The impact of macroeconomic variables on crude palm oil price in Malaysia

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Abstract

Crude Palm Oil (CPO) has been a cornerstone of Malaysia's economy for decades, serving as one of the nation's most valuable export commodities. The persistent volatility of CPO prices reflects the inherent uncertainty of commodity markets, necessitating informed decision-making and robust risk management strategies. This dynamic environment requires continued research to unravel the complex relationships between crude palm oil prices and key economic variables, ensuring Malaysia's palm oil industry remains competitive and resilient in a rapidly changing global market. Thus, this study aims to examine the impact of macroeconomic variables on crude palm oil price in Malaysia. The study employs structural vector autoregressive (SVAR) model, spanning the period from 1971 to 2023. The findings suggest that real GDP positively influences CPO prices, though the response was statistically insignificant. Government expenditure showed a delayed positive impact on CPO prices. The CPI's negative and significant relationship with CPO prices underscores the cost-push effects of inflation. Similarly, the delayed negative impact of interest rates on CPO prices emphasizes the need for careful monetary policy adjustments to support agricultural investment and production.

JEL classification: C32, E0, Q1.

Keywords: crude palm oil, macroeconomics, SVAR model.

1. Introduction

Malaysia is renowned for its diverse natural resources, and one of its most significant economic drivers is the cultivation and production of crude palm oil. Crude Palm Oil (CPO) is a vital edible oil extracted from the pulp of oil palm fruits, and it has become an indispensable component of Malaysia's economy since the 1960s. As the world's second-largest palm oil producer, Malaysia's palm oil industry accounts for a significant portion of its GDP, contributing to the country's overall economic growth and development (Chizari et al., 2017; Sharif et al., 2017). The palm oil industry in Malaysia has played a crucial role in the socio-economic growth of the country.

Crude Palm Oil (CPO) has been a cornerstone of Malaysia's economy for decades, serving as one of the nation's most valuable export commodities. The industry has been instrumental in driving economic growth, creating jobs, and fostering rural development. Understanding its importance requires an exploration of its economic contributions, the roles it plays in various sectors, and the challenges the industry faces in ensuring sustainable growth. The government has recognised the importance of this industry and has established the Federal Land Development Authority to assist low-income families in participating in the palm oil business.

Furthermore, the Malaysian palm oil industry is expected to provide an alternative fuel source, which could help reduce the depletion of non-renewable fossil fuels. Malaysia is one of the world's leading producers and exporters of palm oil. The CPO industry generates billions of dollars in export revenue annually, contributing significantly to Malaysia's Gross Domestic Product (GDP). Major export destinations include China, India, the European Union, and the United States, where palm oil is used in food products, biofuels, and cosmetics.

The contribution of palm oil to the Malaysian economy is substantial, with the export revenue generated from palm oil amounting to RM67.6 billion in 2016, equivalent to 6.1 percent of the country's total GDP (Noor et al., 2021). The expansion of oil palm plantations has been on the rise, driven by the increasing global demand for this versatile and highly valuable commodity (Noor et al., 2021). The palm oil industry has not only contributed to the country's economic growth but has also had a significant impact on the social and environmental aspects of Malaysia (Noor et al., 2021).

In conclusion, the crude palm oil industry is a critical component of the Malaysian economy, contributing significantly to the country's GDP, export earnings, and overall economic development. The government's recognition and support of this industry, along with the growing global demand for palm oil, suggest that the importance of crude palm oil for the Malaysian economy will continue to be emphasized in the years to come. Therefore, this study aims to investigate the impact of macroeconomic variables on crude palm oil price in Malaysia.

Malaysia's own economic history highlights the sensitivity of its GDP and related indicators to external shocks, which subsequently influence crude palm oil prices. The Asian financial crisis of 1998 saw Malaysia's GDP plummet to -7.4%, the lowest in decades, while the COVID-19 pandemic in 2020 caused GDP to drop to -5.6%, marking the second-lowest point since 1998 (World Bank, 2021). These periods of economic turbulence underscore the interconnectedness of GDP, inflation, and interest rates with crude palm oil price volatility. Given the global and domestic importance of palm oil, understanding the factors that drive fluctuations in its prices is critical for stakeholders, including investors, producers, and policymakers. The persistent volatility of CPO prices reflects the inherent uncertainty of commodity markets, necessitating informed decision-making and robust risk management strategies. This dynamic environment requires continued research to unravel the complex relationships between crude palm oil prices and key economic variables, ensuring Malaysia's palm oil industry remains competitive and resilient in a rapidly changing global market.

2. Literature Review

The relationship between GDP and palm oil production is a complex and multifaceted topic, with the industry playing a substantial economic role in countries like Indonesia and Malaysia. Several studies indicate that palm oil production has positively influenced GDP growth by boosting agricultural output, creating jobs, and reducing poverty, particularly in rural areas where employment opportunities are limited (Fevriera & Devi, 2023; Setiowati et al., 2024). For instance, Indonesia, the world's largest palm oil producer, benefits significantly from this sector, which supports both the agricultural economy and broader economic stability. However, despite these contributions, research also suggests that the economic benefits of palm oil production are not always evenly distributed; certain studies highlight a negative correlation between palm oil production and regional GDP per capita, indicating potential

inequalities in income distribution and wealth (Vratolis, 2022). Similarly, Malaysia's palm oil sector contributes significantly to national GDP, rural development, and export earnings, underscoring the industry's role in enhancing economic welfare (Ali et al., 2024; Harun & Laksito, 2022; Muda & Ezechi, 2019).

Beyond economic contributions, palm oil production is associated with various social and environmental issues, which, in turn, impact its economic sustainability. While job creation and infrastructure development have improved living standards in some rural areas, these gains come with social challenges, such as land conflicts and displacement of indigenous communities (Ali et al., 2024; Wahyono, 2017). Additionally, environmental degradation resulting from deforestation and biodiversity loss can diminish the long-term economic viability of palm oil production. The environmental damage linked to unsustainable practices has led to stricter regulations and potential limitations in global market access (Srisawasdi & Tsusaka, 2023). To address these issues, there has been a shift towards sustainable production practices and certification initiatives aimed at balancing economic growth with environmental responsibility, ensuring that palm oil production continues to support GDP growth without compromising ecological health (Ali et al., 2024; Srisawasdi & Tsusaka, 2023).

The relationship between inflation and palm oil production is complex, with inflation exerting both direct and indirect effects on productivity, exports, and economic growth. Studies indicate that inflation generally increases production costs, reducing profitability and productivity in regions such as North Sumatra (Fevriera & Devi, 2023; Hasibuan et al., 2020). Higher costs associated with inflation can also lead to a decline in efficiency, limiting the competitiveness of palm oil exports in the international market (Kostev, 2022; Purnamasari & Japlani, 2023). This, combined with the influence of exchange rates, can contribute to lower export volumes and affect the industry's overall economic contribution.

Inflation's impact on broader economic growth is less direct but still significant, as it influences the purchasing power in importing countries and can shape demand dynamics in the palm oil market (Angin et al., 2023). While inflation may not significantly affect stock prices of palm oil companies, it does impact production costs and profitability, which are crucial factors for investment decisions in the sector (Jannah et al., 2024; Johnnywinata et al., 2015). These studies underscore that while inflation generally has negative implications for palm oil productivity and exports, its effects vary by region and are influenced by additional macroeconomic factors such as exchange rates and global demand.

The relationship between government expenditure and palm oil production is critical to understanding how public investment can drive industry growth, regional development, and economic competitiveness. In Indonesia, government spending on biodiesel development and export taxes has fostered economic growth and stabilised key economic indicators like exchange and interest rates, promoting a favorable environment for the palm oil sector (Singagerda et al., 2018). Additionally, in West Kalimantan, government consumption significantly contributes to regional GDP by supporting infrastructure and market access for palm oil producers (Sulistianingsih et al., 2017). Similarly, Malaysia has leveraged government intervention to enhance industry competitiveness by aligning incentives with national resource endowments, allowing the palm oil sector to thrive (Pletcher, 1990).

However, the effectiveness of government expenditure varies, with challenges noted in countries like Nigeria, where inconsistent policies and inefficient implementation have led to mixed results. While government spending has the potential to boost agricultural outputs, financial constraints and policy misalignment can limit its impact on the palm oil industry (Meredith, 1984; Olanrele, 2020). This literature highlights that, although government support plays a vital role, broader factors such as global market demand and sustainability considerations are essential for the industry's long-term success. A balanced approach that considers both government and market dynamics is necessary for sustainable development in the palm oil sector.

Interest rates significantly impact palm oil production by influencing borrowing costs and investment decisions in the agricultural sector. High interest rates increase the cost of borrowing, limiting palm oil producers' capacity to invest in necessary inputs like fertilisers, machinery, and labour, which can hinder production capacity and efficiency (Fevriera & Devi, 2023; Ibom, 2015). Conversely, lower interest rates can enhance access to capital, allowing producers to improve operations and adopt advanced technology that boosts productivity (Egwuma et al., 2016). The ability to invest in infrastructure and efficient technologies is particularly crucial for long-term growth in palm oil production.

Macroeconomic factors such as inflation and exchange rates also mediate the effect of interest rates on palm oil production. Higher interest rates may cause currency appreciation, reducing the competitiveness of palm oil exports and potentially decreasing demand in global markets (Rizal et al., 2023). Additionally, interest rates can impact overall economic growth, which influences domestic demand for palm oil, especially in economies where it plays a significant agricultural role (Mubarok et al., 2019). Research suggests a long-term equilibrium relationship between interest rates and palm oil production, indicating that, while short-term fluctuations may disrupt production, stable interest rates can support sustained industry growth (Ibom, 2015; Kueh, 2011).

3. Methodology

3.1 Variables

The study examines the impact of macroeconomic variables on crude palm oil prices in Malaysia, utilising annual data from 1971 to 2023. The model incorporates five key variables: real GDP, real government expenditure (comprising operating and development expenditure), consumer price index, interest rate (based on the interbank overnight rate), and crude palm oil price (reflecting the annual average). All variables, except for the interest rate which is expressed as a percentage, are transformed into logarithmic form. The data was obtained from the Department of Statistics Malaysia (DOSM), Ministry of Finance Malaysia (MOF), International Financial Statistics (IFS) online database, and the Ministry of Plantation and Commodities Malaysia.

3.2 Data properties

The study examines the properties of data to assess the presence of unit roots. The Augmented Dickey-Fuller test is employed to evaluate the stationarity of all variables, as presented in Table 1. The results reveal that only two variables, consumer price index and interest rate, are found to be stationary at the level, for both constant and constant with trend specifications. In contrast, the remaining variables are determined to be stationary in the first difference, under both constant and constant with trend conditions.

In line with the perspective of Sims (1980) and Sims et al. (1990), the primary aim of the VAR model is to investigate the interconnections among variables, rather than to estimate their parameters. As a result, they suggest against differencing and recommend that the variables in the VAR model be maintained at their original levels, despite the presence of unit roots detected in the variables. Adhering to this recommendation, the current study estimates the SVAR model using the variables in levels. This approach is also supported by previous empirical studies, which have estimated a VAR in levels despite the variables exhibiting unit root characteristics (Sims, 1992; Kim & Roubini, 2000; Zaidi et al., 2016; Nguyen et al., 2019).

Table 1: ADF test result

Variables	Level		First difference	
	Constant	Constant & trend	Constant	Constant & trend
LY	-1.6270(0)	-1.9997(0)	-7.2192(0)***	-7.4704(0)***
LGE	-2.1472(2)	-2.3795(1)	-4.9513(1)***	-5.2841(1)***
LCPI	-3.5516(1)**	-4.6571(1)***	-4.0317(0)***	-5.0190(0)***
R	-2.7300(0)*	-3.2721(0)*	-7.5875(0)***	-7.5307(0)***
LCPO	-0.5978(2)	-2.0823(2)	-9.8459(1)***	-9.7529(1)***

Note: LY is real GDP, LGE is real government expenditure, LCPI is consumer price index, R is interest rate, and LCPO is crude palm oil price. (***), (**), (*) indicate significance at the 1%, 5% and 10% levels, respectively. The figures in parentheses ( ) show the optimal lag determined by the Schwarz Info Criterion (SIC).

3.3 Econometrics framework

This study employs the Structural Vector Autoregressive (SVAR) model to investigate the impact of macroeconomic variables on crude palm oil prices. The SVAR model can be expressed as follows:

$$\mathrm{Ay_t} = \mathrm{v} + \mathrm{C(L)y_{t-p}} + \varepsilon_\mathrm{t} \tag{1}$$

where A is a rectangular matrix that characterises the contemporaneous structural relationships between the variables, $\mathrm{y_t}$ is (n x 1) is a vector of variables included in the system, v is (n X 1) is a vector of deterministic variables, $\mathrm{C(L)}$ is (n X n) a square matrix polynomial in the lag operator L, and ε_t is (n x 1) is a vector of structural errors that satisfies the conditions $E(\varepsilon_t) = 0$ and $E(\varepsilon_t \varepsilon_t') = I_n$ is $n \times n$ of the identity matrix.

The equation (1) cannot be estimated using Ordinary Least Squares (OLS) regression due to the presence of a lagged effect for the dependent variable. This issue, however, can be addressed by converting the equation (1) into a reduced-form representation by multiplying A^{-1} shown below:

$$y_t = A^{-1}v + A^{-1}\left(C_1 L + C_1 L^2 + \cdots + C_k L^k\right)y_t + A^{-1}\varepsilon_t \tag{2}$$

or

$$y_t = \prod_0 + \prod_1 y_t + \mu_t \tag{3}$$

where $\prod_0 = A^{-1}v$, $\prod_1 y_t = A^{-1}\left(C_1 L + C_1 L^2 + \cdots + C_k L^k\right)y_t$ and $\mu_t = A^{-1}\varepsilon_t$. The value of μ_t represents the residual reduced-form VAR that satisfies the conditions $E(\mu_t) = 0$ and $E(\mu_t \mu_t') = \sum_\mu$, which is a positive and symmetric matrix that can be estimated from the data. Given that the residual reduced-form VAR (μ_t) and the structural error (ε_t) have the relationship $\mu_t = A^{-1}\varepsilon_t$ or $A\mu_t = \varepsilon_t$, the variance-covariance matrix to capture this relationship is as follows:

$$\begin{aligned} E(\mu_t \mu_t') &= A^{-1}\varepsilon_t A^{-1\prime}\varepsilon_t{}' \\ &= A^{-1}E(\varepsilon_t \varepsilon_t{}')A^{-1\prime} \\ &= A^{-1}\textstyle\sum_\varepsilon A^{-1\prime} \\ \textstyle\sum_\mu &= A^{-1}A^{-1\prime} \end{aligned} \tag{4}$$

The variance-covariance matrix ($\sum_\mu$) has $\mathrm{n(n+1)/2}$ distinct elements, where n represents the number of endogenous variables in the SVAR system. This number of elements dictates the maximum number of identifiable parameters that can be estimated for matrix A. However, in the current SVAR model, matrix A contains n^2 parameters, which exceeds the maximum permissible number of parameters. Consequently, the SVAR system faces identification problems.

To address the identification problems in the SVAR system, the order condition proposed by Rothenberg (1971) can be applied. This standard criterion for resolving SVAR identification problems stipulates that the zero restrictions in matrix A must be determined subject to $(n^2 - n)/2$. Once the identification problem has been resolved, maximum likelihood estimation can be employed to estimate the SVAR model.

The compact matrix representation of the equation (5) shows the restrictions imposed on matrix A. This study employs short-run zero restrictions, as it can produce valid impulse responses (Christiano et al., 2006). According to the order condition, 10 zero restrictions are necessary to ensure exact identification of the model. The system of equations (5) in the current study imposes 10 zero restrictions, indicating that the SVAR model is exactly identified.

$$A\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ \alpha_{21} & 1 & 0 & 0 & 0 \\ \alpha_{31} & \alpha_{32} & 1 & 0 & 0 \\ \alpha_{41} & \alpha_{42} & \alpha_{43} & 1 & 0 \\ \alpha_{51} & \alpha_{52} & \alpha_{53} & \alpha_{54} & 1 \end{bmatrix}\begin{bmatrix} \mu_{LY_t} \\ \mu_{LGE_t} \\ \mu_{LCPI_t} \\ \mu_{LCPO_t} \\ \mu_{R_t} \end{bmatrix} = \begin{bmatrix} \varepsilon_{LY_t} \\ \varepsilon_{LGE_t} \\ \varepsilon_{LCPI_t} \\ \varepsilon_{LCPO_t} \\ \varepsilon_{R_t} \end{bmatrix} \quad (5)$$

Based on equation (5), the variables' orders are as follows: LY – Real GDP, LGE, - real government expenditure, LCPI – consumer price index, LCPO – crude palm oil and R – interest rate. We note that the results could be sensitive to variable orderings, hence theoretical considerations are used in this paper (e.g. Bernanke, 1986).

For instance, the positioning of real GDP above government expenditure in the model is based on Wagner's Law, which posits that the growth of the public sector is primarily driven by economic expansion. Accordingly, the expansion of the public sector is claimed to outpace national output growth. This implies that increases in national output lead to growth in the size of the government. Previous studies, for example, Abdul Karim & Mokhtar (2005), Abdullah & Maamor (2010), and Govindaraju et al. (2011) have confirmed the validity of Wagner's law in Malaysia.

The model assumes that the consumer price index is expected to rise instantaneously in response to a real GDP shock, which is grounded in the Phillips curve theory that postulates a positive relationship between output gap and inflation. Likewise, the consumer price index is anticipated to increase immediately following a fiscal policy shock, as discussed in the existing literature by Fatas & Mihov (2001) and Perotti (2002).

The crude palm oil price is positioned below consumer price index in the system, as it is anticipated to respond to the other variables, including real GDP, real government expenditure, and consumer price index. The interest rate variable is positioned last, consistent with the literature on the delayed effects of monetary policy. This study considers all variables as simultaneously determined, without making any a priori assumptions regarding the exogeneity of any variables within the system.

4. Results

This section examined the impulse response functions of crude palm oil prices to shocks in macroeconomic variables, including real GDP, real government expenditure, consumer price index, and interest rates. Figure 1 depicts the impulse response functions of crude palm oil prices, with solid and dotted lines representing the estimated responses and confidence intervals, respectively. The confidence intervals were constructed using the Kilian bias-corrected bootstrap procedure with a 90 percent confidence level and 1000 bootstrap repetitions from the original sample data.

The results indicate that the crude palm oil price exhibits a positive, albeit statistically insignificant, response to a real GDP shock. Specifically, the crude palm oil price rises from year 2, reaching a peak level in year 3 before converging to the long-term trend by year 7. This suggests that a one-standard-deviation increase in real GDP leads to a rise in crude palm oil prices, which is consistent with economic theory, as increased production would be expected to drive up prices (Mohamad, 2018). This shows that real GDP is an important determinant of crude palm oil prices in Malaysia (Ziaei & Ali, 2021; Karunanithi et al., 2022).

The response of crude palm oil to real government expenditure is positive, though statistically insignificant. However, the response becomes positive after year 3. This suggests that a one-standard-deviation increase in fiscal policy variables leads to higher crude palm oil prices. The findings imply that an expansionary fiscal policy could induce an increase in crude palm oil prices (Rumbia et al., 2020; Amin et al., 2019).

The response of crude palm oil to consumer price index is negative and significant. This indicates that a one-standard-deviation increase in consumer price index leads to a decrease in palm oil prices. This suggests that when the cost of production, as proxied by the consumer price index, increases, it could result in a decline in palm oil prices. We exert that when the production cost increases, the crude palm oil price decreases because higher production costs put downward pressure on profit margins and incentivize producers to reduce output, thereby leading to a decline in crude palm oil prices (Said et al., 2021; Ayompe et al., 2020).

The response of crude palm oil prices to interest rate is negative after year 3. However, the response becomes statistically significant after year 5. This indicates that a one-standard-deviation increase in interest rate leads to a decrease in palm oil prices. This finding aligns with economic theory, which suggests that an increase in interest rates can help control prices. For crude palm oil, it appears that tightening monetary policy could help curb price increases. this suggest that policymakers can use monetary policy to influence crude palm oil prices in Malaysia (Said et al., 2021; Sharma, 2020)

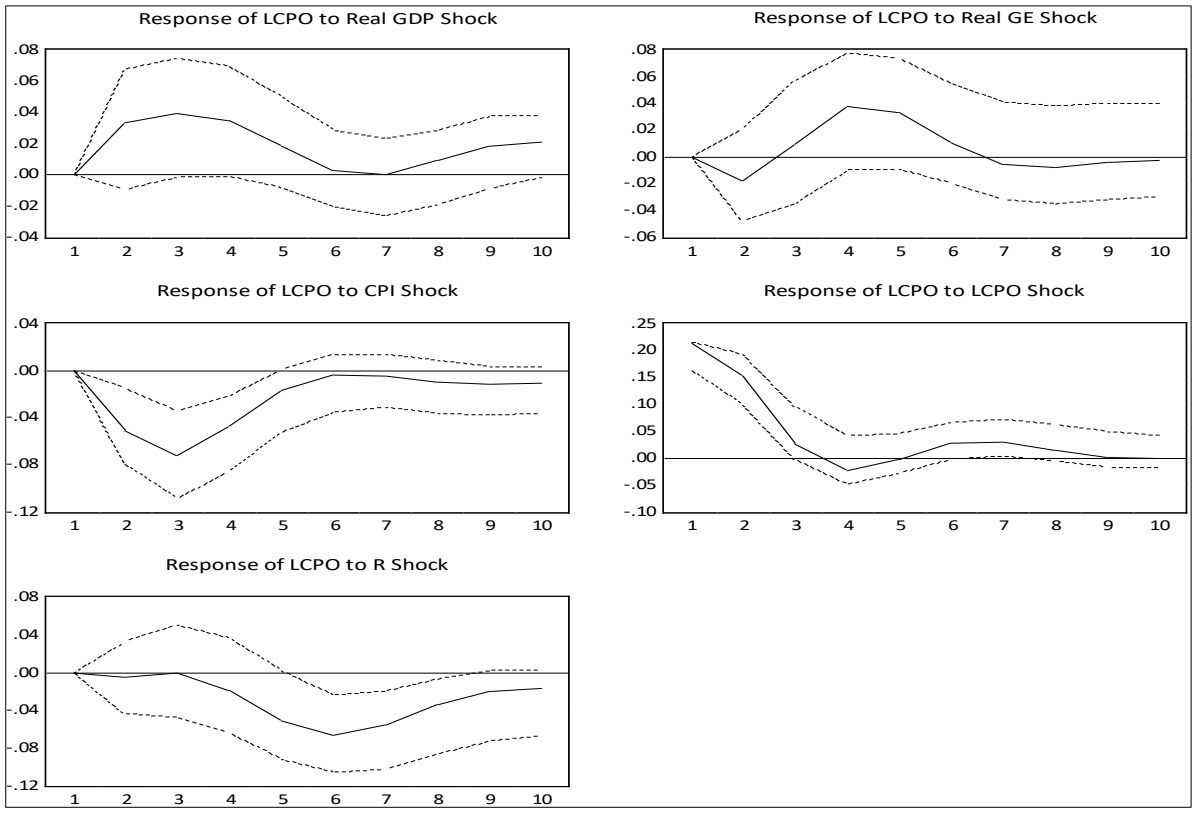


Figure 1: The response of crude palm oil prices to macroeconomics variables

5. Discussion

The study's findings highlight the nuanced and interconnected relationships between macroeconomic variables and crude palm oil (CPO) prices in Malaysia, offering valuable insights for policymakers and industry stakeholders. These results are also contextualised with existing literature to better understand their implications.

The positive, albeit statistically insignificant, response of crude palm oil (CPO) prices to real GDP shocks in this study reflects the broader expectation that economic growth increases demand for agricultural commodities. As GDP grows, higher consumption and investment can drive up demand and prices, with this study showing a peak impact on CPO prices in the third year. However, the lack of statistical significance suggests that other factors, such as export demand or production constraints, may moderate this relationship, warranting further investigation.

This dynamic resonates with findings from Iran, where (Kohansal et al., 2013) observed a positive and significant relationship between GDP growth and the variance of agricultural product prices. As GDP increases, agricultural prices in Iran tend to fluctuate more, likely due to rising demand and shifting resource allocation among competing sectors. These insights highlight that while GDP growth generally stimulates demand and prices, its effects can vary based on how resources are distributed, and market conditions evolve. In the context of palm oil, this suggests that while GDP growth is an important driver, the relationship might be influenced by Malaysia's specific economic structure and the global market dynamics for palm oil. Further research could explore these nuances to better understand how GDP growth impacts CPO prices over time.

Government spending plays a crucial role in supporting the palm oil industry, as seen in this study where crude palm oil (CPO) prices respond positively to such expenditure, especially after the third year. This delayed response suggests that investments in infrastructure, subsidies, or research and development take time to improve productivity and efficiency in the market. A similar trend is evident in China, where public spending on agricultural R&D and subsidies has significantly boosted food production and stabilised prices (Xu et al., 2011). These findings highlight how well-targeted fiscal policies can reduce production costs and create a more stable market environment. However, the delayed impact also emphasises the need for long-term planning to ensure that these interventions achieve their full potential in supporting industries like palm oil.

The negative and significant relationship between the Consumer Price Index (CPI) and crude palm oil (CPO) prices in this study highlights how inflation can push up production costs, squeezing profit margins and ultimately leading to lower output and prices. This finding aligns with research from (Wu & Li, 2022) in China, which shows a strong correlation between the CPI and agricultural product prices, where inflation directly impacts agricultural markets. Similarly, Koçak's study in Turkey reveals a two-way relationship between CPI and agricultural producer prices, with consumer prices exerting a stronger influence, emphasising how inflationary pressures affect agricultural pricing dynamics.

However, the relationship between CPI and agricultural prices isn't always straightforward. Lee and Kim's research in Korea highlights the asymmetric price transmission (APT) from agricultural producer prices to CPI, showing that changes in agricultural prices don't always have a uniform effect on inflation. This suggests that structural changes and market instability can influence how agricultural prices and inflation interact over time.

For the palm oil sector, these findings underline the need to manage inflation carefully to maintain competitiveness and sustainability. Adopting cost-efficient practices and technologies can help mitigate inflationary pressures, ensuring that the industry remains resilient even in the face of rising production costs and volatile market conditions. Continuous monitoring of inflation's impact is crucial, as its effects on agricultural markets can vary depending on broader economic and structural factors.

The delayed yet statistically significant negative impact of interest rates on crude palm oil (CPO) prices, observed after the fifth year, highlights how higher borrowing costs can slow investment in the agricultural sector. When access to affordable financing for essentials like inputs, machinery, and labour is restricted, production capacity and efficiency are reduced, ultimately affecting market prices. This finding underscores the importance of monetary policy in stabilizing agricultural markets and suggests that interest rate adjustments should account for their broader effects on the palm oil industry.

In the short term, changes in interest rates can lead to immediate and sometimes dramatic fluctuations in agricultural commodity prices. For example, (Wu & Li, 2022) found that crops like corn and soybeans often overreact to interest rate changes, overshooting their long-term equilibrium before eventually

stabilising. Over the long term, however, the relationship between interest rates and agricultural prices tends to become more balanced, as prices adjust to reflect the new financial environment.

For the palm oil sector, these insights emphasise the dual nature of interest rate impacts—short-term volatility and long-term adjustments. Policymakers and industry stakeholders must consider both the immediate and lasting effects of interest rate changes, ensuring that strategies are in place to manage short-term disruptions while fostering long-term resilience and stability in the market.

5.1 Implications

The comparison with other research underscores the importance of contextual factors in understanding the relationship between macroeconomic variables and palm oil prices. While the findings of this study are largely consistent with broader literature, the variations in response dynamics highlight the need for region-specific policies. Policymakers should consider Malaysia's unique economic and institutional context when designing fiscal and monetary interventions to support the palm oil sector.

For industry stakeholders, the insights emphasise the importance of mitigating macroeconomic risks through sustainable practices, cost management, and diversification of funding sources. Learning from experiences in other regions, such as Indonesia and Nigeria, could provide additional strategies to enhance resilience to economic shocks.

5.2 Limitations and Recommendations for Future Research

Future research should expand the comparative analysis by incorporating additional macroeconomic variables, such as exchange rates and global palm oil demand. Additionally, cross-country comparisons using panel data could further elucidate the relative impact of macroeconomic variables across different palm oil-producing nations.

6. Conclusion

This study has examined the relationships between key macroeconomic variables—real GDP, government expenditure, consumer price index (CPI), and interest rates—and crude palm oil (CPO) prices in Malaysia. The findings highlight the complex dynamics underpinning these interactions and their implications for policymakers and industry stakeholders. The study found that real GDP positively influences CPO prices, though the response was statistically insignificant, suggesting the need for further exploration into indirect effects and market-specific dynamics. Government expenditure showed a delayed positive impact on CPO prices, reinforcing the importance of long-term planning and targeted fiscal policies to enhance market efficiency and productivity.

The CPI's negative and significant relationship with CPO prices underscores the cost-push effects of inflation, which pressures profit margins and reduces output. This finding highlights the critical role of managing inflation and adopting cost-efficient practices to ensure the sustainability of the palm oil sector. Similarly, the delayed negative impact of interest rates on CPO prices emphasises the need for careful monetary policy adjustments to support agricultural investment and production. Overall, these results stress the importance of a balanced approach to macroeconomic policy, considering both short-term impacts and long-term adjustments. Future research could extend these findings by incorporating additional variables such as exchange rates, global demand, and cross-country comparisons to deepen the understanding of how macroeconomic factors shape the palm oil industry. This would provide more comprehensive guidance for ensuring the resilience and competitiveness of the Malaysian palm oil sector in an increasingly volatile global market.

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