Journal of Economich, Technology and Business (JETBIS)
Volume 5, Number 1 Januari 2026
p-ISSN 2964-903X; e-ISSN 2962-9330

Analysis of the Influence of Production, Global Prices, Exchange Rate, and Interest Rate on Changes in Indonesia's Crude Palm oil (CPO) Export Value

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KEYWORDS:
Export Value; Crude Palm Oil (CPO); Production; Global Price; Exchange Rate; Interest Rate

ABSTRACT
Exports play a pivotal role in Indonesia's economic growth, with crude palm oil (CPO) being a key contributor to international trade. A decline in CPO export value could potentially weaken economic performance. This research investigates the influence of production, global prices, exchange rates, and interest rates on Indonesia's CPO export value using a quantitative approach with the Error Correction Model (ECM) to analyze annual time-series data for the period 1995–2024 sourced from UN Comtrade, Index Mundi, Bank Indonesia, and Refinitiv. The findings indicate that production has a significant positive impact on export value in both the short run and the long run. Global prices and exchange rates also exert significant effects across both horizons, while domestic interest rates show an indirect influence. Overall, the study confirms that Indonesia's CPO export dynamics are shaped by a combination of production factors and macroeconomic variables, with distinct patterns of relationships between short-run and long-run contexts.

INTRODUCTION

International trade plays a crucial role in driving global economic growth. Exports and imports enable countries to leverage their comparative advantages to improve production efficiency and expand markets. According to Krugman et al. (2012), international trade enables countries to achieve higher levels of prosperity through specialization in sectors where they have a relative advantage. For developing countries like Indonesia, exports serve as a key driver of economic growth and a major source of foreign exchange earnings. Over the past two decades, exports have significantly impacted GDP stability and the national trade balance. Research by Devitasari et al. (2023) shows that increased export performance strengthens the national economy's resilience to external pressures such as exchange rate fluctuations and global demand. Furthermore, Afriyanti et al. (2024) found that a slowdown in exports can reduce state revenues and impact fiscal stability.

According to data from the Central Statistics Agency (2025), Indonesia's export value in 2024 was USD 264.7 billion, with approximately 84 percent coming from non-oil and gas exports. Among Indonesia's various non-oil and gas export commodities, Crude Palm Oil (CPO) occupies a strategic position in supporting the national economy. This commodity plays a major role as a foreign exchange earner and is a sector that absorbs a large number of domestic workers (Sari et al., 2024). Research by Purnama et al. (2023) also noted that the palm oil sector has a significant contribution to national financial stability. According to the table below, Indonesia's CPO export value in 2024 reached USD 22.9 billion, or approximately 10.8 percent of total national non-oil and gas exports (Central Statistics Agency, 2025). This figure places CPO in the top position as a major non-oil and gas export commodity, surpassing base metals, iron and steel, and nickel.

Indonesia's high CPO export volume not only reflects its substantial production capacity but also demonstrates the effectiveness of trade policies and the continued development of export

infrastructure (Rifin, 2010). The Indonesian government actively promotes CPO exports through various fiscal incentives and bilateral trade agreements, expanding market access to key destination countries such as India, China, and the European Union (L. P. Sari & Sishadiyati, 2022). Furthermore, the presence of strategic ports and an increasingly integrated logistics system strengthen Indonesia's position as a global CPO distribution hub (Haranto & Achmadi, 2012). These resource advantages and adaptive trade strategies help Indonesia maintain its competitiveness in the international market. Furthermore, the sustainability of this competitiveness is also aided by increased processing technology capacity and globally recognized sustainability certifications.

This phenomenon is a crucial concern in evaluating national export performance, given that CPO is a major contributor to the country's foreign exchange earnings. According to Djam'an et al. (2024), year-to-year export value instability can impact projected revenues for the plantation sector and downstream industries that rely on CPO export performance. Similarly, Hamidi et al. (2024) emphasize the importance of regularly monitoring export trends to understand market trends and formulate adaptive trade strategies to maintain Indonesia's sustainable position in the global vegetable oil market. Furthermore, Advent et al. (2021) emphasize that maintaining consistent CPO export performance is crucial for macroeconomic stability, given the sector's close link to foreign exchange earnings, employment, and the growth of domestic downstream industries.

In the dynamics of international trade, a country's production capacity is a fundamental factor determining competitiveness and export performance. Countries with stable and efficient production capabilities tend to have a comparative advantage in exporting leading commodities, including Indonesia, with its primary commodity being Crude Palm Oil (CPO). According to Purba et al. (2021), increased production of export commodities theoretically has a positive relationship with export value, because the greater the domestic production capacity, the greater the potential for goods to be exported to international markets. In CPO trade, high production reflects the availability of adequate supply to meet foreign demand, thus directly driving an increase in Indonesia's export value (Djam'an et al., 2024). This aligns with supply-side theory, which emphasizes that production capacity is the primary determinant of commodity exports (Sankaran et al., 2021). Theoretically, increasing production scale also provides cost efficiency benefits (economies of scale) that strengthen export competitiveness (R. N. Hamzah & Santoso, 2020). However, this positive relationship can deviate in certain periods when unpredictable external disturbances occur, resulting in non-linear conditions in those years.

Based on observations of Indonesian CPO export data, it is clear that despite its high production capacity and competitiveness, Indonesia's CPO export performance for the 1995–2024 period shows significant fluctuations from year to year. Based on the data in Figure 2 below, Indonesia's CPO export value reached USD 877.7 million in 2011 but then experienced a decline in the following years, such as USD 420.6 million in 2014 and USD 269.3 million in 2021. Furthermore, from 2022 to 2024, the export value weakened again from USD 341.0 million to USD 271.0 million even though production volume increased during the same period. This mismatch between increasing production capacity and decreasing export value illustrates an interesting dynamic in the Indonesian palm oil trade (Alatas, 2015).

In the context of international trade, global commodity prices are a fundamental factor influencing a country's export performance. Prices formed on the world market reflect the balance between international supply and demand, so any changes in global prices directly impact the export

value of traded commodities (Ridho & Nurcahyo, 2022). According to Krugman et al. (2012), global price fluctuations play a crucial role in determining an exporting country's export revenue, as changes in the unit export price directly impact total foreign exchange earnings. In CPO trading, global market prices are the primary indicator determining the value of Indonesian export transactions, given that most CPO trade uses US dollar-denominated contracts (Rifin, 2010).

Theoretically, the relationship between global prices and export value is positive, with price increases tending to drive export value upwards through increased sales value per unit export volume (Pradina & Adhitya, 2023). However, this relationship can vary depending on market conditions and prevailing trade policies. When global prices rise sharply, demand from importing countries can weaken, impacting export volumes. Conversely, when global prices decline, export value can potentially decline even if shipment volumes increase (Kalsum et al., 2025).

Based on observations of historical data in Figure 4 below, global CPO prices experienced quite sharp fluctuations between 1995 and 2024. For example, global CPO prices reached USD 1,234.6 per metric ton in 2010, then declined between 2015 and 2018 before rising again to USD 940.4 per metric ton in 2022. This price fluctuation indicates a potential link to Indonesia's CPO export value, which also experienced instability during the same period. According to Wibowo et al. (2023), the relationship between Indonesian export activities and international market prices makes the CPO sector highly sensitive to global dynamics.

The phenomenon of declining export values for leading commodities such as CPO is significant because this commodity is a major source of foreign exchange earnings and a pillar of the country's financial stability. When export values decline, potential foreign exchange earnings also decrease, which ultimately can impact the government's ability to maintain fiscal balance and national macroeconomic stability (Kalsum et al., 2025). Methodologically, this study stems from the need to empirically analyze the relationship between macroeconomic factors suspected of influencing changes in Indonesia's CPO export value, with an emphasis on the dynamics of both short-term and long-term relationships. Through this approach, the research results are expected to provide empirical contributions to the formulation of more effective policies to maintain export stability, foreign exchange earnings, and the sustainability of Indonesia's economic growth.

This research has a research problem formulation based on the background explained above, namely: first, how does production affect the value of Indonesian CPO exports in the short and long term? Second, how do world oil prices affect the value of Indonesian CPO exports in the short and long term? Third, how does the rupiah exchange rate affect the value of Indonesian CPO exports in the short and long term? Fourth, how do interest rates affect the value of Indonesian CPO exports in the short and long term?

The purpose of this research is to analyze the factors influencing changes in the value of Indonesian CPO exports during the period 1995–2024. Specifically, this research objective includes analyzing the effect of production on the value of CPO exports in the short and long term, the effect of world oil prices on the value of Indonesian CPO exports in the short and long term, the effect of the rupiah exchange rate on the value of Indonesian CPO exports in the short and long term, and the effect of interest rates on the value of Indonesian CPO exports in the short and long term.

This research is expected to provide both theoretical and practical contributions. Theoretically, this research is expected to enrich the economic literature, particularly in the fields of international trade and macroeconomics, by providing a deeper understanding of the factors influencing

Indonesian CPO exports. The findings of this study can also serve as a reference for further research that examines the dynamics of commodity exports or utilizes the Error Correction Model (ECM) to examine the short- and long-term relationships between variables.

Practically, the benefits of this research are expected to provide the following contributions: first, for researchers, this research serves as a means to develop analytical skills in the field of international economics, particularly on the export of Crude Palm Oil (CPO) commodities, as well as providing experience in applying quantitative methods in analyzing the relationship between macroeconomic variables and a country's export performance. Second, for academics and the educational world, the results of this research are expected to add scientific references regarding the factors that influence the value of Indonesian CPO exports. Third, for the government and policymakers, this research can provide empirical input in formulating CPO export policies that are more adaptive to global dynamics, in order to strengthen export competitiveness and maintain the stability of the CPO sector's contribution to the national economy. Fourth, for industry players, the results of this research can be a strategic consideration for business actors and CPO exporters in making business decisions related to production, exchange rate risk management, and export strategies, especially in the face of global price uncertainty and exchange rate fluctuations.

RESEARCH METHOD

This study employs a quantitative research approach using econometric modeling to examine the factors influencing the value of Indonesian CPO exports during the period 1995–2024. This study examines the factors influencing the value of Indonesian CPO exports during the period 1995–2024. The dependent variable in this study is the value of Indonesian CPO exports measured in USD, while the independent variables include domestic CPO production, global CPO commodity prices, changes in the IDR/USD exchange rate, and interest rates. Measurements of each variable are carried out using annual data, such as the amount of CPO production in thousand metric tons, the average annual global CPO price (USD/ton), the IDR/USD exchange rate, and Bank Indonesia's benchmark interest rate (%). This study uses the Error Correction Model (ECM) analysis method to examine the short-term and long-term relationships between variables. In addition, stationarity, cointegration, and classical assumptions (normality, multicollinearity, autocorrelation, and heteroscedasticity) are tested to ensure the validity of the estimation results (Purnomo, 2025; Basuki, 2019; Sulistiana et al., 2017).

The data used in this study are secondary data sourced from UN Comtrade, Index Mundi, Bank Indonesia, and Refinitiv. Researchers collected data through documentation and literature studies. Significance testing was conducted using a t-test to determine the extent of influence of the independent variables on the dependent variable, and the R-Squared and Adjusted R-Squared values were used to measure the model's ability to explain variations in the dependent variable (Sulistiana et al., 2017). The results of this study are expected to contribute to the development of economic literature, particularly in international trade and macroeconomics, as well as provide input for the government and industry players in making decisions related to export policies and business strategies for Indonesian CPO.

RESULTS AND DISCUSSION

Stationarity Test

The stationarity test is conducted to ensure that the variables in the study have stable statistical properties, namely that the mean, variance, and covariance do not change over time. The main requirement for stationarity is a probability value (p-value) from the unit root test <0.05. In this study, the test results at the level level showed a p-value >0.05, indicating that the variables are not yet stationary. Therefore, this test is continued at the first difference level. The following is a data table from the results of the stationarity test that has been carried out:

1. Export Value Data

The results showed a t-statistic of -3.272107 and a probability of 0.0265 < 0.05. This shows that the export value variable is stationary at the first difference level and is eligible to proceed to the next ECM stage.

2. Production Data

The data results showed a t-statistical value of -3.919911 with a probability of 0.0059 < 0.05. This shows that the production variable is stationary at the first difference level and is eligible to proceed to the next stage of ECM.

3. Global Price Data

The data results showed a t-statistic value of -5.913991 with a probability of 0.0000 < 0.05. This shows that the global price variable is already stationary at the first difference level and is eligible to proceed to the next stage of the ECM.

4. Exchange Rate Data

The results show a t-statistic of -5.098906 with a probability of 0.0003 < 0.05. This shows that the exchange rate variable is stationary at the first difference level and can continue to the next ECM stage.

5. Interest Rate Data

The data results show a t-statistic value of -6.659719 with a probability of 0.0000 < 0.05. This shows that the variable interest rate is stationary at the first difference level and is eligible to proceed to the next stage of ECM.

Cointegration Test

Although previously all variables were not stationary at the level level and had become stationary at the first difference level, this condition is not enough to ensure a long-term equilibrium between the variables. Therefore, cointegration testing is used to see whether the linear combination of all these variables is stationary, which means that there is a long-term equilibrium relationship or not. Here is a table of the results of the cointegration test:

Table 1. Cointegration Test Results

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.496397	0.0157
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

Source: Eviews Data Processing Results 13

The cointegration test using the ADF test showed a t-statistic value of -3.496397 with a probability of 0.0157 < 0.05. Based on these results, it is concluded that there is a long-term relationship (cointegration) between the variables used in the model.

Long-Term Estimation

Long-term estimation is carried out to see how production variables, global prices, exchange rates, and interest rates affect the value of CPO exports in relation to long-term equilibrium. Here is a table of long-term estimation tests:

Table 2. Long-Term Estimation Test Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
PROD	-0.369789	0.201594	-1.834325	0.0790
HCG	0.590900	0.284147	2.079554	0.0484
KRS	0.973907	0.408948	2.381492	0.0255
SB	-0.057830	0.015639	-3.697903	0.0011
C	6.756923	2.244846	3.009972	0.0061

Source: Eviews Data Processing Results 13

After the long-term estimation was carried out, the following results were obtained:

a. Testing on production variables

The production variable has a coefficient of -0.369789 with a probability of 0.0790 > 0.05, so it has a negative but not significant influence on Indonesia's CPO exports.

b. Testing on global price variables

The global price variable shows a coefficient of 0.590900 with a probability of 0.0484 < 0.05, which means that it has a positive and significant influence on Indonesia's CPO exports.

c. Testing on rate variables

The exchange rate variable has a coefficient of 0.973907 with a probability of 0.0255 < 0.05, so it has a positive and significant influence on Indonesia's CPO exports.

d. Testing on interest rate variables

The interest rate variable shows a coefficient of -0.057830 with a probability of 0.0011 < 0.05, which means that it has a negative and significant influence on Indonesia's CPO exports.

Long-Term Estimation Classic Assumption Test

1. Long-Term Estimation Normality Test

The normality test using the Jarque-Bera method yielded a value of 0.116668 with a probability of 0.943335 > 0.05. These results show that the residual is normally distributed, so the assumption of normality in the model is fulfilled.

2. Long-Term Estimation Multicollinearity Test

The test results showed that the Centered VIF value for the production variable was 1.086191, the global price was 1.082788, the exchange rate was 1.073234, and the interest rate was 1.041754. The overall centered value of VIF is well below the general threshold of 10, so there are no problems of multicollinearity in the long run.

3. Long-Term Estimation Heteroscedasticity Test

The heterokedasticity test yielded an F-statistic of 0.194508 and a probability of 0.9389 > 0.05, an Obs*R-squared value of 0.910604 and a probability of 0.9230 > 0.05, and a Scaled

explained SS of 0.575763 and a probability of 0.9657 > 0.05. This shows that the residual does not experience heteroscedasticity.

4. Long-Term Estimation Autocorrelation Test

The autocorrelation test yielded an F-statistic value of 2.033542 with a probability of 0.1548 > 0.05, and an Obs*R-squared value of 4.524689 with a probability of 0.1041 > 0.05. These results show that residual does not undergo autocorrelation.

Short-Term Estimation

Estimates on the short horizon are carried out to see how production variables, global prices, exchange rates, and interest rates affect the value of CPO exports in the short term. The following is a table of the results of the short-term estimation test:

Table 3. Short-Term Estimation Test Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
PROD	-0.325922	0.134485	-2.423485	0.0240
HCG	-0.038508	0.223895	-0.171990	0.8650
KRS	0.890335	0.443159	2.009063	0.0570
SB	-0.031362	0.012100	-2.591827	0.0166
ECT(-1)	-0.545961	0.171126	-3.190405	0.0042
C	0.007914	0.066462	0.119074	0.9063

Source: Eviews Data Processing Results 13

Based on the table above, the long-term estimation test yielded the following results:

a. Testing on production variables

The production variable has a coefficient of -0.325922 and a probability of 0.0240 < 0.05, so it has a negative and significant influence on Indonesia's CPO exports.

b. Testing on global price variables

The global price variable shows a coefficient of -0.038508 and a probability of 0.8650 > 0.05, which means it has a negative but insignificant influence.

c. Testing on rate variables

The exchange rate variable has a coefficient of 0.890335 and a probability of 0.0570 > 0.05, so it has a positive but insignificant influence.

d. Testing on interest rate variables

The interest rate variable shows a coefficient of -0.031362 and a probability of 0.0166 < 0.05, which means that it has a negative and significant influence on Indonesia's CPO exports.

Short-Term Classic Assumption Test

Classical assumption tests are performed to ensure that the regression model meets the necessary statistical characteristics, so that the estimation results are unbiased, consistent, and efficient. These tests include normality, multicollinearity, heteroscedasticity, and autocorrelation.

1. Short-Term Estimation Normality Test

The result of the normality test with the Jarque-Bera method was 4.991200 and the probability was 0.082447 > 0.05. The results show that the residual has been distributed normally, and the assumption of normality in the model has been met.

2. Short-Term Estimation Multicollinearity Test

The test results showed that the Centered VIF value for the production variable was 1.033737, the global price was 1.346894, the exchange rate was 1.797294, the interest rate was 1.904063. The overall value of VIF is well below the general threshold of 10, so the problem of multicollinearity in the short term does not occur.

3. Short-Term Estimation Heteroscedasticity Test

The short-term heteroscedasticity test yielded an F-statistic value of 0.438179 and a probability of 0.8170 > 0.05, an Obs*R-squared value of 2.535872 and a probability of 0.7711 > 0.05, as well as a Scaled explained SS of 2.508358 and a probability of 0.7752 > 0.05. These results show that heteroscedasticity does not occur.

4. Short-Term Estimation Autocorrelation Test

The short-term autocorrelation test yielded an F-statistic value of 0.668526 and a probability of 0.5235 > 0.05, an Obs*R-squared value of 1.754575 and a probability of 0.4159 > 0.05. These results show that there is no autocorrelation in residuals.

Long-Term Model Interpretation

The interpretation of the long-term model was carried out to see the equilibrium relationship between independent variables and the value of Indonesia's CPO exports in the long-term horizon. The long-term model is estimated using the Error Correction Model (ECM) approach with variables in the form of natural logarithms (LN), so that the resulting regression coefficient can be interpreted as elasticity. Thus, each coefficient shows the magnitude of the percentage change in the value of CPO exports in response to the percentage change in each explanatory variable in the long term. The results of the long-term model estimation provide an overview of the structural linkages between variables and equilibrium tendencies formed in Indonesia's CPO trade. Here are the results of the long-term model estimates:

Table 4. Long-Term Model Interpretation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
PROD	-0.369789	0.201594	-1.834325	0.0790
HCG	0.590900	0.284147	2.079554	0.0484
KRS	0.973907	0.408948	2.381492	0.0255
SB	-0.057830	0.015639	-3.697903	0.0011
C	6.756923	2.244846	3.009972	0.0061

Source: Eviews Data Processing Results 13

Based on the results of long-term estimation, the relationship between CPO production, global CPO prices, IDR/USD exchange rates, and interest rates on the value of Indonesia's CPO exports can be expressed in the following equation:

$$\ln NXC_t = 6.756923 - 0.369789 \ln PROD_{1t} + 0.590900 \ln HCG_{2t} + 0.973907 \ln KRS_{3t} - 0.057830 SB_{4t}$$

The equation reflects the long-term equilibrium relationship between independent variables and the value of Indonesia's CPO exports. Given that the variables of CPO export value, CPO production, global CPO prices, and exchange rates are expressed in the form of natural logarithms, the coefficients of these variables can be interpreted as long-term elasticity. Meanwhile, the interest rate variable used in the form of a level has an interpretation as semi-elasticity. The following is a summary of the interpretation of the long-term model:

a. The constant coefficient of 6.756923 shows that the value of Indonesia's CPO exports is at the base level of 6.756923 in the form of a natural logarithm assuming all independent variables have a constant value.
b. The CPO production coefficient of −0.369789 indicates that in the long run, an increase in CPO production of 1% tends to decrease the value of Indonesia's CPO exports by 0.36% assuming other variables are constant, which indicates that an increase in production is not always followed by an increase in export value. This condition can be caused by increasing domestic consumption, export restriction policies, or trade barriers that affect CPO export volume.
c. The global CPO price coefficient of 0.590900 shows that in the long term an increase in global CPO prices of 1% will increase the value of Indonesia's CPO exports by 0.59%, showing that CPO price movements in the global market have a role in determining the value of Indonesia's CPO exports in the long term.
d. The IDR/USD exchange rate coefficient of 0.973907 indicates that the depreciation of the rupiah exchange rate by 1% against the United States dollar will increase the value of Indonesia's CPO exports by 0.97% in the long run, indicating that the weakening of the rupiah exchange rate increases the competitiveness of Indonesia's CPO prices in the international market.
e. The interest rate coefficient of −0.057830 indicates that an increase in the interest rate by 1 percentage point will reduce the value of Indonesia's CPO exports by 0.05% in the long run, indicating that the increase in interest rates has the potential to suppress investment and production activities, thereby negatively impacting Indonesia's CPO export performance.

Interpretation of the Short-Term Model

The interpretation of the short-term model was carried out to see the effect of changes in exchange rate variables, inflation, interest rates, and gross domestic product on changes in the trade balance in the short term. The short-term model is estimated using the Error Correction Model (ECM) approach with a variable in the form of first difference (Δ), so that the resulting coefficient reflects the influence of changes in independent variables on changes in dependent variables in the short term. Here are the results of the short-term model estimates:

Table 5. Interpretation of the Short-Term Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
PROD	-0.325922	0.134485	-2.423485	0.0240
HCG	-0.038508	0.223895	-0.171990	0.8650
KRS	0.890335	0.443159	2.009063	0.0570
SB	-0.031362	0.012100	-2.591827	0.0166
ECT(-1)	-0.545961	0.171126	-3.190405	0.0042
C	0.007914	0.066462	0.119074	0.9063

Source: Eviews Data Processing Results 13

Based on the estimated results, the short-term model equation can be written as follows:

$$\ln NXC_t = 0.007914 - 0.325922 \ln PROD_{1t} - 0.038508 \ln HCG_{2t} + 0.890335 \ln KRS_{3t} - 0.031362 SB_{4t} - 0.545961 ECT(-1)$$

The equation shows the dynamics of short-term adjustment towards long-term equilibrium. Because the variables in the short-term equation are expressed in the form of first difference (Δ), the resulting coefficient reflects the influence of independent variable changes on changes in the value of Indonesia's CPO exports in the short term. The following is a summary of the interpretation of the long-term model:

a. The constant coefficient of 0.007914 shows that the value of Indonesia's CPO exports has increased by 0.007914 percent assuming that production variables, global CPO prices, exchange rates, and interest rates are considered constant.
b. The coefficient of change in CPO production of −0.325922 indicates that in the short term an increase in CPO production of 1 percent will decrease the change in the value of Indonesia's CPO exports by 0.32%, assuming that other variables are constant.
c. The coefficient of change in global CPO prices of −0.038508 shows that in the short term, an increase in global CPO prices of 1% tends to reduce the change in the value of Indonesia's CPO exports by 0.03%.
d. The exchange rate change coefficient of 0.890335 indicates that in the short term, the depreciation of the rupiah exchange rate by 1% against the United States dollar will increase the change in the value of Indonesia's CPO exports by 0.89%.
e. The coefficient of interest rate change of −0.031362 shows that an increase in interest rate by 1 percentage point will reduce the change in the value of Indonesia's CPO exports by 0.03 percent in the short term.
f. The ECT coefficient of −0.545961 indicates the existence of an adjustment mechanism towards long-term equilibrium. The value of the coefficient indicates that the imbalance that occurred in the previous period will be corrected in one current period so that the system will return to a long-term equilibrium condition.

Significance Test

The significance test is used to see whether a variable or model statistically has a real effect on the dependent variable. The following are the results of the significance test that has been carried out:

1. Partial Test (t-test)

Table 6. Long-Term t-Test Results

Variable	t-Statistic	Prob.
PROD	-1.834325	0.0790
HCG	2.079554	0.0484
KRS	2.381492	0.0255
SB	-3.697903	0.0011
C	3.009972	0.0061

Source: Eviews Data Processing Results 13

a. Testing of production variables

Based on the estimated results, the tcal value is -1.834325 < ttable 1.70814, with a probability of 0.0790 > 0.05. These findings indicate that the H1 hypothesis is rejected, because the production variable shows an insignificant negative influence on the value of Indonesia's CPO exports in the long term.

b. Testing against global price variables

Based on the estimated results, the calculated value of 2.079554 > the table 1.70814, with a probability of 0.0484 < 0.05. This finding indicates that the H2 hypothesis is accepted, because global price variables have a significant positive effect on the value of Indonesia's CPO exports in the long term.

c. Testing of exchange rate variables

Based on the results, $_{tcal}$ 2.381492 > ttable 1.70814 with a probability of 0.0255 < 0.05. This finding indicates that the H3 hypothesis is accepted, because the exchange rate variable has a significant positive influence on the value of Indonesia's CPO exports in the long term.

d. Testing of interest rate variables

Based on estimates, the tcal value of -3.697903 < ttable 1.70814, with a probability of 0.0011 < 0.05. This finding indicates that the H4 hypothesis is accepted, because interest rates have a significant negative effect on the value of Indonesia's CPO exports in the long term.

Table 7. Short-Term t-Test Results

Variable	t-Statistic	Prob.
PROD	-2.423485	0.0240
HCG	-0.171990	0.8650
KRS	2.009063	0.0570
SB	-2.591827	0.0166
C	0.119074	0.9063

Source: Eviews Data Processing Results 13

a. Testing of production variables

The production variable has a tcal value of -2.423485 < a ttable of 1.70814, with a probability of 0.0240 < 0.05. So that H1 was rejected because production variables had a significant negative effect on the value of Indonesia's CPO exports in the short term.

b. Testing against global price variables

The global price variable has a tcal value of -0.171990 < a table of 1.70814, with a probability of 0.8650 > 0.05. So H2 was rejected, because global price variables have a significant negative effect on the value of Indonesia's CPO exports in the short term.

c. Testing of exchange rate variables

The exchange rate variable has a calculated value of 2.009063 > a table value of 1.70814, with a probability of 0.0570 < 0.05. So that H3 is accepted because there is a positive influence on the exchange rate variable on the value of Indonesia's CPO exports in the short term.

d. Testing of interest rate variables

The variable interest rate has a calculated value of -2.591827 < a ttable of 1.70814, with a probability of 0.0166 < 0.05. So that H4 is accepted because interest rates have a significant negative effect on the value of Indonesia's CPO exports in the short term.

2. R-Squared Test and Adjusted R-Squared Test

Table 8. R-Squared Test and Long-Term R-Squared Adjusted Test

R-squared	**0.596493**
Adjusted R-squared	0.529242

Source: Eviews Data Processing Results 13

The R-Squared value of 0.596 means that around 59.6% of Indonesia's CPO export variations can be explained by production variables, global prices, exchange rates, and interest rates. After

adjusting the amount on the independent variable, the Adjusted R-Squared with a value of 0.529 confirms that the model is still able to explain the 52.9% variation in Indonesia's CPO exports in the long term.

Table 9. R-Squared Test and Short-Term R-Squared Adjusted Test

R-squared	**0.577305**
Adjusted R-squared	0.481238

Source: Eviews Data Processing Results 13

The *R-Squared* value of 0.577 indicates that 57.7% of the variation in Indonesia's CPO exports can be explained by the independent variables used. The *Adjusted R-Squared* value of 0.481 shows that after adjustment, the model is still able to explain 48.1% of Indonesia's CPO export variations in the short term.

Economic Analysis and Discussion

The use of the Error Correction Model (ECM) in this study allows the analysis of long-term relationships as well as short-term adjustments between independent variables and the value of Indonesia's CPO exports. This model is used to capture the dynamics of changes in economic variables in the short term as well as the equilibrium tendencies formed in the long term. All variables are transformed into natural logarithms (LN) to stabilize the data variance and facilitate the interpretation of the regression coefficient. With this transformation, the regression coefficient can be interpreted as elasticity, which is the percentage change in the value of CPO exports in response to the percentage change in each explanatory variable. In addition, the short-term estimates in the ECM model are arranged in the form of first difference (Δ), which represents the change of variables from one period to the next. Therefore, the results of short-term estimates reflect the influence of changes in independent variables on changes in the value of CPO exports in the short-term horizon, while long-term estimates describe the equilibrium relationship between variables in the long term.

Analysis of the Influence of Production on the Export Value of CPO

Based on the results of ECM estimation, the long-term production variables show that H1 is rejected and H0 is accepted, because the effect on Indonesia's CPO exports is negative but not significant. Short-term tests provide consistent results, where H1 is again rejected and H0 is accepted, so that production still shows a non-significant negative influence on exports.

These findings are in line with the research of Murni Asliyana and Eni Setyowati (2022), which emphasized that CPO production has a significant negative impact on exports, and was reinforced by Firmansyah and Astuti (2022) who stated that production does not have a significant influence on the short and long term. The difference in direction with the theory can be explained by the increase in domestic consumption and the downstream policy that absorbs most of the production for domestic needs. Thus, the results of this study confirm that the increase in production does not always go hand in hand with an increase in exports, so other factors such as market orientation and industrial policies need to be considered in the analysis of Indonesia's CPO trade.

Analysis of the Influence of Global Prices on the Export Value of CPO

Global prices are theoretically one of the determinants of export performance because changes in international prices can affect the value of commodity trade in the global market. Based on the results of the long-term ECM estimate, H2 was accepted and H0 was rejected, because global price variables have a significant positive effect on the value of Indonesia's CPO exports. This proves that when world prices increase, the value of Indonesia's exports tends to rise in line with the increasing selling value of commodities in the international market. This is in line with research by Arifin & Setiawan (2021), which found that international prices have a positive effect on Indonesia's CPO exports in the long term.

But in the short term, the test results show that H2 is rejected and H0 is accepted, because global prices have a negative and insignificant coefficient. This condition indicates that world price fluctuations in a short period have not sufficiently affected the value of exports, given that CPO trading often follows contracts and market mechanisms that do not directly respond to daily price changes. However, the long-term results remain consistent with the research.

Analysis of the Effect of Exchange Rate on the Export Value of CPO

The rupiah exchange rate against the US dollar is seen as able to boost exports, because the depreciation of the rupiah makes the price of domestic products relatively lower in the international market, thereby increasing competitiveness. Based on the results of the Error Correction Model (ECM) estimate, in the long term, it is concluded that H3 is accepted and H0 is rejected, which means that the exchange rate variable has a significant positive effect on the value of Indonesia's CPO exports. This shows that the weakening of the rupiah in the long term horizon tends to increase CPO exports because export prices become more competitive.

On the other hand, in the short term, the test results show that H3 is rejected and H0 is accepted, so that the exchange rate variable only has a negative effect that is not significant on exports. This condition indicates that exchange rate fluctuations in the short period have not directly affected exports, given that CPO trading generally depends on long-term contracts, distribution capacity, and predetermined market orientation. These findings are consistent with the research of Rifki Khoirudin et al. (2024) and Rifda Azzahra et al. (2024), which states that the exchange rate does not have a significant effect on CPO exports in the short term, but has a role in the long term. Thus, this study confirms that the effect of exchange rates on CPO exports is more pronounced in the long term, while in the short term the impact is relatively limited.

Analysis of the Influence of Interest Rates on the Export Value of CPO

Interest rates are often assumed to have a negative relationship with exports, as rising interest rates can increase borrowing costs and suppress production and trade activities. Based on the results of ECM estimation, in the long term, it is shown that H4 is accepted and H0 is rejected, so that interest rate variables have a significant negative influence on the value of Indonesia's CPO exports. The results of the short-term test also show a similar pattern, namely accepting H4 and subtracting H0, which means that interest rates again have a significant negative effect on exports.

The results of this study are in line with the findings of Tiara Yulisa Savitri (2022) and Lady Paramita Sari and Sishadiyati (2022), which show that the increase in interest rates has a negative

impact on CPO exports. This condition can be understood because the increase in interest rates pushes the cost of capital to be higher and weakens the competitiveness of domestic products, so that export activities experience obstacles. Therefore, it can be emphasized that interest rates are an important factor that has a significant effect on Indonesia's CPO exports, both in the short and long term.

Model Conclusion

The results of previous research and recent research related to the influence of free variables on Indonesian CPO exports. Research by Murni Asliyana and Eni Setyowati (2022) shows that production has a significant negative influence on CPO exports, while recent research reveals that production has a negative and insignificant influence in the long term, but a significant negative effect in the short term. Tiara Yulisa Savitri, Yanto, and Afrizal (2022) stated that global prices have a significant positive effect on CPO exports in the long and short term. Recent research shows that global prices have a significant positive influence on the long term, but the effect becomes negative and insignificant in the short term. Aldi Firmansyah and Milan Puji Astuti (2022) found that the exchange rate has a significant positive influence in the long term and insignificant in the short term. The results of recent research show that the exchange rate remains positive in the long term, but not significant in the short term. Meanwhile, research by Tulus Widjajanto, Adhi Susano, and Ambar Tri Hapsari (2024) shows that interest rates have a significant negative effect on CPO exports in both the long and short term, and recent research has also found that interest rates have a significant negative influence on both time periods.

Research Limitations

The results of this study have several limitations that must be considered when interpreting the results and drawing conclusions.

1. This research has limitations in the research time period because the time span used is only 30 years starting from 1995-2024, this is due to unavailable and incomplete data.
2. This study focuses on the value of Indonesia's CPO exports nationally, so that the results of the analysis explain the condition in aggregate. Subsequent research may consider broader or more specific coverage as per the needs of the researcher.

CONCLUSION

Using the Error Correction Model (ECM) on data from 1995–2024, this study found that CPO production negatively influences Indonesia's CPO export value—insignificant in the long term but significantly negative in the short term, as much output is absorbed domestically due to downstream policies; global CPO prices exert a significant positive long-term effect but insignificantly negative short-term impact owing to trade contract delays; the rupiah's depreciation against the USD has a significant positive long-term effect but insignificantly positive short-term one, limited by hedging and old contracts; and domestic interest rates significantly negatively affect exports in both terms by raising financing costs and eroding competitiveness. Practically, the government should optimize downstream programs while preserving export supply chains, and industry players enhance production efficiency via better supply chain management and technology. For future research, scholars could expand the time span to include post-2024 data and integrate additional international

trade theories (e.g., beyond supply-side models) to provide multifaceted explanations of these dynamics and test robustness amid evolving global conditions.

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