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Abstract

Over the past few years, there has been much interest regarding the Futures Crude Palm Oil (FCPO) in Malaysia. Its volatility in particular, has drawn a lot of concern and has become the focus of discussion in several studies. This study attempts to contribute to the research by examining the macroeconomic variables on Malaysia's Crude Palm Oil from the year 1990 to 2021. It is crucial to identify the factors in order to have a better control regarding the FCPO price uncertainties. The primary question that is being addressed here is whether the macroeconomic variables affect the price of FCPO. Moreover, a selection of independent variables was chosen in this study, namely *Gross Domestic Product (GDP)*, *Interest Rate (IR)* and *Inflation Rate (CPI)*. Meanwhile the dependent variable would be FCPO price. All data were sourced from The World Bank and Trading Economics. For analysis, this study employed the methods of Descriptive Analysis, Regression Analysis, Normality Test and Correlation Analysis. Overall, the results found that GDP and IR have a significant and positive relationship with the price of FCPO, with IR as the most significant variable. The study also revealed that CPI has no significant relationship with the price of FCPO and, in fact, negatively affected it. The results of this research may assist the Malaysian government, as well as private and palm oil sectors to take better initiatives to control the volatility of FCPO and boost the growth of CPO in Malaysia.

Keywords: Gross Domestic Product, Inflation Rate, Interest Rate, Futures Crude Palm Oil, Malaysia

Introduction

Crude Palm Oil (CPO) is an edible oil derived from the pulp of the oil palm. Since 1960, it has become one of the major commodities that contributes to the Malaysian economy (Malaysian Palm Oil Council (MPOC)). According to Bursa Malaysia, Futures Crude Palm Oil (FCPO) derivatives are an agreement between the buyer together with seller to purchase and deliver the CPO later day while the buyer and seller must accept as well as deliver the actual CPO respectively at the time when the contract matures or expires (Bursa Malaysia).

FCPO is actively traded electronically on a global electronic platform named CME GLOBEX. This allows traders all around the world to trade in the Bursa Malaysia Derivatives. The CPO must only be physically delivered under the FCPO contract from palm oil mills that adhere to the standards of the Malaysian Sustainable Palm Oil Certification Scheme for Oil Palm Management Certification. Unlike the stock market, FCPO is more volatile because it attracts risk taker investors for trade and allows for greater returns (Bursa Malaysia).

In recent years, there have been a number of studies looking at CPO and its relationship with different factors. Applainadu (2011) discovered a positive relationship between GDP and CPO in a previous study. However, Zakaria (2017) discovered a significant negative relationship between CPO and GDP in their study to identify the factors that influence demand for palm oil in India using Autoregressive Distributed Lag (ARDL) models from 1980 to 2015.

Furthermore, Ahmed (2018) discovered that there is a long-term relationship between changes in the price of crude oil that directly affect Oman's inflation rate. Jalil and Shah (2021) also reported that one of the push factors that affects the rise in the commodities sector is the higher inflation rate. In a condition of a rising inflation rate issue, plantation sectors could benefit from the event due to its ability to foster economic expansion and possess greater pricing power.

Kilian and Zhou (2020); Kilian and Lewis (2011); Bodenstein et al (2012), discovered that changes in interest rates do have a notable effect on commodity future prices. Moreover, according to Ahmed et al (2020), when assuming an efficiency in the market, interest rates often have a negative impact on commodities future prices through a variety of channels. As the interest rate increases, the commodities future prices will decrease (Ahmed et al., 2020).

Background of Study

Palm oil is the most traded vegetable oil on the global market and thus its trade is affected by a variety of factors that change over time (Rahman, 2013). The unpredictable nature of this commodity causes its price to fluctuate hence the use of Futures Crude Palm Oil (FCPO) as a mechanism. The CPO price behaviour is currently complex, resulting in high volatility in its prices.

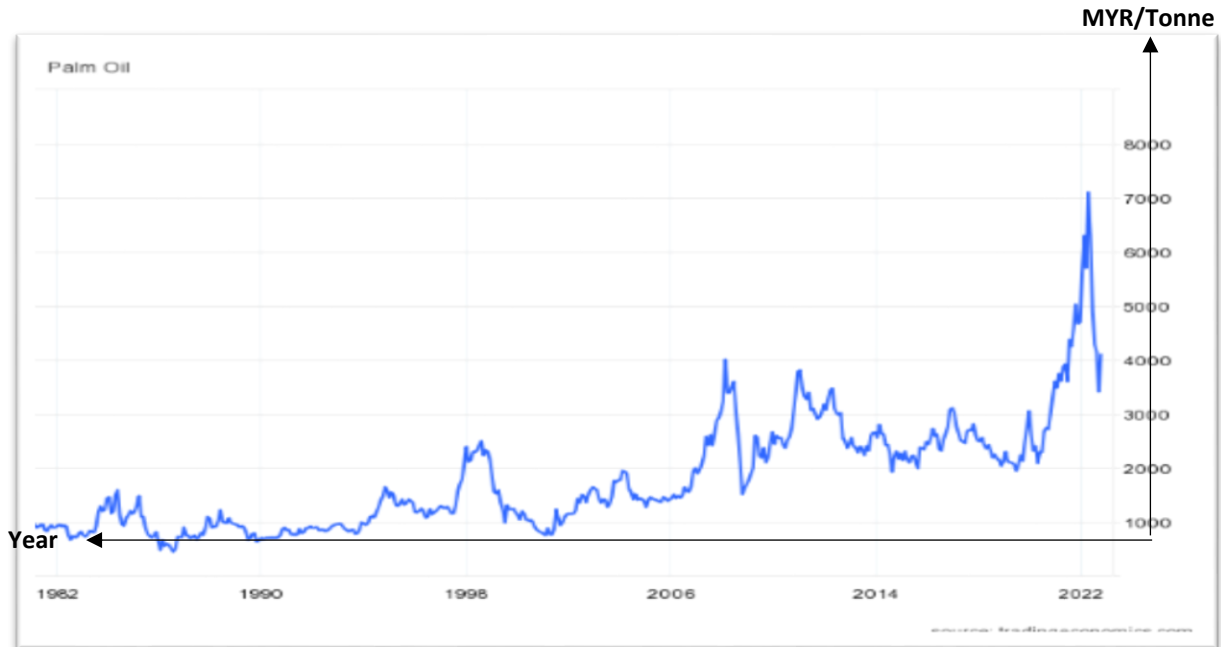
The high volatility of futures prices expresses price ambiguity, which may harm hedgers, producers, and those in charge of making macroeconomic policies (Ahmed et al., 2020). As a result, studying the macroeconomic factors on Malaysia's FCPO would be critical particularly for involved parties.

Figure 1 below depicts the fluctuating price of CPO futures from the 1980s to the present. The price of CPO futures in 2022 is the highest since the 1980s, indicating that the fluctuation is concerning over time. According to the Malaysian Industrial Development Finance Berhad (MIDF) Research, the high prices in the second half of 2022 are the result of higher edible oil prices due to supply concerns in the midst of the ongoing Russian-Ukraine war (The Star, 2022).

According to Ahmed (2020), when investing in commodity futures, investors, producers, and hedgers should make informed decisions based on the effect of macroeconomic variables. This indicates that these variables play a significant role in the fluctuations in the price of CPO in Malaysia. Among the factors that have contributed to the fluctuation of FCPO prices in

Malaysia, include Gross Domestic Product (GDP), inflation rate, and interest rate. However, not all macroeconomic variables have a long-term positive impact on FCPO.

With different variables and different time period from previous studies, this study aims to determine which of GDP, inflation rate, and interest rate has the greatest impact on FCPO from 1990 – 2021.



Adapted from: (Trading Economics, 2022). *The price of Futures Crude Palm Oil (FCPO) from 1982 to 2022*

Gross Domestic Product (GDP) and Futures Crude Palm Oil (FCPO)

GDP is the total market value of all finished goods and services produced in a country over a given time period. Because it measures a country's market value, it also serves as an indicator of the country's economic health (Fernando, 2022). Palm oil is one of Malaysia's primary industries and the country's main agricultural export worldwide. The performance of Malaysia's GDP remains sideways for the time period of 1961 until 2021. According to data from The World Bank, Malaysia's GDP has once reached as low as -7.4% in 1998 due to the Asian financial crisis. In 2020, Malaysia's GDP is negative with -5.6%, making it the second lowest since 1998 (The World Bank). This is due to the Covid-19 pandemic that impacted not only Malaysia but the entire world.

Inflation Rate and Futures Crude Palm Oil (FCPO)

For the past decades, recession and the rising inflation rate have appeared to be the key risks impacting the future of Malaysia's macroeconomic. Moreover, these factors are just two of the numerous uncertainties that our economy has faced.

Based on the study made by Isa et al (2020), inflation is often strongly linked to the purchasing power of money. To explain, inflation analyzes the general price level of goods and service trends in the economy over a certain period. Oil is known to be a substantial component of goods and production activities used in numerous ways. Hence, the higher the price of oil, the higher the price of finished goods. On the other hand, we can also see the similar effect with a rise in the price of Crude Palm Oil (CPO) on manufacturing costs.

Furthermore, previous studies on the correspondence between inflation rates and Futures Crude Palm Oil (FCPO) have suggested that there might be a positive relationship as supported by the studies made by Ahmed (2018); Jalil and Shah (2021), a negative relationship or perhaps even no relationship at all between these two variables. According to Jalil and Shah (2021), the rising inflation rate indicates that the economy is growing, hence industries that are closely tied to that expansion are anticipated to perform better, which in this case is the commodity industry.

Interest Rate and Futures Crude Palm Oil (FCPO)

The relationship between interest rate and Futures Crude Palm Oil has shown an inconsistency in its result based on previous studies. Several studies made in the past such as by Kilian and Zhou (2020); Kilian and Lewis (2011); Bodenstein et al (2012) have indicated that changes in interest rate do have a notable effect on commodity future prices. Moreover, according to Ahmed et al (2020), when assuming an efficiency in the market, interest rates often have a negative impact on commodities future prices through a variety of channels. As the interest rate increases, the commodities future prices will decrease (Ahmed et al., 2020). Besides, the researcher also stated that the factor behind this can be caused by the actions of market participants, which is investor. It occurs when investors sell future contracts in order to hold more money while still earning high interest rates in it rises. Consequently, the commodity prices will decrease, and vice versa (Ahmed et al., 2020).

Purpose of The Study

The purpose of this study is to discover if there is a positive, negative, or even no relationship between the macroeconomic variables and Malaysia's Futures Crude Palm Oil (FCPO). Therefore, this study is primarily focused on the independent variables of the Gross Domestic Product (GDP), inflation rate, and interest rate. Previous research conducted by Isa et al (2020) focused on the exchange rate, inflation, money supply and GDP. Furthermore, Ahmed et al (2020) used interest rate, exchange rate, and Industrial Production Index (IPI) as the independent variables in the study. Meanwhile, Ahmed (2018) focused mainly on the inflation rate.

Isa et al (2020) has studied the correlation between the macroeconomic variables and Malaysian CPO price from 1999 to 2018 by using the secondary data from 1999 to 2018. Additionally, Ahmed et al (2020) has conducted the study of the selected variables and FCPO by using the method of cointegration and Vector Error Correction. Furthermore, the Granger causality analyses based on the data from January 1999 to December 2019 is also used in this study. Besides, Ahmed (2018) has focused on the study that determines the relationship between fluctuations of the CPO price and the behaviour or inflation in Oman during 1990 to 2017.

Literature Review

According to Isa et al (2020), Malaysia is listed as the top 5 exporters in vegetable oil in the domestic and international market which amounts to 14.35% contribution in a total of seventeen most dominant in oil and fats market players. Furthermore, according to the Malaysian Palm Oil Council (2020), Malaysia accounted for 25.8% and 34.3%, respectively, of the global production and exports of palm oil in 2020. This indicates that Malaysia is one of the major palm oil producers and exporters in the world where it has been sustained in the market to provide the global need for oils and fats.

Moreover, according to Ab Rahman et al (2013), the factor affecting the price of Crude Palm Oil (CPO) to increase is mainly due to the increase in CPO production as CPO mature phase and the decrease of CPO export as well as other factor such as replanting scheme of oil palm by the government specifically during the year 2008 to 2013. Meanwhile, the factor affecting the price of CPO to decrease is due to monsoon rains which limits the harvest process and logistic as there were road closures around Malaysia (Kondalamahanty, 2022). Based on data from Malaysian Palm Oil Council (MPOC) (2012), the decreasing factor in CPO is also affected by the increase in performance of palm oil export to major countries like China, India, and Europe especially during the second quarter of 2012.

Furthermore, according to Ganesh (2022), the price of palm oil continues to grow to a better value as seen on 25 April 2020 whereby the price of palm oil has reached the highest 7,081 (MYR/T) price point due to the high export demand from abroad like from China and India as well as the domestic market.

Also, according to Alias et al (1992), the export earning of palm oil in Malaysia continues to increase for the past 10 years with a high of 77.81 billion in the year of 2017 compared to 4.4 billion in 1990 which is approximately 17 times of total earnings in 2017.

Isa et al (2020) has studied the *“Crude Palm Oil (CPO) Fluctuation in Malaysia”* to investigate the connections between and effects of four macroeconomic variables on the Malaysian CPO price: the exchange rate (EXC), inflation (INF), money supply (M3), and Gross Domestic Product (GDP) in Malaysia from 1999 to 2018 where the multiple regression test and Pearson's correlation test both show a positive correlation between GDP and the price of CPO.

Murshidi and Aralas (2017) conducted a study of *“The Impact of Price Shocks of Crude Oil, Palm Oil and Rubber Towards Gross Domestic Product (GDP) Growth of Malaysia”*. This research examines the relationship of crude oil, palm oil and rubber towards GDP of Malaysia in both short and long run term for the period of the first quarter of the year 2020 to the third quarter of the year 2016 using the method of cointegration test. The results show that the price shocks of oil affect GDP positively in the short run and negatively in the long run.

Baharim (2019) conducted a study of *“The Macroeconomics Factor That Affect Crude Palm Oil Price in Malaysia”*. This study uses secondary data to investigate the relationships between the CPO price and the GDP, money supply, inflation, and money supply from 1999 to 2018. The findings indicate a positive correlation between GDP and CPO price.

Zakaria et al (2017) conducted a study of *“Factors Affecting Palm Oil Demand in India”*. The objective of this study is to determine factors influencing the demand for palm oil in India by using the Autoregressive Distributed Lag (ARDL) models over the period 1980- 2015. The outcome of the bound test shows that there is a long-term relationship between the variables under research and the demand for palm oil. The empirical finding demonstrates a significant inverse relationship between domestic income as measured by GDP and India's demand for palm oil. In other words, this also implies that GDP and the price of CPO are inversely related.

Isa et al (2020) conducted a recent study by figuring out the relationship between CPO price and macroeconomic variable which is inflation rate. The data was extracted from the World

Bank and Data Stream from 1999 to 2018. The correlation between the CPO and macroeconomic variable which is interest rate shows that the interest rate has strong correlation. Furthermore, the results of a multiple regression test and the econometric model indicate that the inflation rate has significant macroeconomic variables that influence the CPO price in Malaysia. Being the dominant commodity in Malaysia, the inflation rate will affect the CPO price in Malaysia.

Ahmed (2018) conducted a research to study the relationship between the crude oil price fluctuations and inflation in Oman by 1990 to 2017 using Auto-Regressive Distributed Lag (ARDL) approach in 1990 to 2017. The research stated that there is a long-term relationship between these elements, and changes in the price of crude oil directly affect Oman's inflation rate. Thus, the inflation rate has a significant effect on the crude oil price of Oman.

Mukrim and Masih (2017) conducted a research on the impact of inflation rate and interest rate to export volume of the CPO by using Autoregressive Distributed Lag (ARDL) model. The outcome demonstrates that Malaysia's CPO export volume to satisfy global crude palm oil demand is not directly affected by the inflation rate and the interest rate between 1997 to 2015.

Ahmed et al (2020) conducted a study to analyse the relationship between Malaysian Futures Crude Palm Oil (FCPO) and interest rate. The study finds that there is a negative relationship between FCPO and interest rate. Generally, interest rates have a negative impact on commodity futures prices via many channels, assuming the market is efficient (Ahmed et al., 2020).

According to Nambiappan et al. (2018), the supply and demand are main factors contributing to the fluctuation of FCPO while weather condition, import and export policies, demand and supply for other vegetable oils, import duty, and taxation is among the major factor that affects the price of FCPO.

Mukrim and Masih (2017) conducted a study that begins from 1997 to 2017 about the impact of the Malaysia's FCPO towards interest rate. From the study, several tests have been run, and the research will continue to use the Autoregressive Distributed Lag (ARDL) model method for reasons that will be discussed more in the Empirical Result section. Moreover, according to the study, interest rates have an influence on the price of products and have an impact on purchasing power parity. This explains why interest rates have a long-run link with crude palm oil export volume (Mukrim & Masih, 2017). This will cause the price of the export volume of CPO to decrease.

Methodology

The types of investigation can be divided into two, namely causal and correlation. For this study, the most suitable type of investigation is correlation. Correlation defines the relationship between variables, where the changes of variables will most definitely happen if one of them changes. In this case, correlation acts as the statistical indicator in this relationship (Bhandari, 2021). The dependent variable is the price of the Futures Crude Palm Oil (FCPO). This is what the researcher is most likely to depend on for the historical data of Malaysia's FCPO. This study employs mainly secondary data. Therefore, there is minimal or

no risk of interference from the researchers in the correlation analysis. In addition to this, the secondary data is obtained as it is, without being manipulated and from reliable sources. The study has adopted the use of quantitative data, mostly from the World Bank and Trading Economics. The type of data used is time-series data that had been extracted for the past 31 years, from 1990 until 2021.

Moreover, the sampling method used in this study is non-probability sampling, which is convenience sampling. The sample population is chosen since it is readily available and convenient. Each variable in this study has a total of 20 years of observations. The macroeconomic factors on Malaysia's FCPO are determined by the Gross Domestic Product (GDP) percentage, the inflation rate, and the interest rate. These variables are used to determine how the macroeconomic factors can affect the Malaysia's FCPO.

Data Collection Method

This study focuses on using time series data as its main source of secondary data. The data are collected annually, thus are already assembled and does not require access to respondents or subjects. The Futures Crudes Palm Oil (FCPO) is the research's dependent variable, and Gross Domestic Product (GDP), inflation rate and interest rate are the independent factors. For this study, the data used are from 1990 to 2021, and obtained from different sources including the World Bank and Trading Economics. The World Bank Data Portal is accessible to users for information and statistics on economic growth including World Development Indicators, International Debt Statistics, Millennium Development Indicators and data on poverty, education, and gender (The World Bank)(The World Bank). Trading Economics indicators are made available for consumers with accurate information for 196 countries including past records and projections for more than 20 million economic statistics, exchange rates, stock market indexes, government bond yields and commodity prices (Trading Economics)(Trading Economics).

Theoretical Framework

The theory that can be related to this research is the Real Business Cycle (RBC) Theory which is defined as the latest version of the classical view of economic fluctuations. According to Pettinger (2018), technology shocks and changes in productivity can cause a significant portion of the macroeconomic fluctuations. It assumes that there are large fluctuations in technological change which will have an impact on how business choose to invest and hire. There are two studies that support the correlation between Gross Domestic Product (GDP) and RBC theory which are (Murshidi and Aralas, 2017; Kaihatsu et al., 2018). The result of the study by Murshidi and Aralas (2017) shows that the Crude Palm Oil (CPO) price has an impact on the GDP growth in the long-term and short-term duration. However, Kaihatsu et al (2018) found that business cycle and GDP are likely to support one another according to the observation of the recession shock.

In this research, the RBC theory studies the relationship between changes in productivity and relates it to the factors of CPO with the GDP. Therefore, the RBC theory is relevant to our current study as the macroeconomic factor of GDP is used as one of our independent variables.

Figure 2 illustrates the relationship between Futures Crude Palm Oil (FCPO) and the macroeconomic variables on Malaysia's FCPO which are Gross Domestic Product (GDP), inflation rate and interest rate. The scope of study is to determine Malaysia's FCPO, and the data collected is from 1990 to 2021.

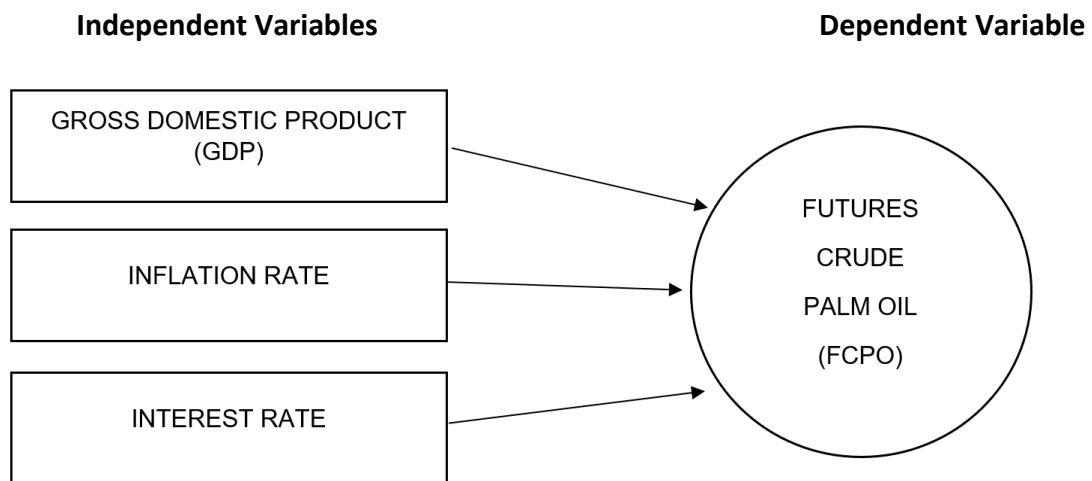


Figure 2

Results of The Study

Table 1

Ordinary Least Squares (OLS) results.

Variable	Coefficient	Std. Error	P-value	Results
Gross Domestic Product	-9357.270	2997.216	0.0041	Significant; reject null hypothesis (H1)
Inflation Rate	-7419.907	8468.779	0.3884	Not significant; do not reject null hypothesis (H0)
Interest Rate	-12268.44	3279.511	0.0008	Significant; reject null hypothesis (H1)

R-squared: 0.462823

Adjusted R-squared: 0.405269

F-statistic: 8.041463

Prob (F-statistic): 0.000510

Regression Equation

$$\ln FCPO = 3034.487 - 0.0041 \ln GDP - 0.3884 \ln CPI - 0.0008 \ln IR$$

(2997.216) (8468.779) (3279.511)

The R^2 value is 0.462823 which indicates that 46.28% of the variations in the dependent variable which is the Futures Crude Palm Oil (FCPO) can be explained by the variability of the independent variables; Gross Domestic Product (GDP), inflation rate, interest rate whereas the remaining 53.72% can be explained by other factors that are not included in the study.

Moreover, the p-value of the F-statistic is 0.0005 and is used to test the overall significance of the regression model, thus researchers can reject the null hypothesis. On the other hand, the adjusted R^2 is 0.405629, smaller than the R^2 . This indicates the variables in the regression model are strong fitting models and can be used to study the FCPO.

According to the results from the Least Square Regression, at a 95% confidence interval, the p-value for GDP is 0.0041. It shows that the economic growth is significant as the level of p-value is less than 0.05 and has a positive relationship with FCPO. With a beta coefficient of negative 9357.270 for the Natural Logarithm form of GDP, this means that an increase in 1% of GDP will affect FCPO to decrease by 9357.270 points.

Next, the inflation rate indicates a negative and insignificant relationship with FCPO. It shows that an increase in 1% of government expenditures will decrease FCPO by negative 7419.907. Furthermore, the interest rate has a significant and positive relationship with FCPO. The result shows 0.008 at 95% confidence interval and a negative 12268.44 coefficient. Analyzing the beta coefficient of negative 12268.44 for the interest rate, this signifies that for every 1% increase in the interest rate, holding other variables constant, the FCPO will decline by 12268.44 points.

Conclusion

To conclude, this study is aimed at finding the relationship between the prices of Futures Crude Palm Oil (FCPO) and selected factors such as Gross Domestic Product (GDP), inflation rate and interest rate with the data covering from 1990 to 2021. There are four types of statistical methods used in this study to achieve the research objectives. The methods are Descriptive Analysis, Correlation Analysis, Normality Test and Regression Analysis. Even so, this study focused on the results of the Regression Analysis.

Firstly, it is concluded that there is a significant positive relationship between the factors of GDP and FCPO. This result can be supported by the study made by Applanaidu (2011) where it was found there was a significant and positive relationship between the world GDP and palm oil world price. Researchers such as Isa et al (2020) and Baharim (2019) also came out with the same conclusion in their studies, with Mukrim and Masih (2017) suggested similarly, but only for the long-term duration.

Moreover, the inflation rate has been proven to affect the FCPO negatively with no significant relationship that exists between the variables. According to Lee (2022), a significant source of inflation is anticipated to be reduced by declining commodity prices. However, a number of factors contribute to global inflation. For example, in United States, the inflation has no significant relationship with the commodity prices as even with the lower CPO alone cannot solve the higher inflation rate issue (Lee, 2022).

Next, based on the Regression Analysis, the result showed a significant positive relationship between the interest rate and FCPO, hence the null hypothesis can be rejected. This result is supported by Kilian and Zhou (2020) whereas the interest rate in U.S. does give an impact to the CPO, hence the variable cannot be taken for granted as the factors of fluctuation in the price of CPO. This study was also supported by other researchers namely (Kilian and Lewis, 2011; Bodenstern et al., 2012).

In order to maintain a stability of Malaysia's FCPO with the given macroeconomic factors, it is important for several parties to take responsibility in order to achieve a better performance

in the commodity sector. For example, the government should consider developing schemes in assisting the current growth in the palm oil industry. The Economic Recovery Plan (PENJANA) incentives that were made back in 2020 during the pandemic and the reduction of export tax on CPO Izmir (2020); Izmir (2020) would be one important scheme. Referring to the plan, the government has announced a 100% CPO export duty exemption for the duration of 6 months (1st July 2020 until 31st December 2020). As a result, the Malaysian Palm Oil Board (MPOB) stated that this will increase the palm oil production as it motivates the industry players to sell more palm oil and hence, gain higher earnings (Izmir, 2020).

As for the private sectors, it is important to remember that they should take part in talks at the Roundtable on Sustainable Palm Oil (RSPO) to develop a mutual understanding at the global level (Malaysian and Palm Oil Council (MPOC)). Moreover, according to MPOC, this comprehension would be turned into widespread activities to achieve sustainability in the production and use of palm oil along its whole supply chain.

Meanwhile, Ignatius (2022) stated that the palm oil sector will continue to become competitive since the government has been doing ongoing initiatives to promote the growth and sustainable performance of the CPO. This is because the sector provides a good potential in the future. Additionally, the latest budget of 2023 has allocated RM 70 million for the palm oil sector to encourage the farmers to reuse palm waste to increase the sustainable development in the palm oil sector. Consequently, this initiative helps the palm oil sector despite the aftermath of Covid-19 (Ignatius, 2022).

Finally, it is hoped that the effort and support from various parties will bring about a secure and stable performance of Malaysia's commodity sectors despite the price volatility and other issues arising either locally or globally.

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