

ECONOMIC AND TRADE DYNAMICS: ANALYZING THE INTERRELATIONSHIP BETWEEN LOCAL ECONOMY, EXPORTS, AND GLOBAL CPO PRICES

Rineliana¹; Ridarmin²; Edi Susanto³; Nana Sari⁴; Agung Dermawan⁵;
Omar Farrakhan Tampubolon⁶

^{1,2,3,4,5}Universitas Dumai

Jln. Utama Karya, Bukit Batrem, Kec. Dumai Tim., Kota Dumai, Riau 28811

Jln. Yos Sudarso Km 08 Rumbai Telp. (0761) 52581 Fax. (0761) 52581

⁶Universitas Gadjah Mada

E-mail : rineliana7851@grad.unri.ac.id (Koresponding)

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Abstract: The palm oil industry is a pivotal sector in Indonesia's economy, particularly in Riau Province, significantly contributing to exports and the regional economy. This study aims to analyze the impact of CPO price fluctuations on the regional economy, specifically focusing on the export and investment sectors in Riau Province. Employing a quantitative approach and multiple linear regression analysis, this research examines the relationship between regional economic variables, exports, investments, and world CPO prices throughout 2008-2022. The findings indicate that exports and investments significantly influence world CPO prices, while the regional economy does not directly impact them. This study offers crucial implications for regional economic policies, highlighting the need to strengthen export and investment sectors and implement sustainability policies within the palm oil industry. These findings will serve as a reference for formulating policies that can reduce dependence on global price fluctuations and bolster the local economy

Keywords: *Regional economy, exports, investment, CPO price, palm oil*

The palm oil industry holds immense global economic significance, particularly for major producing nations such as Indonesia, Malaysia, and Thailand. Palm oil is a primary source of income for these countries and influences diverse industrial sectors, including food and beverages, cosmetics, and renewable energy like biodiesel. According to FAO (2021), Indonesia is the world's largest palm oil producer, contributing over 50% of the global output. Recent data confirms Indonesia's continued dominance, as it produced 47 million tons of crude palm oil in 2023, maintaining its position as the world's largest palm oil exporter and accounting for 54% of global exports (Benedict & Heilmayr, 2024). Furthermore, this sector is crucial in employing millions in developing countries, making it a highly sought-after commodity in international trade, with the global palm oil market valued at USD 71.23 billion in

2023 and projected to reach USD 103.6 billion by 2032.

Despite its substantial economic contributions to producing countries, the palm oil industry faces numerous challenges, primarily concerning its negative environmental impact. Deforestation, biodiversity loss, and pollution are major issues caused by expanding palm oil plantations in tropical regions. Recent analysis shows that deforestation associated with the palm oil sector in Indonesia increased slightly in 2022 after falling for nearly a decade, highlighting ongoing environmental concerns. Therefore, while the palm oil industry offers significant economic benefits, its sustainability is frequently questioned. Various global policies and regulations related to sustainability have emerged to mitigate the negative impacts of this industry, yet significant challenges

persist (Varkkey et al., 2018; McCarthy et al., 2012).

Indonesia is among the countries most affected by the global palm oil market dynamics. The country boasts over 11.9 million hectares of oil palm land spread across various provinces, with Riau Province being one of the largest producers. According to data from the Central Statistics Agency (BPS), the total area of oil palm plantations in Indonesia experienced rapid growth from approximately 4 million hectares in 2000 to over 11 million hectares in 2022. The Indonesian Palm Oil Association (GAPKI) reported that crude palm oil production reached 50.07 million tons in 2023, representing a 7.15% increase compared to 2022's 46.73 million tons (GAPKI, 2024). Indonesia is estimated to have around 20 million hectares of oil palm plantations by 2025 to meet the continuously increasing export demand, especially from Asian and European markets.

The palm oil market has experienced significant volatility in recent years, with unprecedented price swings that have profound implications for regional economies. Palm oil witnessed extreme price fluctuations, reaching record highs of MYR 5,000-7,000 per ton in 2022 before declining to 20% below average price levels in 2023. This volatility continued into 2024, with CPO prices remaining volatile and projected to range between RM 3,800 and RM 3,900 per ton by the end of 2024 (MPOC, 2024). Such price volatility directly impacts regional economies dependent on palm oil production and exports.

Conversely, the increase in palm oil production also brings significant challenges related to natural resource management, environmental management, and its impact on local communities. For instance, the expansion of oil palm plantations often leads to land conflicts, forest destruction, and poverty in regions involved in palm oil production (Casson, 2000; Dahlan et al., 2019). These issues

become a primary concern, particularly when discussing the sustainability of the palm oil industry and the management of regional economies dependent on this sector.

METHODS

This study adopts a quantitative approach using multiple linear regression analysis to examine the relationship between regional economic variables, exports, and investments with world Crude Palm Oil (CPO) prices. This approach's capability to identify and quantify the influence of each independent variable on the dependent variable, CPO price, within the context of Riau Province's regional economy led to its selection. The quantitative approach allows objective hypothesis testing using numerical data that is amenable to appropriate statistical techniques.

This study employs multiple linear regression analysis to analyze the relationships between these variables. Multiple linear regression was chosen because it can measure the relationship between more than one independent variable (regional economy, exports, and investment) and a single dependent variable (CPO price).

RESULTS

The following sections present the descriptive analysis, classical assumption tests, statistical tests based on the research results, and comparisons to other relevant studies' findings.

Descriptive Analysis and Classical Assumption Tests

Descriptive Analysis

A descriptive analysis was conducted to characterize the data utilized in this study, which included variables such as regional economy, exports, investment, and CPO prices. The data used is secondary data spanning the period 2008-2022.

CPO Price (Y): CPO prices are influenced by international market fluctuations and global demand. Based on the collected data, CPO prices exhibited

significant variations, peaking in 2021 and declining in 2022. This reflects the market's dependence on global conditions and policies of CPO-producing countries. Recent market analyses indicate that this volatility continues into 2025, with palm oil prices experiencing fluctuations due to changing demand patterns and biodiesel consumption requirements. The global palm oil market is projected to expand significantly, reaching USD 115.56 billion by 2033, registering a CAGR of 5.1% from 2025 to 2033 (Straits Research, 2025).

Regional Economy (X_1): The regional economy was measured using indicators such as GRDP, inflation, and unemployment rate. Generally, Riau Province's economy experienced stable growth with increased per capita GRDP and a decreased unemployment rate. However, its reliance on the oil palm plantation sector makes Riau vulnerable to CPO price fluctuations. This vulnerability aligns with recent findings on Indonesia's palm oil sector, which continues to play a strategic role in the country's economic development despite sustainability challenges (Indonesia Investments, 2024; Springer, 2024).

Exports (X_2): The value of palm oil and its derivative exports from Riau Province showed a significant upward trend. This indicates that the palm oil export sector plays a crucial role in the regional economy. International trade policies and demand from importing countries also influence CPO exports. Indonesia's position as the world's largest palm oil producer and exporter continues to strengthen, with the Indonesian palm oil market estimated at USD 12.58 billion in 2023 and projected to grow at a CAGR of 4.4% from 2024 to 2030.

Investment (X_3): The realization of both domestic and foreign investment also demonstrated a significant increase. This indicates a high interest in the palm oil sector in Riau Province, contributing to infrastructure development and increased palm oil production capacity. Recent studies emphasize the continuing role of foreign direct investment in palm oil expansion, though with increased attention to

sustainability implications (Hasudungan et al., 2024).

Table 1: CPO Price Trend, GRDP per Capita, Exports and Investment 2008 – 2022

Year	CPO Price Per (US\$/Ton)	Capita GRDP (IDR)	Exports (Million USD)	Investment (Million IDR)
2008	600	10,120	2,000	5,000
2010	750	12,135	2,500	6,000
2012	850	18,518	3,000	7,500
2014	900	21,371	4,000	8,000
2016	1,100	30,362	5,000	9,000
2018	1,200	45,018	6,000	10,000
2020	1,000	79,653	7,000	12,000
2022	1,150	144,560	8,000	15,000

Classical Assumption Tests

Before regression analysis, classical assumption tests were performed to ensure the data met the criteria for valid regression analysis. These tests included normality, multicollinearity, heteroscedasticity, and autocorrelation.

Normality Test: The normality test determines whether the data distribution follows a normal distribution. Based on the P-P plot and histogram, the data points exhibited a pattern close to the diagonal line, indicating that the data is normally distributed. Additionally, the Kolmogorov-Smirnov statistical test results showed a p-value of 0.012, greater than 0.05, indicating a normal distribution in the data.

Multicollinearity Test: This test was conducted to determine if there was a high correlation between independent variables. The test results showed that the VIF (Variance Inflation Factor) values for each independent variable (regional economy, exports, and investment) were less than 10, indicating the absence of multicollinearity. The tolerance values were also greater than 0.1, concluding that multicollinearity is not an issue in this regression model.

Heteroscedasticity Test: The heteroscedasticity test was performed to determine whether the variance of the residuals remained constant across observations. The scatter plot results showed

that the residual points did not form a clear pattern and were randomly dispersed, indicating no symptoms of heteroscedasticity.

Autocorrelation Test: The autocorrelation test was conducted to determine if there was a correlation between residuals in one observation and another. In this study, the autocorrelation test results indicated no correlation between residuals, suggesting that the assumption of residual independence was met.

Statistical Tests

After ensuring that the classical assumptions were met, statistical tests were conducted to determine the influence of the independent variables on the dependent variable (CPO price).

Partial t-test: Based on the t-test results, exports (X_2) and investment (X_3) were found to significantly influence CPO prices with p-values of 0.001 and 0.015, respectively, both less than 0.05. In contrast, the regional economy (X_1) did not significantly affect CPO prices, with a p-value of 0.109 greater than 0.05. These results indicate that exports and investment are crucial in determining CPO prices, while regional economic factors do not directly impact these prices.

Simultaneous F-test: The F-test was conducted to examine whether all independent variables collectively influence the dependent variable. The F-test results showed a p-value of 0.000, less than 0.05, leading to the acceptance of the alternative hypothesis. This means that the regional economy, exports, and investment simultaneously influence CPO prices.

Multiple Linear Regression Model: The multiple linear regression analysis results indicate that the constructed model effectively explains the variation in CPO prices. The coefficient of determination (R^2) showed a significant value, indicating that the regression model can explain most of the variation in CPO prices based on the independent variables used.

The findings of this study, indicating that exports and investment significantly

influence CPO prices, align with those of several previous studies. For instance, Batubara et al. (2023), in their research on CPO exports, found that exports positively influenced the regional economy, similar to this study's finding that exports also affect CPO prices. This research reinforces that international trade directly impacts local economic sectors dependent on palm oil. Purnomo et al. (2020) also found that world oil prices positively influenced the economy. However, in the context of CPO prices, this study provides additional insight into the fact that local factors, such as exports and investment, play a more significant role than the regional economy. These findings are further supported by recent market analyses indicating that Indonesian palm oil exports continue to be a major driver of economic growth, despite environmental concerns (Trase, 2024).

DISCUSSION

Influence of Regional Economy on CPO Prices in Riau Province

This study found that, partially, the regional economy, measured by indicators such as GRDP, inflation, and unemployment rate, does not significantly influence world CPO prices. The t-test results showed a significance value of 0.109, greater than 0.05, thus rejecting the hypothesis that the regional economy influences CPO prices. This indicates that while important in the context of local economic growth, regional economic factors do not directly impact CPO prices in the global market. However, when analyzed simultaneously, the analysis shows that the regional economy, exports, and investments collectively influence CPO prices. This suggests that although the regional economy may not be strong enough to influence CPO prices, the interaction with the export and investment sectors can yield a greater impact.

Research conducted by Purnomo et al. (2020) and Prabheesh & Laila (2020) indicates that macroeconomic factors, such as inflation and economic growth, influence global commodity prices, including palm oil.

Purnomo et al. (2020) stated in his research that world oil prices positively influence Indonesia's economic growth. However, this influence is more global and not limited to local factors. Meanwhile, Prabheesh & Laila (2020) emphasized the importance of external factors in influencing world oil prices, including CPO prices. In this study's context, the results show a difference, where regional economic factors do not directly influence CPO prices. However, this influence can emerge indirectly through the export and investment sectors.

Recent studies have reinforced the complexity of regional economic impacts on global commodity markets. Hidayat et al. (2024) found that Indonesia's CPO industry concentration and influencing factors demonstrate that while regional factors are important for local development, global market dynamics remain the primary price determinants. This finding is consistent with current market trends where global demand patterns, particularly from biodiesel sectors, have become increasingly significant in price formation.

Impact of Exports on CPO Prices

The results of this study demonstrate that palm oil exports from Riau Province significantly influence world CPO prices. The t-test shows a significance value of 0.001, which is less than 0.05, leading to the acceptance of the hypothesis that exports influence CPO prices. This confirms that the contribution of palm oil exports to Riau's economy is substantial, and the volume of exports from Riau Province highly influences global CPO price movements.

Previous research, such as that by Batubara et al. (2023) and Rokhim (2023), revealed that palm oil exports positively impact regional economic growth. Batubara et al. (2023) found that CPO exports positively influenced the regional economy, similar to the findings in this study, which indicate that exports significantly influence world CPO prices. Prabheesh & Laila (2020) also reported a similar finding, which stated that the value of palm oil commodity exports

significantly impacted regional economic growth. However, the main difference lies in scale and context. In Riau Province, the palm oil export sector is more dominant. Thus, global CPO price fluctuations heavily influence regional income and other related sectors.

This research strengthens the understanding that international trade, especially exports, significantly impacts regional economies that are heavily dependent on this commodity. Recent market analyses support these findings, indicating that Indonesian palm oil exports remain crucial for the country's economy, with exports valued at significant amounts annually. The export sector's influence has been further emphasized by recent policy developments, including biodiesel mandates that have increased domestic and international demand for palm oil derivatives (Reuters, 2025). Current market projections suggest that palm oil prices will average higher in 2025 due to increased biodiesel consumption, particularly from Indonesia's domestic policies. However, competition from cheaper alternatives may limit price increases (Reuters, 2025).

Contribution of Investment to CPO Price Changes

This study also shows that investment significantly influences CPO prices, with a significance value of 0.015. These results indicate that domestic (PMDN) and foreign (PMA) investment play an important role in increasing palm oil production capacity and exports, which in turn influence CPO prices in the global market. Investment in the palm oil sector, particularly in technology and infrastructure, can improve production and distribution efficiency, increasing export volume and price stability.

Purnomo et al. (2020) and Prabheesh & Laila (2020) also highlighted the importance of investment in the Indonesian economy, especially in strategic sectors such as energy and plantations. Purnomo et al. (2020) stated that investment in the energy

and palm oil plantation sectors influences the price stability of these commodities. The findings of this study align with this view, where investment directly affects production capacity, which ultimately influences CPO prices in the global market.

This research enriches the literature by demonstrating that investment in the palm oil sector, especially in Riau, a major production center, significantly influences CPO prices. Unlike previous studies that emphasized energy sector investment, this research highlights investment in the plantation sector, which is more directly related to commodity prices. Recent research has further confirmed the critical role of foreign direct investment in palm oil expansion, though with increasing attention to sustainability and food security implications (Discover Sustainability, 2024). The continuing growth in investment, both domestic and foreign, has contributed to Indonesia maintaining its position as the world's largest palm oil producer, with the sector continuing to attract significant capital inflows despite environmental concerns (Grand View Research, 2024).

Contemporary analyses indicate that investment patterns in the palm oil sector are evolving, with increasing emphasis on sustainable practices and value-added processing. The Business Research Company (2025) projects continued growth in the global palm oil market, driven by increasing demand from the biofuel industry, which supports continued investment in production capacity. However, recent studies also highlight the need for balanced investment approaches that consider environmental sustainability alongside economic returns.

Implications of Findings for Regional Economic Policy

The findings of this study have several important implications for regional economic policy in Riau Province. Firstly, although the regional economy does not directly influence CPO prices, the export and investment sectors must be strengthened to cope with unpredictable CPO price fluctuations. Local governments need to enhance policies that support the diversification of export products

and attract more investment in downstream palm oil sectors, such as CPO processing industries and their derivative products.

Secondly, policies supporting the sustainability of the palm oil industry also need attention. The environmental impact of oil palm plantation expansion must be managed wisely to avoid damaging Indonesia's reputation as a major CPO producer. Sustainability programs, such as RSPO (Roundtable on Sustainable Palm Oil), need to be expanded to ensure that palm oil production is economically beneficial and environmentally friendly.

Recent policy developments and market trends reinforce these recommendations. The increasing focus on sustainable palm oil production, driven by international pressure and market demands, requires comprehensive policy frameworks that balance economic growth with environmental protection (Trase, 2024). The European Union's sustainability requirements for palm oil imports highlight the importance of integrating environmental considerations into economic planning (Rifin et al., 2020; New Security Beat, 2024).

Furthermore, the projected growth in global palm oil demand, particularly from the biodiesel sector, presents opportunities for regional economic development through strategic investment in value-added processing capabilities. Policymakers should consider developing integrated approaches that leverage the strong relationship between exports, investment, and CPO prices while addressing sustainability challenges to ensure long-term economic viability

CONCLUSION

Based on the research findings, several important points can be concluded regarding the economic dynamics and the influence of Crude Palm Oil (CPO) price fluctuations in Riau Province. This study indicates that the regional economy, measured by GRDP, inflation, and unemployment rate indicators, does not

directly influence world CPO prices. This is supported by the t-test results, which show a significance value of 0.109, greater than 0.05, leading to the conclusion that local economic factors in Riau Province do not directly impact CPO prices in the global market. However, when analyzed simultaneously, regional economic factors, exports, and investments collectively influence CPO prices, suggesting that the interaction between these sectors can affect commodity prices.

Palm oil exports from Riau Province significantly influence world CPO prices. The research results show that exports are crucial in determining CPO prices. This is reflected in the t-test significance value of 0.001, which is less than 0.05. Therefore, palm oil exports substantially impact Riau's economy and CPO prices in the global market, consistent with previous research findings indicating the importance of the export sector in the regional economy.

Investment, both domestic and foreign, also proved to have a significant influence on CPO prices. The t-test results show a significance value of 0.015, which is less than 0.05, meaning that investment in the palm oil sector, particularly related to increasing production capacity and infrastructure, also plays a role in determining CPO prices in the world market. Investment directly impacts improving production and distribution efficiency, which contributes to CPO price stability.

The findings of this study have several important implications for regional economic policy. The Riau provincial government needs to develop policies that support the export and investment sectors to strengthen CPO price resilience, reduce dependence on global price fluctuations, and encourage diversification of export products. Furthermore, it is also crucial to implement stricter sustainability policies to ensure that the palm oil industry continues to provide economic benefits without compromising environmental sustainability. This research also offers suggestions for further studies that could include several palm oil-producing provinces in Indonesia to obtain a more comprehensive overview of the

dynamics of the national palm oil industry

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