The cooking palm oil price determinants after palm oil-free labeling

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ABSTRAK

Penelitian ini bertujuan untuk meramalkan bagaimana harga CPO (crude palm oil – minyak kelapa sawit mentah) ataupun kebijakan pemerintah seperti penetapan BI 7Days dan pajak ekspor CPO dalam memberikan pengaruh terhadap harga minyak goreng di Indonesia selama era labelisasi Palm Oil Free. Untuk menjawab isu persoalan tersebut, penelitian ini menggunakan metode VECM dengan bantuan analisis IRF dan dekomposisi varians untuk menganalisis data penelitian. Selain itu, periode penelitian dimulai dari Januari 2017 sampai dengan April 2020. Hasil kajian menunjukkan harga CPO memberikan pengaruh positif terhadap harga minyak goreng. Namun justru kebijakan pemerintah lewat bunga acuan dan pajak ekspor CPO memberikan pengaruh negatif terhadap harga minyak goreng di era Palm Oil Free. Dari semua variabel determinan yang dianalisis dalam penelitian ini, harga CPO adalah variabel penelitian yang memberikan respon terbesar terhadap fluktuasi harga minyak goreng. Terkait dengan hasil penelitian tersebut, pemerintah perlu menekan harga bahan baku (dari sisi harga CPO) jika ingin menekan harga minyak goreng pada pasar domestik.

ABSTRACT

This study aims to predict the effect of CPO (crude palm oil) prices or government policies such as BI 7days and CPO export taxes on palm cooking palm oil prices in Indonesia during the Palm Oil-Free labeling period. To address this research issue, this study uses the VECM method by implementing the Impulse Response Function (IRF) and variance decomposition approaches to analyze the research data. Further, the research period starts from January 2017 to April 2020. The study results show that CPO prices affect palm cooking palm oil prices positively. On the contrary, the

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government policies such as BI 7days and CPO export taxes negatively affect cooking palm oil prices during the Palm Oil-Free labeling period. Further, this study also informs that of all the determinant variables, CPO prices have the greatest response to the fluctuations in cooking palm oil prices. Thus, this study suggests the government to constrain raw material or CPO prices to reduce palm cooking palm oil prices in the domestic market.

INTRODUCTION

Indonesia is the world's largest producer and consumer of palm oil since 2016 (GIMNI, 2018). Cooking palm oil is an essential need for Indonesian people. As in Table 1, the consumption rate of cooking palm oil in Indonesia increases from 2012 (1.9 million liters) to 2016 (2.5 million liters). The consumption of cooking palm oil in Indonesia increases by around 32.51 percent from 2012 to 2016. The consumption of cooking palm oil originates from the difference between the supply and the use of Crude Palm Oil (CPO). CPO supply comes from domestic production plus the number of imports minus exports. Then, the use of CPO is allocated for the benefit of the non-food industry. Some of the CPO transported or processed to the industry will be scattered as much as 2.39 percent of the total inventory (Setjen Pertanian, 2017).

Table 1
The Consumption of cooking palm oil in Indonesia, the Year of 2012 – 2016

No	Description	Year				
		2012	2013	2014	2015	2016
A	The Supply of CPO:	7,171,191	7,269,589	6,386,101	4,610,023	10,470,225
	- Production (CPO)	26,015,518	27,782,004	29,278,189	31,070,015	33,229,381
	- Import (ton)	693	65,561	299	7,572	2,658
	- Export (ton)	18,845,020	20,577,976	22,892,387	26,467,564	22,761,814
B	The Use of CPO:	384,768	354,768	341,628	291,180	435,238
	- Raw material of the non-food industry	213,376	181,025	189,000	181,000	185,000
	- Scattered	171,391	173,743	152,628	110,180	250,238
C	The Available of CPO to be Processed (A – B)	6,786,423	6,914,820	6,044,473	4,318,843	10,034,987
D	The Supply of Cooking palm oil (CPO to cooking palm oil)	4,633,770	4,721,439	4,127,166	2,948,906	6,851,889
E	The Consumption of Cooking palm oil:	1,904,378	1,848,037	2,001,454	2,336,835	2,523,544
	- Household consumption	1,832,555	1,774,855	1,937,483	2,291,127	2,417,340
	- Scattered	71,823	73,182	63,971	45,708	106,204
	Balance	2,729,391	2,873,402	2,125,712	612,072	4,328,345

Source: Setjen Pertanian RI (2017)

According to Mba et al. (2015), cooking palm oil comes from the CPO fractionation. CPO production in large amounts can produce more olein (cooking palm oil). The abundant amount of cooking palm oil should be able to keep its price under

control. However, the price rate of cooking palm oil in Indonesia from 2015 to 2017 continues to fluctuate (Kementrian Perdagangan, 2017). Although Indonesia is the largest CPO producer globally, Indonesia cannot stabilize cooking palm oil prices.

Moreover, at the beginning of 2017, the European Union proposed a proposal of COM/2016/0767 regarding the use of energy from renewable resources. One of the proposals is the Palm Oil-Free policy or free from the use of CPO. With this policy, CPO production in Indonesia is affected, which consequently also impacts cooking palm oil production. The fluctuation of CPO prices, in turn, influences cooking palm oil prices in Indonesia.

Applanaidu et al. (2011) uncover that Malaysia's vegetable oil price movements follow the same trend as CPO price movements. The increased price of CPO negatively influences society because the cooking palm oil price also rises. In this case, the role of the Indonesian government is needed to control palm cooking palm oil prices. The government may control macroeconomic fundamentals. According to Prastowo et al. (2008), determining the monetary policy response rate to commodities changes must select a dominant and elastic commodity. Since cooking palm oil is one of the basic goods, monetary policy can provide a more measured and targeted response to cooking palm oil price changes. Monetary policy with an increase in interest rates indicates an increase in demand for money, signifying an increase in the price of goods, such as cooking palm oil (Iskandar, 2015). Further, the movement of food commodity prices will be in line with the prices of goods in general. Thus, a commodity price can be a signal of changes in inflation. When the government wants to increase inflation by setting an expansionary monetary policy, the price of cooking palm oil increases. Besides monetary policy in controlling fluctuations of cooking palm oil prices, the Indonesian government, through the Ministry of Finance, has issued regulation No.439/KMK.017/1994. Its essence is to provide a tax on CPO exports to overcome high cooking palm oil prices (Rifin, 2010).

Furthermore, understanding the cooking palm oil price determinants may help stakeholders take the necessary actions, especially since cooking palm oil is an essential commodity for Indonesian people. Nevertheless, the discussion about cooking palm oil prices in Indonesia is rarely done. Several previous studies, especially in Indonesia and Malaysia as the largest CPO producers, do not focus on the era of Palm Oil-Free labeling (Djaenudin & Gonarsyah, 2002; Rifin, 2009; Abdullah, 2013; and Bentivoglio et al., 2018). Therefore, this research focuses on the time when the European Union first submitted a proposal related to the freedom to use palm oil in early 2017. The research is essential because previous studies discussing the changes in cooking palm oil prices only linked CPO prices and macro policies separately. However, this research uses both CPO and macroeconomics variables as determinants

of cooking palm oil prices in Indonesia, primarily focusing on the era of Palm Oil-Free labeling. The researchers investigate the understanding of the relationship between palm oil prices and palm oil-free policy. The policy prohibits the European Union from using CPO or all kinds of derivative products. Where as the raw material for making cooking palm oil is CPO. Thus, the prohibition on the use of CPO and its derivative products will undoubtedly cause palm cooking palm oil prices to fluctuate.

With the Palm Oil-Free labeling policy, the price of cooking palm oil may fluctuate even more. Therefore, a study is needed to discuss how the movement of cooking palm oil prices is influenced by factors, such as CPO prices and macro policies: interest rates and CPO export taxes during the Palm Oil-Free era. This research aims first to predict the effect of CPO prices, interest rates, and CPO export taxes on changes in cooking palm oil prices during the Palm Oil-Free era. Second, this study is to find out how much influence of the CPO prices and macro policies, such as interest and CPO export tax, on changes in cooking palm oil prices in the Palm Oil-Free era.

The novelty of this research, if associated with previous studies by Djaenudin and Gonarsyah (2002); Rifin (2009); Abdullah, (2013); Bentivoglio et al. (2018), is the use of CPO as a producer of cooking palm oil and macro policies as a stabilizer of commodity prices. Previous studies have only separately employed CPO and government policies as determinants of cooking palm oil prices. Besides, this research's novelty is to link the Palm Oil-Free policy, a policy that not only impacts the yield and price of CPO but also affects derivative products, such as cooking palm oil.

LITERATURE REVIEW AND HYPOTHESIS

The policy issued by the European Union with submitting a proposal COM/2016/0767 is about the use of energy from renewable resources in early 2017. The policy suggests that the EU will gradually reduce food crops-based biofuels by 3.8 percent until 2030. Thus, this policy expects to reduce CPO production, which is also the main ingredient for cooking palm oil.

On the other hand, determining a product price relates to supply and demand at the micro level to the aggregate level (Mankiw, 2017). Hence, the determinants for a commodity can be formed from both supply and demand. Prastowo et al. (2008) indicate that food or agricultural commodities' price formation is more influenced by the supply. Traditionally, economic agents' or suppliers' price formation behavior can also be affected by input costs (Prastowo et al., 2008).

Besides, Abdullah (2013) affirms that CPO and some vegetable oil prices, such as cooking palm oil, move in the same direction after 2000. It means that CPO, which is also a vegetable oil commodity, has the same sensitivity as other vegetable oil commodities. When the world CPO price increases, the cooking palm oil price also increases. Chuangchid et al. (2012) also find that CPO prices influence palm oil price movements even though they are not very influential.

H1: CPO prices affect cooking palm oil prices.

Not only do CPO prices have a dominant role, but the role of government also has an impact on overcoming fluctuations in cooking palm oil prices. The government can control macroeconomic variables, such as interest rates and export tax rates. Furthermore, monetary policy affects the prices of several commodities, such as cooking palm oil (Djaenudin & Gonarsyah, 2002). In the long-term, when the interest rate is low, the inflation rate rises. Thus, the prices for goods in general, such as cooking palm oil price, also increase. Other researchers also find that the interest rates and cooking palm oil prices are interrelated, as Taghizadeh-Hesary et al. (2018) studied.

H2: Interest rates affect cooking palm oil prices.

Moreover, the Indonesian government applies a CPO export tax policy in controlling domestic cooking palm oil prices. For example, Malaysia and Indonesia impose CPO export tax not only to increase government revenues but also to monitor the domestic cooking palm oil supply (Abdulla et al., 2014). The increase in CPO export tax makes CPO producers reduce the number of exports, which in turn, the number of CPO increases and the cooking palm oil price decreases. Through the Ministry of Finance, the Indonesian government issues regulation no.439/KMK.017/1994 to provide a tax on CPO exports to overcome high cooking palm oil prices (Rifin, 2010). Thus, an increase in cooking palm oil prices in the market can lead the government to issue a policy regarding CPO export taxes (Salam et al., 2014).

H3: CPO export taxes affect cooking palm oil prices.

RESEARCH METHOD

This study's independent variables are CPO prices, CPO export taxes, and interest rates, while the dependent variable is cooking palm oil prices. Actually, the

variable CPO availability can be used as a determinant of cooking palm oil price. However, because of limitations in finding monthly data on CPO availability, the CPO availability variable is not used for the research. Besides, the research data is in the form of monthly data. The period begins in early 2017 when the European Union first launched the proposal of COM/2016/0767 associated with Palm Oil-Free labeling and ends in April 2020. This research data is secondary data, meaning that all variable data in this research can be collected from several sources.

Based on Table 2, some variables have the nominal denomination data, but only the BI 7days variable has the percentage data. Therefore, to equalize the measured data denomination for all variables, they are converted into nominal. The reason is to equalize the dependent variable denomination in this research with the cooking palm oil prices.

Table 2
Types of Data, Symbols, Denominations, and Data Sources

No.	Variable Name	Symbols	Denominations	Data Sources
1.	Cooking palm oil Price	HMGS	Rupiah/liter	BPS (2020)
2.	CPO Price	HCPO	US\$/ton	Markets Insider (2020)
3.	BI 7days REPO	BIRATE	Percentage	Bank Indonesia (2020)
4.	CPO Export Tax	PCPO	US\$/metric ton	Kemendag (2020)

Sources: Combination of several sources (2020)

All variables in this research can be measured as follow:

Cooking palm oil price is a price unit, so the proxy is a nominal denomination. For cooking palm oil price data from January 2017 to April 2020, it can be measured by looking at Social and Economic Data Reports (*Laporan Data Sosial dan Ekonomi*) published by BPS every month. Besides, the price applied for CPO is in US dollars. Therefore, the proxy for CPO price is also nominal. Measuring CPO prices from January 2017 to April 2020 can be done by looking at the Markets Business Insider website.

On the other hand, the researchers determine CPO export tax based on the amount of CPO reference prices in the USD unit per metric ton. Therefore, the proxy for CPO export tax is nominal. To measure CPO export tax data from January 2017 to April 2020, the researchers look at the release of reports informed by the Ministry of Trade each month. Meanwhile, BI 7days is a reference interest based on monetary policy set by Bank Indonesia. Thus, the proxy of BI 7days is in percentage. The measurement of BI 7days data from January 2017 to April 2020 is by looking directly on the Bank Indonesia website.

This research on determinants of cooking palm oil prices in the Palm Oil-Free labeling era uses time-series data. Time series analysis applies Vector Auto Regression

(VAR) or Vector Error Correction Model (VECM) approach (Bentivoglio et al., 2014). This research employs the VAR approach if the data are stationary and there is no cointegration (Sihombing & Sundoro, 2017). If the data used are then known to be not stationary, but there is cointegration, the research utilizes VECM (Sihombing & Sundoro, 2017). Besides, a stationary test is carried out first to find whether the unit root or not. Data that have unit roots creates a regression bias (Greene, 2012). The next test is the optimum lag test. Determining the optimal lag length is vital; it makes data biased if the lag length is too short or long (Sudarsono, 2018). The last test is the cointegration test. This test determines the possibility of a long-term balance between the variables studied (Sundoro & Theovardo, 2019).

The equation model that can be written in this research to predict the determinants of cooking palm oil prices is as follows:

$$HMGS_t = a_0 + \sum_{i=1}^P a_{1i} HMGS_{t-i} + \sum_{i=1}^P a_{2i} HCPO_{t-i} + \sum_{i=1}^P a_{3i} BIRATE_{t-i} + \sum_{i=1}^P a_{4i} PCPO_{t-i} + \varepsilon_t \quad \dots 1$$

HMGS is cooking palm oil prices; HCPO is CPO prices; BIRATE means BI 7days or interest rate; PCPO is CPO export tax. a_0 is intercept vector; a_i is parameter matrix for each $i = 1, 2, \dots, p$; ε represents a residual vector.

ANALYSIS AND DISCUSSION

The research aims to obtain a comprehensive picture of the effect of CPO prices, interest rates, and CPO export taxes on cooking palm oil prices. To answer all hypotheses, the research utilizes the VAR-VECM statistical model. The credible result of VAR-VECM comes from several statistical tests first, as described in the sub-chapter below.

Unit Root and Cointegration Tests

To avoid biased regression results, the unit root test is the first test for this research. This type of unit root test for this research applies Augmented Dickey-Fuller (ADF).

Table 3
The Results of Unit Root Test

Variables	Level		First Difference	
	<i>P-value</i>	Description	<i>P-Value</i>	Description
HMGS	0.798	Not Stationary	0.000	Stationary
HCPO	0.212	Not Stationary	0.000	Stationary
BIRATE	0.572	Not Stationary	0.001	Stationary
PCPO	0.001	Stationary	0.000	Stationary

Sources: Data processed (2020)

Based on Table 3, only PCPO is stationary at the level, while several other variables are stationary in the first difference level, which is seen with a p-value below 0.05. All variables data in this study can be interrelated in the long term because they are free from the unit root at the first difference level (Juanda & Junaidi, 2012). To ensure all variables have an interrelated relationship, the researchers carry out a cointegration test.

Table 4
The Results of Cointegration Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.841	97.600	47.856	0.000
At most 1	0.372	29.492	29.797	0.054
At most 2	0.188	12.268	15.495	0.145
At most 3 *	0.116	4.549	3.841	0.033

Description:

* Denotation indicates a cointegrating equation at the 0.05 level.

** Significance at the 0.05 level

Sources: Data processed (2020)

Based on Table 4, the two cointegration equations have a prob value below 0.05. It shows that all variables in this research have a long-term relationship.

As displayed in Table 3, only a few variables are not stationary at the level, but all variables are stationary at the first difference level. The cointegration test in Table 4 reveals a cointegrated equation. Further, this research employs the VECM model in regression analysis.

Table 5 exhibits the estimation results of the VECM model for cooking palm oil prices with short-term and long-term estimates. In the short-term, cooking palm oil prices and CPO prices are significant at the 0.05 level. The short-term estimation results show that the cooking palm oil price at lag 1 has a positive effect. Thus, if there is an increase of 1 percent in the previous month, the cooking palm oil price will increase by 0.5 percent. In the short-term, CPO export tax at lag 1 will negatively affect cooking palm oil price by 3.23 percent. Meanwhile, in the long-term, a 1 percent increase in CPO price causes an increase in cooking palm oil price by 1.54 percent. On the other hand, the CPO export tax negatively influences cooking palm oil prices at 21.39 percent in the long-term.

Table 5
Estimation Results of VECM Model

Variables	Coefficient	T-statistic
Short-term		
D(HMGS(-1))	0.509*	[3.455]
D(BIRATE(-1))	9.278	[0.085]
D(HCPO(-1))	0.301*	[2.308]
D(PCPO(-1))	-3.237	[-0.741]
CointEq1	0.019**	[1.988]
Long-term		
BIRATE(-1)	-33.759	[-1.424]
HCPO(-1)	1.539*	[2.301]
PCPO(-1)	-21.394*	[-5.534]

Description:

**Significance at the 0.10 level

* Significance at the 0.05 level

Sources: Data processed (2020)

Impulse Response Function (IRF)

A study with VECM analysis requires the assistance of Impulse Response Function (IRF) and Forecast Error Variance Decomposition (FEVD) analysis. Figure 1 displays the IRF results for this research.

(a)

(b)

(c)

Sources: Data processed (2020)

Figure 1
The Result of Impulse Response Function (IRF)

Figure 1 (a) answers the first hypothesis about CPO prices' effect on cooking palm oil prices. CPO prices affect domestic cooking palm oil prices in Indonesia positively. From the first period, cooking palm oil prices tend to rise but fall in the third period. From period 4 to 13, the cooking palm oil prices tend to rise again. From the fourteenth period onwards, cooking palm oil price finds its balance because it is

stable with a positive response to CPO prices. This research is in accordance with the findings by Abdullah (2013) and Chuangchid et al. (2012), which state that cooking palm oil price movements are in line with CPO price movements. Thus, these findings suggest that cooking palm oil price gets cheaper when CPO price falls in the palm Oil-Free labeling era.

Meanwhile, Figure 1 (b) answers the second hypothesis, which assumes that the interest rate affects the movement of the domestic cooking palm oil prices in Indonesia. Initially, the cooking palm oil price tends to rise but continues to fall starting from the third period. From the eighteenth period onwards, cooking palm oil prices return to balance with a stable movement and respond negatively to the BI 7days rate shock. This research corroborates with the findings of Djaenudin and Gonarsyah (2002) and Taghizadeh-Hesary et al. (2018). They find that monetary conditions can affect cooking palm oil prices. Besides, the theory argues that when inflation is high, nominal interest also increases. When the BI 7days rate falls, inflation rises, which consequently raises domestic cooking palm oil prices. In this case, applying low-interest rates is expected to increase investment in the cooking palm oil industry, which can then be exported abroad. However, Palm Oil-Free labeling that prohibits CPO Indonesia from entering the European Union makes the investment futile. In fact, the low-interest rate causes cooking palm oil prices to rise due to inflation.

Figure 1 (c) answers the third hypothesis for this study, which suspects that the CPO export tax can affect Indonesia's cooking palm oil prices. From the beginning to the tenth period, Indonesia's cooking palm oil prices still fluctuate when there is a CPO export tax shock, with a negative response. Domestic cooking palm oil prices get stabilization with a negative response to the CPO export tax shock starting in period 11. Previous research conducted by Rifin (2010) uncovers that the government raises CPO export tax to control domestic cooking palm oil prices. However, the European Union's policy regarding Palm Oil-Free labeling leads to a decline in CPO exports, subsequently lowering CPO export taxes. Then, it makes domestic cooking palm oil prices also go up.

Forecast Error Variance Decomposition (FEVD)

FEVD analysis shows the percentage of the role or contribution of each variable used in the model to the variability of certain variables. Table 5 exhibits the FEVD results for this research.

Table 5
The Results of Forecast Error Variance Decomposition(FEVD)

Period	S.E.	HMGS	HCPO	BIRATE	PCPO
1	100.176	100.000	0.000	0.000	0.000
2	192.010	78.964	20.162	0.008	0.867
3	274.250	61.021	38.383	0.068	0.528
4	335.979	56.505	42.790	0.175	0.530
5	392.028	53.373	45.191	0.923	0.513
6	444.448	50.639	47.119	1.763	0.479
7	494.735	48.503	48.545	2.500	0.452
8	542.368	46.744	49.663	3.161	0.432
9	587.475	45.311	50.525	3.749	0.415
10	630.215	44.144	51.184	4.270	0.401
11	670.910	43.173	51.713	4.725	0.390
12	709.726	42.359	52.142	5.117	0.380
13	746.857	41.672	52.498	5.457	0.372
14	782.449	41.086	52.796	5.752	0.365
15	816.650	40.582	53.049	6.010	0.359
16	849.586	40.146	53.265	6.235	0.354
17	881.371	39.765	53.452	6.433	0.350
18	912.104	39.431	53.615	6.608	0.346

Cholesky Ordering: HMGS HCPO BIRATE PCPO

Sources: Data processed (2020)

At the beginning of the period, cooking palm oil price itself gives the biggest response with a contribution of 100 percent. However, gradually, the independent variables begin to provide a relatively large response to cooking palm oil prices in the long-term. Indonesia's domestic cooking palm oil prices respond to CPO prices shock by 20 percent to 52 percent from the initial period until the fourteenth period. From the eighteenth period onwards, the response of cooking palm oil prices to CPO prices shock is about 53.6 percent. Meanwhile, the two other variables, such as BI 7days rate and CPO export tax, only have a small effect on changes in cooking palm oil prices by 6.6 percent and 0.35 percent. Also, the CPO export tax has the least effect on domestic cooking palm oil price fluctuations during the Palm Oil-Free period. It happens because the Palm Oil-Free policy prohibits Indonesian CPO from entering the European market, which means that CPO exports become small, then CPO export tax only contributes a small part to the cooking palm oil prices.

CONCLUSION, LIMITATIONAND SUGGESTION

CPO prices have the largest contribution in responding to changes in domestic cooking palm oil prices in Indonesia. Thus, the condition for Palm Oil-Free labeling certainly benefits the cooking palm oil market in Indonesia. When the European Union avoids using CPO, the domestic cooking palm oil price falls because the CPO price gets falling. Besides, the ban on CPO exports to Europe increases the supply of CPO

in the domestic market as a basic ingredient for making cooking palm oil and causes cooking palm oil prices to decline. Meanwhile, the interest rate and CPO export tax variable have a negative effect on fluctuations in domestic cooking palm oil prices during the Palm Oil-Free labeling period, but their contributions are only small, at 6.6 percent and 0.35 percent, respectively.

Actually, the CPO availability variable can be related to fluctuations in domestic cooking palm oil prices. Moreover, the Palm Oil-Free policy causes the availability of domestic CPO to become more abundant. However, this research does not use it because the researchers have difficulty finding monthly data on the CPO availability variables. In the long-term, if the Palm Oil-Free policy is still valid, further research may include this variable as a determinant of domestic cooking palm oil prices. The next suggestion is that if the government wants to reduce cooking palm oil prices in the domestic market, the government can reduce the price of raw materials, namely CPO prices.

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