account, financial account, and official reserve transactions.

Empirical literature has identified several determinants of foreign exchange reserve dynamics, including export earnings, imports, exchange rates, foreign direct investment, portfolio and other capital flows, external borrowing, external debt service, inflation, and interest rates. However, these sources of foreign exchange differ considerably in their economic characteristics. Foreign borrowing, for example, can increase the availability of foreign currency in the short term but simultaneously creates future repayment and interest obligations. Portfolio capital inflows can also strengthen foreign exchange availability, yet they may be highly sensitive to changes in global interest rates, investor expectations, and international financial conditions.

Foreign direct investment tends to be relatively more stable than short-term portfolio flows and can contribute to foreign exchange availability while simultaneously supporting productive capacity. Nevertheless, FDI remains dependent on investment conditions, political and macroeconomic stability, and investors' expectations regarding future returns. In comparison, export earnings represent a foreign exchange inflow generated directly from productive economic activity and international demand for domestically produced goods and services. Export proceeds therefore do not inherently create the same repayment obligations associated with external debt.

They are generally less directly exposed to the sudden reversal risk characteristic of short-term speculative capital flows.

Nevertheless, the relationship between exports and foreign exchange reserves should not be regarded as automatic or proportional. Higher exports generate greater potential foreign exchange earnings, but the extent to which these earnings translate into higher official reserves depends on several factors. These include the country's import requirements, external debt repayments, exchange-rate regime, capital flows, foreign exchange intervention policies, repatriation and conversion of export proceeds, and the institutional framework governing foreign exchange transactions. Consequently, a country may experience strong export growth without an equivalent increase in reserves when higher imports, debt servicing, or capital outflows simultaneously absorb foreign currency earnings.

The composition and sustainability of exports are also important. Economies that depend heavily on primary commodities may experience substantial fluctuations in export earnings because international commodity prices are volatile. A temporary commodity-price boom can increase foreign exchange earnings and reserves, but the effect may weaken when global prices decline. Conversely, greater export diversification, expansion into higher-value-added products, and access to a broader range of international markets can contribute to more sustainable foreign exchange earnings and reduce vulnerability to sector-specific external shocks.

Previous empirical studies generally provide support for the importance of exports in explaining foreign exchange reserve movements. Puspita and Kurniawan (2024) found that exports had a positive relationship with Indonesia's foreign exchange reserves, indicating that stronger export performance can increase the availability of foreign currency within the domestic economy. Other studies have approached reserve accumulation from a broader macroeconomic perspective. Rahmawati and Suriani (2022) examined Indonesia's foreign exchange reserves by considering exports alongside imports, exchange rates, inflation, and external debt, demonstrating that reserve movements are closely connected to developments in both the external sector and domestic macroeconomic conditions. Similarly, Maghfiroh and Anggraeni examined the relationships among exchange rates, exports, imports, inflation, and foreign exchange reserves, further highlighting the relevance of international trade variables in explaining reserve dynamics. Taken together, the empirical literature indicates that multiple macroeconomic forces determine foreign exchange reserves, while exports constitute an important real-sector source of foreign currency.

The theoretical mechanisms and empirical evidence therefore provide a strong basis for expecting a positive relationship between exports and foreign exchange reserves. Higher export earnings increase the potential inflow of foreign currency and, provided that these inflows are not fully offset by imports, debt servicing, or capital outflows, can strengthen the country's reserve position. This relationship is particularly important because export-generated foreign exchange originates from productive international transactions rather than from the accumulation of additional external liabilities. Based on the theoretical arguments and previous empirical findings, this study proposes the following hypothesis:

H1: Exports have a positive and statistically significant effect on foreign exchange reserves.

3. Research Methods

3.1 Research Design and Data

This study adopts a quantitative approach to test the effect of export performance on foreign exchange reserves. Secondary annual time-series data spanning 2010 to 2024 were utilized. All data were collected from official databases of the World Bank and Bank Indonesia.

Table 1. Operational Definition of Research Variables

Variable	Indicator	Description	Source
Dependent	Foreign	Foreign assets held by the central bank	World Bank

Variable	Indicator	Description	Source
Variable	Exchange Reserves	for international transactions, expressed in natural logarithm.	
Independent Variable	Exports	Total value of oil/gas and non-oil/gas goods and services sold abroad, expressed in natural logarithm.	BPS / World Bank

Source: Author compilation based on study parameters (2025).

3.2 Classical Assumption Tests

Prior to regression estimation, statistical diagnostic tests were performed to verify that Ordinary Least Squares (OLS) estimates fulfill Best Linear Unbiased Estimator (BLUE) properties. Diagnostic evaluations encompassed: (1) Normality testing via Jarque-Bera to confirm normally distributed residuals; (2) Heteroscedasticity testing via White's Test to verify constant error variance; and (3) Autocorrelation testing via Breusch-Godfrey Serial Correlation LM Test to rule out cross-period error dependence. All diagnostic procedures were conducted using EViews 12 software.

The simple linear regression model is specified as follows:

$$\text{Reserves} = \beta 0 + \beta 1\ \text{Export} + \varepsilon$$

Where Reserves represents foreign exchange reserves, Export represents export value, $\beta 0$ is the constant term, $\beta 1$ is the regression coefficient, and ε is the error term.

3.3 Hypothesis Testing

The hypothesized directional effect is $\beta_1 > 0$, implying a positive impact of exports on foreign exchange reserves. Hypothesis testing was conducted using the t-test for partial significance and F-test for overall model significance, evaluated at a 5% significance level ($\alpha = 0.05$).

4. Research Findings and Discussion

4.1 Descriptive Statistics

Table 2 summarizes the descriptive statistics of the research variables. Indonesia's foreign exchange reserves averaged USD 125.93 billion with a standard deviation of USD 17.82 billion, ranging from USD 96.21 billion (2010) to USD 155.71 billion (2024). Meanwhile, export values averaged USD 198.54 billion with a standard deviation of USD 45.37 billion, bounded between USD 145.13 billion and USD 292.19 billion.

Table 2. Descriptive Statistics of Research Variables

Variable	Mean	Std. Dev.	Min	Max
Foreign Exchange Reserves (USD Billion)	125.93	17.82	96.21	155.71
Exports (USD Billion)	198.54	45.37	145.13	292.19

Source: Research data, processed (2025).

4.2 Classical Assumption Test Results

1) ***Normality Test*:** The Jarque-Bera statistic was 0.939011 with a probability value of 0.625311 (> 0.05). Thus, H_0 cannot be rejected, confirming that the residuals are normally distributed.

Table 3. Jarque-Bera Normality Test Results

Criterion	Value	Conclusion
Jarque-Bera Statistic	0.939011	Residuals are normally distributed (H_0 accepted)
Probability (Prob.)	0.625311	Residuals are normally distributed (H_0 accepted)

Criterion	Value	Conclusion
Skewness	-0.181190	Residuals are normally distributed (H_0 accepted)
Kurtosis	1.829061	Residuals are normally distributed (H_0 accepted)

Source: Research data, processed (2025).

***2) Autocorrelation Test*:** The Breusch-Godfrey Serial Correlation LM Test yielded an F-statistic probability of 0.1029 and Obs*R-squared probability of 0.0789, both exceeding 0.05. This indicates the absence of serial correlation across period errors.

Table 4. Autocorrelation Test Results

Criterion	Value	Probability	Conclusion
F-statistic	2.815608	0.1029	No autocorrelation present
Obs*R-squared	5.078898	0.0789	No autocorrelation present

Source: Research data, processed (2025).

***3) Heteroscedasticity Test*:** White's Test generated an Obs*R-squared probability of 0.3393 and Prob. F of 0.3753 (> 0.05). Therefore, the assumption of homoscedasticity is fulfilled.

Table 5. Heteroscedasticity Test Results

Criterion	Value	Probability	Conclusion
F-statistic	0.842753	0.3753	No heteroscedasticity present
Obs*R-squared	0.913206	0.3393	No heteroscedasticity present
Scaled explained SS	0.284334	0.5939	No heteroscedasticity present

Source: Research data, processed (2025).

a) Simple Linear Regression Results

Regression estimates demonstrate that export value significantly influences foreign exchange reserves. The regression coefficient for exports is 0.437138 (p = 0.0086), indicating that a 1% increase in export performance leads to approximately 0.44% growth in foreign exchange reserves. Dengan demikian, semakin tinggi nilai ekspor, semakin besar pula devisa yang diprediksi akan diperoleh.

Table 6. Simple Linear Regression Estimation Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C (Constant)	-0.509554	1.719525	-0.296334	0.7717
Export (X)	0.437138	0.141376	3.092029	0.0086

Dependent Variable: Reserves. *Source*: Research data, processed (2025).

This influence is statistically significant. This can be seen from the t-statistic value of 3.092029 with a probability of 0.0086. Since the probability value of 0.0086 is smaller than the significance level of 5% (0.05), H_0 is rejected and H_1 is accepted. In fact, the result is still significant at a significance level of 1% because it is 0.0086<0.01. Thus, there is strong statistical evidence that exports have an effect on foreign exchange, and the direction of its influence is positive. The standard error of the export coefficient of 0.141376 is also relatively small compared to the coefficient of 0.437138. This shows that the estimated export coefficient has a fairly good level of accuracy.

From an economic perspective, the results are in accordance with international trade mechanisms. Export activities generate revenue from abroad, which is generally paid in foreign currency. The higher a country's exports, the greater the potential for incoming foreign exchange flows, which can increase the receipt or availability of foreign exchange. This happens because export transactions are basically the activities

of selling domestic goods and services to foreign parties that result in payments in foreign currencies. The receipt of foreign exchange then enters the domestic financial system and becomes one of the important sources in the formation and strengthening of the country's foreign exchange. Thus, the increase in exports not only reflects increased international trade activity, but also demonstrates the ability of the domestic economy to generate external sources of revenue.

The increase in foreign exchange receipts from export activities has strategic significance for the economy because foreign exchange is needed to finance various international transactions, especially the payment of imports of goods and services, foreign debt obligations, and other international transaction needs. Adequate foreign exchange can also strengthen a country's ability to meet the import needs of capital goods, raw materials, technology, and intermediate goods needed in the domestic production process. In this context, exports can have a wider impact because foreign exchange earned from exports can be reused to support productive activities in the country.

In addition, increasing foreign exchange receipts through exports can help strengthen a country's external position. As export receipts increase, the supply of foreign exchange in the economy tends to increase. These conditions can help meet foreign exchange demand derived from import needs and the payment of international obligations. If the increase in exports is sustainable and not followed by a greater increase in foreign exchange needs, this can strengthen the trade balance and ultimately support the country's balance of payments position.

In terms of macroeconomic stability, an increase in foreign exchange supply from exports can also help reduce pressure on the domestic currency exchange rate. When the need for foreign exchange can be offset by export receipts, dependence on other external sources of financing can be reduced. This condition is important because too much dependence on external debt or short-term capital flows can increase the vulnerability of economies to changes in global economic conditions. Therefore, foreign exchange revenues sourced from exports are relatively important in strengthening the economy's external resilience.

However, the contribution of exports to foreign exchange increases is determined not only by export volume but also by export value, international commodity prices, types of products exported, exchange rates, and a country's trade structure. An increase in export volume does not necessarily result in an increase in foreign exchange in the same proportion if the price of export commodities decreases. Conversely, rising commodity prices in international markets can increase the value of export receipts even if export volumes do not increase significantly. Therefore, the relationship between exports and foreign exchange needs to be understood not only in terms of the quantity of goods traded, but also in terms of the economic value generated from these activities.

The structure of exports also determines the sustainability of foreign exchange receipts. Countries that are heavily dependent on some primary commodities tend to be more susceptible to price fluctuations in international markets. When the prices of major commodities decline, export receipts and foreign exchange flows may also decline. Conversely, diversifying exports and increasing the proportion of value-added products can create a more stable source of foreign exchange. Thus, efforts to increase foreign exchange through exports are not enough to be carried out only by increasing the number of exports, but also need to be accompanied by increasing competitiveness, diversifying products and destination markets, and developing products that have higher added value.

In relation to the results of this study, the mechanism can explain the positive export regression coefficient of 0.437138, which is statistically significant with a probability of 0.0086. These results provide empirical evidence that changes in exports are positively related to changes in foreign exchange in the period studied. In other words, an increase in export activity tends to be followed by an increase in foreign exchange.

The results of this study are in line with several previous studies that show that exports have an important role in increasing foreign exchange or foreign exchange reserves (Puspita and Kurniawan, 2024; Maghfiroh and Anggraeni, 2024; Rahmawati and Suriani, 2022). These findings show that exports are an important source of foreign exchange receipts and play a strategic role in strengthening an economy's external capacity.

5. Conclusion

This study concludes that international trade, represented by export performance, exerts a positive and statistically significant effect on Indonesia's foreign exchange reserves over the 2010–2024 period. The empirical results show that higher exports are associated with higher foreign exchange reserves, confirming the important role of export activities as a source of foreign currency earnings. Stronger export performance increases foreign currency inflows generated through international transactions and can consequently strengthen Indonesia's external liquidity position. This finding also reinforces the theoretical argument that export-generated foreign exchange provides an important foundation for reserve accumulation, which in turn supports the country's capacity to finance imports, meet international payment obligations, maintain confidence in the domestic economy, and enhance resilience against external economic and financial shocks.

From a policy perspective, these findings underline the importance of strengthening Indonesia's export capacity as part of a broader strategy to maintain adequate and sustainable foreign exchange reserves. Policy efforts should extend beyond simply increasing export volumes and instead focus on industrial downstreaming, export diversification, technological upgrading, and the development of higher-value-added products. Reducing dependence on primary commodities is particularly important because commodity-based export revenues remain vulnerable to fluctuations in global prices and demand. Expanding Indonesia's access to both traditional and non-traditional export markets can further reduce market concentration risks and create more stable sources of foreign exchange earnings. At the same time, improving domestic industrial competitiveness, infrastructure, logistics efficiency, product quality, and integration into global value chains will be essential to ensure that export expansion translates into sustainable foreign exchange generation and stronger external economic resilience.

Future research should extend the present analysis by incorporating additional macroeconomic determinants of foreign exchange reserves, including imports, exchange rates, foreign direct investment, external debt, inflation, interest rates, capital flows, and external debt servicing, to provide a more comprehensive explanation of reserve dynamics.

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