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Article

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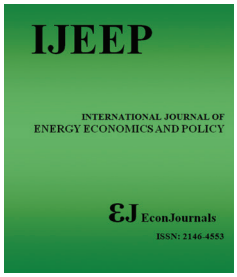

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World Vegetable Oil Competition in 1960-2019

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ABSTRACT

This study aims to examine the balance and competition of world vegetable oils as a policy formulation to improve palm oil competitiveness in the balance that is partial to the welfare of palm oil farmers in Indonesia. The study used the Vector Error Correction Model (VECM) to analyze short- and long-term balance relationships with the Johanson Cointegration Test. It then analyzed the relationship of bivariate causality with the Pairwise Granger Causality Tests approach. It further analyzes shocks on the values of independent variables that are responded by dependent variables using Impulse Response and Variance Decomposition. The study used monthly data from 1960 to 2019 sourced from the Food and Agriculture Organization (FAO) and the World Trade Organization (WTO). The results of the study proved that the balance in the short-term variable palm oil prices in one and two previous periods was negative to the price of palm oil now. Furthermore, the same findings on soybean oil prices in the previous 1 and 2 years negatively affect the price of soybean oil today. Furthermore, the price of coconut oil in the previous two periods also negatively affects the price of coconut oil now. However, the price of coconut oil variable in the previous period had a positive and significant effect on the price of palm oil. While in the long run, the variable price of soybean oil negatively affects the price of palm oil, then the price of coconut oil has a positive effect on palm oil. The results of bivariate causality tests prove that the variable relationship of palm oil prices has a two-way causality with soybean oil prices, then the price of coconut oil (PCO) has a one-way relationship with the price of palm oil (PPO). This means that changes in price of palm oil (PPO) do not affect changes in price of palm oil (PPO), while changes in price of palm oil (PPO) affect changes in price of coconut oil (PCO). Furthermore, the two-way causality relationship between price of coconut oil (PCO) and price of soybean oil (PSO), meaning that changes in price of coconut oil (PCO) will affect price of soybean oil (PSO) and vice versa. Based on the results of impulse response function and variance decomposition explained that the shock of palm oil prices responded to changes in soybean oil prices and coconut oil prices.

Keywords: Vegetable Oil Competition, Vector Error Correction Model, Palm Oil
JEL Classifications: C01, C50, Q43, Q51

1. INTRODUCTION

Soybean oil, coconut oil and palm oil are a group of vegetable oils that throughout history are needed by the world community (Nuhung, 2013; Horas and Purba, 2019). These three vegetable oils compete with each other along with the times and technology in producing derivative products and health balance for consumers. In addition, the level of production development and interest in the availability of raw materials to various industries in the world, which determines the competition of the demand of the three.

Observing developments throughout history from 1960 to 2019 which is very competitive between soybean oil and palm oil. The world's largest producer of soybean oil is located in south America (the United States, Brazil, Argentina, China and India), while the world's largest palm oil producers are Indonesia, Malaysia, Thailand, Colombia and Nigeria. So of course, the world's largest producers of vegetable oil continue to carry out various trading strategies in controlling the world market.

Competition from vegetable oils producing countries has led to business politics, this is in accordance with the findings of

Masruroh (2017), the rejection of Indonesian CPO imports because of political motives where the United States does not want the existence of CPO Indonesia to replace soybean oil as the main vegetable oil product of the United States. The United States is worried that the growing development of Indonesia's CPO imports will replace its domestic vegetable oil market share because America realizes that Indonesian CPO is more efficient and economical than soybean oil. One hectare of oil palm plantations can produce 7 tons of oil while one hectare of soybean plantations produces only 0.45 tons of oil, especially compared to canola and sunflower, palm oil productivity is 10 times bigger (Masruroh, 2017).

Business politics developed by oil-producing countries from soybeans and corn are generally countries in Europe and America (developed countries). Issues such as non-hygienic products, destruction of forest ecosystems including the issue of Orangutan habitat destruction are issues raised to drop world CPO prices. Furthermore, according to Suwarno (2019) added, negative issues regarding forest fires, peatland management, the control of a handful of large corporations or conglomerates in the national oil palm plantation sector. Furthermore, related to indigenous tribes, the rights of indigenous peoples and ulayat, issues of defense and regional spatial planning, employment, and various other social issues.

Actually, the spotlight on palm oil because this vegetable oil is the largest production in the world (Wu et al., 2017; Guan and Mckay, 2014) which is predicted to be difficult to compete so that it serves as a basis in developing the issues and negative effects of palm oil as in some studies that the expansion of oil palm land becomes a driver of environmental damage, especially deforestation (Jean et al., 2019; Saswattecha et al., 2017; Euler et al., 2016). Moreover, more unobjective criticism about the transition of fossil energy use to renewable energy triggers the world's growing demand for palm oil so that it is predicted that the development of large-scale palm oil plantations so that this action will negatively affect the environment (Pacca and Bicalho, 2016), one of which is the use of palm oil as a biodiesel raw material (Rincón et al., 2015). Thus added Alfonso-lizarazo et al. (2013), the negative impact of palm oil on the environment makes the focus of consideration for consumer countries in deciding on trade cooperation.

Efforts to discriminate against palm oil are further strengthening those built by other vegetable oil producing countries, especially soybean producers. This can be observed from the Horas and Purba study (2010), that soybean oil is a source of biodiesel that contributes to the world market by 76% while CPO exports for world biodiesel needs are only 24%. Then in the case of butter production in the EU, there is the notion that palm oil poses a threat to the commodities it produces (Bergmann et al., 2016). Strengthening world market domination for soybean producing countries is normally impossible because the cost of producing palm oil is much cheaper than soybean oil. The most effective strategy is by developing negative opinions on palm oil through studies that confirm the development of palm oil plantations damages the environment, palm oil is not good for health and the development of palm oil into biodiesels resulted in an increase in world food goods that eventually increase poverty.

This research urgently needs to be done immediately to answer the problem of palm oil prices in Indonesia, which is not the largest producer in the world. Moreover, to see the movement of the price of palm oil, soybean oil and coconut oil that has an effect on the price of cluster of palm oil fruit in Indonesia at the farmer level. The results of existing empirical studies have not looked at how the short- and long-term balance and bivariate causality relationships between the variables studied, and also looked at the shock of dependent variables responded by independent variables.

2. LITERATURE REVIEW

Soybean oil which is a substitute for palm oil, in theory the price movement is unidirectional. This means when the price of soybeans moves up it will encourage the increase movement of palm oil prices as well. This is in line with the study of Arianto and Arief (2010), during 2004-2008 the increase in soybean oil prices will cause palm oil prices will also increase. Then Nasution and Faisal (2016) added, the movement of palm oil prices will follow other vegetable oil movements as they compete for the share of global vegetable oil.

While what happened in the period 1980-2003 is different, the increase in soybean oil prices reduce the price of Palm according to Oil Arianto and Arief (2010). The results of this finding are also in line with Buyung et al. (2017), during the period 2005-2015 found that the increase in soybean oil prices led to a decrease in Indonesia's CPO export prices.

In addition to soybean oil, other price movements that are in line with palm oil is the world's crude oil Palm oil (CPO) which is a raw material for industry (cosmetic, hygiene products and foodstuffs, etc.) and renewable energy sources (Nasution and Faisal, 2016), so when the price of crude oil increases it will increase the demand for palm oil. This is in line with Buyung et al. (2017) research that the world CPO price movement is symmetrical or followed by the pattern of world crude oil price movements.

Furthermore, Syahril et al. (2019), mentioned that soybean oil which is the substitution of palm oil fluctuated with an average growth during 2008-2017 of −2.55%. The decline in the average rate of soybean oil growth is connected with palm oil production which is the vegetable oil with the lowest production cost. With the advantages of palm oil production costs, the increase in soybean oil prices led to a decrease in The Price of Indonesian CPO exports (Buyung et al., 2017), but in contrast to Nasution and Faisal 's research (2016) that soybean oil will push the price of palm oil up.

Then Masruroh (2017) added that the rejection of Indonesian CPO imports was due to political motives that the United States did not want the existence of CPO Indonesia to replace soybean oil as the main vegetable oil of the United States. The United States is worried that the growing development of Indonesia's CPO imports will replace its domestic vegetable oil market share because the US realizes that Indonesian CPO is more efficient and economical

than soybean oil. Therefore, the United States rolled out negative issues against Indonesian palm oil. Furthermore Akmal Huda Nasution (2016), explained that fluctuations in CPO prices tend to be influenced by issues made by countries producing substitute products (rival CPO), namely the countries that produce oil from soybeans and corn which are generally countries in Europe and America (developed countries). Issues such as non-hygienic products, destruction of forest ecosystems including the issue of orangutan destruction are issues raised to drop world CPO prices.

In addition, the more severe challenge for Indonesia is a negative campaign about palm oil not only coming from abroad but also from within the country through groups of community social institutions. According to Suwarno (2019), the various negative issues referred to are related to forest fires, peatland management, the control of a handful of large corporations or conglomerates in the national oil palm plantation sector. Then related to indigenous tribes, the rights of indigenous peoples and ulayat, issues of defense and regional spatial planning, employment, and various other social issues. Regarding this negative campaign in the country, we should envy Malaysia, the neighboring countries that are the second largest palm oil producers in the world, in line with the steps of their governments and parliaments, all community groups one vote in full support of the existence and sustainability of the oil palm plantation sector as the driving force of the country's economy and the achievement of community welfare.

Empirical studies on vegetable oil competition have been widely conducted, including Arianto and Arief studies (2010) in the period 1980-2003, proving that the increase in soybean oil prices will reduce the price of palm oil, and during 2004-2008 the increase in soybean oil prices cause the price of palm oil also increase. Then Nasution and Faisal (2016) added, the movement of palm oil prices will follow other vegetable oil movements as they compete for the share of global vegetable oil. Furthermore, Buyung et al. (2017) looked at the period 2005-2015, found that the increase in soybean oil prices caused a decrease in the export price of Indonesian CPO. The similar study also conducted by Syahril et al. (2019) proved that in the long term the world soybean oil price negatively affects the volatility of world CPO prices, this indicates that in terms of importers that the world's palm oil is not a substitute for soybean oil, but palm oil as a complement of soybean oil.

Various studies above have not focused on the competition between soybean oil, coconut oil and palm oil, and further how the competition of these three vegetable oils affects the price of bunches of fresh palm fruit at the farmer level. Therefore, this will focus on that and the study used monthly data in the long term from 1960 to 2018. Furthermore, the results of existing empirical studies have not looked at how the short- and long-term balance and causality relationships of bivariate between the variables studied, and looked at *the shock* of dependent variables responded by independent variables.

3. DATA AND EMPIRICAL MODELS

The data used in this study is a monthly time series secondary data from January 1960 to December 2019, with the number of observations being 696 months and this already meets the data time series requirements (Narayan and Narayan, 2005). This data is sourced from Bank Indonesia, the Central Bureau of Statistics, WTO and FAO. This research analysis model uses the Vector Error Correction Model (VECM) to look at short- and long-term balance relationships (Kassim and Majid, 2015; Pal and Mitra, 2017; Abdul et al., 2011). This analysis model analyzes the relationship of balance with the Cointegration Test approach (Johansion Cointegration Test) and analyzes the bivariate causality relationship with the Pairwise Granger Causality Tests approach. Furthermore, we analyze the shocks on the values of independent variables that are responded by dependent variables using Impulse Response and analyzes how much the contribution of independent variable in explaining the dependent variables contribution using Variance Decomposition.

The study began with testing the stationarity of data using Augmented Dickey-Fuller (ADF), Philips-Perron (PP) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) at the same degree (level or different) until a stationary data is obtained, i.e., data which variants are not too large and have a tendency to approach the average value (Enders, 1995).

Once the data is stationary, it is necessary to perform a stability test of the model to prove that the model is good. The stability of the model both illustrates that the results of the estimate against the next test obtained unbiased results. A model stability test is performed by using the VAR system. The results of the model stability test are described in two forms, namely: tabulation form and graph. The tabulation form describes the modulus values and the graph describes the distributed points in a circle. A modulus value with an average value smaller than one illustrates that the model is stable and the inverse root graph of *AR characteristic polynomial* describes a stable model as the alignment of the dots in the circle. After the model stability test is done with the results already in accordance with the characteristics of the stability test, then the long lag test can be conducted.

Once the model is stable; it is continued with the determination of optimal lag length to find out the length of response period of a variable to its past variables and to other endogenous variables. In this study to determine optimal lag length using criteria, namely; Likelihood Ratio (LR), Final prediction error (FPE), Akaike Information Criterion (AIC), Schwartz Information Criterion (SIC), Hannan-Quinn Information Criterion (HQ) (Nizar, 2012). Determining the optimal lag length using these criteria pays attention to the criteria that have the smallest value (which has the most asterisk) among the various lags proposed. VAR model.

After a long lag test, the cointegration test is carried out. The cointegration test approach used in this study is the Johansen cointegration method. Johansen's cointegration test can be analyzed via VAR with the order p (Ajija et al., 2011). Then to analyze the observed intervariable causality relationships are the Granger Causality Test and the Multivariate Test (Wald tests). Thus, this study has been conducted preliminary tests that prove the existence of a cointegration relationship, so that the VECM model can be used to determine the short-term behavior of a

variable to its long-term value. VECM is also used to calculate short-term relationships between variables through standard coefficients and estimate long-term relationships using residual lag from cointegrated regression.

This research forms the equation as follows:
$PPO = f(PSO, PCO)$

$$PPO_t = a_0 + a_1 PSO + a_2 \mathrm{PCO}_t + \varepsilon_t \quad (1)$$

the *PPO* is the price of palm oil, *PSO* is the price of soybean oil, *PCO* is the price of coconut oil and ε as *error term*.

Then the VECM model applied is as follows:

$$\Delta PPO_t = a_0 + a_1 \sum_{i=1}^{n} PSO_{t-1} + a_2 \sum_{i=1}^{n} PCO_{t-1} + ECT_{1t-1} \quad (2)$$

$$\Delta PSO_t = a_0 + a_1 \sum_{i=1}^{n} PPO_{t-1} + a_2 \sum_{i=1}^{n} PCO_{t-1} + ECT_{1t-1} \quad (3)$$

$$\Delta PCO_t = a_0 + a_1 \sum_{i=1}^{n} PSO_{t-1} + a_2 \sum_{i=1}^{n} PPO_{t-1} + ECT_{1t-1} \quad (4)$$

As a reinforcement of the results of bivariate causality in this study, it is necessary to analyze impulse response function (IRF) to see the shock of independent variables responded by dependent variables, this is in line with the study conducted by Machpudin (2013) and Nasution (2015).

After the IRF estimate is done, it looks at the shock of the independent variable that the dependent variable responds to. According to Majid and Mahrizal (2016), it explains that measuring the percentage of variable estimate errors is described by other variables or in other words the relative impact that one variable has on another variable. Meanwhile, according to Khaliq (2015), stated that Variance Decomposition (VD) is used to see the estimated error variance of a variable, meaning how big the difference between variance before and after shock. It can then be concluded that the analysis of Variance Decomposition to determine the magnitude of the contribution of independent variables in explaining dependent variables in the event of shock.

4. RESULT AND DISCUSSION

4.1. Palm Oil, Soybean Oil and Coconut Oil World Price Movement 1960-2020

The price movement of palm oil, soybean oil and coconut oil in the period 1960-2020 fluctuated these three vegetable oils go hand in hand and also cut each other in the development of price movements. If you look at the price movements of these three vegetable oils in Figure 1, it appears that the price of coconut oil is averaged of US $ 658.69, then followed by soybean oil with an average of US $ 560.77 and furthermore the average price of palm oil of US $ 502.36. The low price of palm oil illustrates the productivity level of palm oil commodities is higher than the productivity of coconut oil and soybean oil.

4.2. Stationary Testing

The study begins with a data stationary test (unit root test) to prove all data in a stationary state (Richi and Napitupulu, 2012). The root test using Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) limits the significance level to 1-10%.

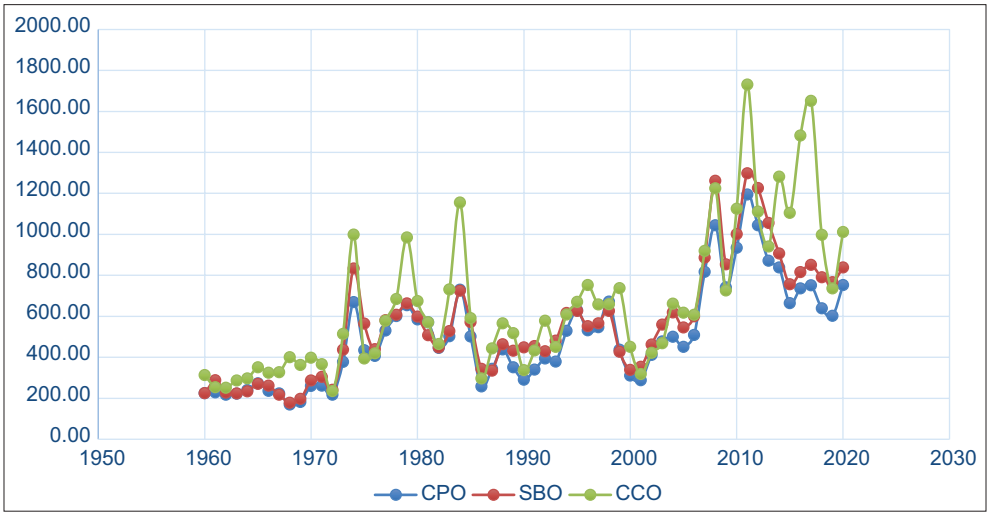
Table 1 shows the results of the unit root test using the Dickey-Fuller Augmented method (ADF) that the price of soybean oil (PSO) is not stationary at level or I(0). Then using the Phillips-Perron (PP) method that the price of palm oil (PPO) and pice of soybean oil (PSO) are not stationary at the level or I(0). First

Table 1: Unit root test results

Variable	Level		First Difference	
	ADF	PP	ADF	PP
PPO	−2,6072*	−2,2231	−11,6486***	−17,7406***
	(0,0919)	(0,1983)	(0,0000)	(0,0000)
PSO	−2,5287	−2,3569	−18,4880***	−18,3689***
	(0,1090)	(0,1546)	(0,0000)	(0,0000)
PCO	−3,3553**	−3,1723**	−11,6980***	−21,9784***
	(0,0129)	(0,0221)	(0,0000)	(0,0000)

Significant 1%***, 5%** and 10%*

Figure 1: Development of Palm Oil Prices, Soybean Oil Prices and World Coconut Oil Prices, 2008-2020



difference or I(1) with the Dickey-Fuller Augmented (ADF) and Phillips-Perron (PP) methods results in all variables stationary at 1% alpha.

4.3. Determining of Lag Length

After established all data is in stationary conditions, then the test for optimal lag length (Nugroho, 2012) is conducted. To eliminate autocorrelation problems in the VAR system the indicator likelihood ratio (LR), final prediction error (FPE), Akaike Information Criterion (AIC), Schwartz Information Criterion (SIC) and Hannan-Quinn Information Criterion (HQ) is used (Poetry and Sanrego, 2011). The result of the optimum lag length test used is lag 2 which means that all the variables used in this second equation affect each other between variables in the same period but are interrelated until the previous two periods.

4.4. Cointegration Testing

The next stage is a cointegration test to see a long-term equilibrium relationship between variables that are not stationary but have stationary linear combinations (Dirga et al., 2016). The study was conducted using Johansen's cointegration method which qualified that the variables to be tested must be stationary variables in similar degree.

Table 2 shows that this study model is integrated, proven trace statistical value and maximum eigenvalue is greater than critical value which shows this model has a long-term balance and is very appropriate to use is the VECM model. To be clear, the results of the Johansen cointegration test of both models can be shown in Table 2.

4.5. Analysis of the Effect of Soybean Oil Prices and Coconut Oil Prices on World Palm Oil Prices in the Long and Short Term

This estimation results are answering the purpose of the study which are to analyze the influence of variable soybean oil prices (PSO) and coconut oil prices (PCO) on world palm oil prices (PPO) in the short and long term. In accordance with the results of VECM estimates show probability value of ECT of 0.08 ($ECT<\alpha$) 8% (significant ECT). These results show equation 1, a valid model describing short-term dynamics. This result is in line with the study of the tourism demand (Sianipar et al., 2016). Then ECT significant signaling a an adjustment mechanism from short term to long term. The value of adjustment from short term to long term is 0.273551;thus, the time it takes to return to equilibrium is 0.273551 months or approximately 8.21 days (taking the number in 1 month is 30 days).

Table 3 shows that in the short term, palm oil price variable in one and two previous periods has negative effect to recent world palm oil price on the significant level of 10% amounting to 0.2153 and 0.2483, respectively. The increase of US$ 1 per metric ton palm oil price in one and two previous periods will decrease palm oil prices by US$ 0.22 and US$ 0.25 per metric tons in this month.

Then there is similar finding on soybean oil prices. The soybean oil prices in the previous 1 and 2 years negatively affect soybean oil prices now by 0.0711 and 0.0987, respectively. This means the increase US$ 1 per metric ton soybean oil price in the previous one and two periods will decrease the price of soybean oil by US$ 0.07 and US$ 0.10 per metric ton in this month.

Furthermore, the price of coconut oil in the previous two periods also negatively affects the price of coconut oil now by 0.02019, that the increase US$ 1 per metric ton coconut oil price in previous two periods will decrease the price of coconut oil by US$ 0.02 per metric ton today. This finding is in accordance with the theory that explains that the price of the goods themselves is one that affects demand. This is also in line with the latest study conducted by Syahril et al. (2019) and Buyung (2017), finding that Indonesia's palm oil prices are influenced by the growth in world palm oil price volatility. The influence of world palm oil prices it self illustrates that market participants not only consider the demand and supply that occurred in the month concerned, but also pay attention to palm oil in one and two previous periods.

It is different with coconut oil prices in the previous period which had a positive and significant effect on the price of palm oil; that the increase of coconut oil price in the previous period by US $ 1, will decrease the price of palm oil by US $ 0.01 per metric ton, This finding is in line with the Maygirtasari and Yulianto (2015).

The long-term balance of palm oil, soybean oil and coconut oil price variables can be seen in Table 4 as follows:

Table 4 shows that the price of soybean oil negatively affects the price of palm oil, that the increase in soybean oil by US $ 1 per metric ton will decrease palm oil by US $ 1.14 per metric ton. While the price of coconut oil has a positive effect on palm oil, if coconut oil rises by US $ 1 per metric ton then the price of palm oil also increases by US $ 0.04 per metric ton.

4.6. Analysis of Bivariate and Multivariate Causality Relationship among Palm Oil Price, Soybean Oil Price and Coconut Oil Price

This research uses bivariate VAR Pairwise Granger Causality Test with a real level of 10%. In Table 5, we can see that the price of palm oil (PPO) variable has a two-way causality with the price of soybean oil, so it can be interpreted that changes in the price of palm oil (PPO) affect the change in soybean oil price (PSO)

Table 2: Johansen cointegration test results

H_0	Trace			Maximum Eigenvalue		
	Trace statistic	Critical value	Prob**	Maximum Eigenvalue statistic	Critical value	Prob**
r=0*	417.4308	29.79707	0.0001	202.9150	21.13162	0.0001
r≤1*	214.5158	15.49471	0.0001	134.2922	14.26460	0.0001
r≤2*	80.22359	3.841466	0.0000	80.22359	3.841466	0.0000

*Indicated cointegrated

Table 3: Short-term estimates of world palm oil prices

Variabel	Lag Optimum	
	(−1)	(−2)
PPO	−0.215286*	−0.248263*
	(−2.95737)	(−4.23849)
PSO	−0.071101*	−0.098673*
	(−0.90870)	(−1.63130)
PCO	0,011367**	−0,020190**
	(0,46773)	(0.83346)
ECT	−0.273551**	
	(−3.40798)	

Significant 1%***, 5%** and 10%*

Table 4: Long-term estimates of world palm oil prices

Variabel	Koefisien	t. statistik
PSO	−1.144978*	−20.3217
PCO	0.039704**	1.15845

Significant 1%***, 5%** and 10%*

Table 5: Results of estimated bivariate causality of world palm oil prices

Null Hypothesis	F-statistic	Prob.	Null Hypothesis	F-statistic	Prob.
PSO=PPO	3.89195	0.0017	PPO=PCO	4.32275	0,0007
PPO=PSO	6.09663	2.E-05	PCO=PSO	3.43206	0,0045
PCO≠PPO	1.60067	0.1576	PSO=PCO	2.67490	0,0209

=Has significant relation and≠no significant relation

Table 6: Results of variance decomposition testworld palm oil price

Variabel	POP		SOP		COP	
PPO	(2)	98.54	(10)	84.82	(10)	33.44
PSO	(10)	3.68	(1)	43.34	(10)	1.40
PCO	(3)	0.01	(3)	0.29	(1)	71.16

()=the period with the highest value

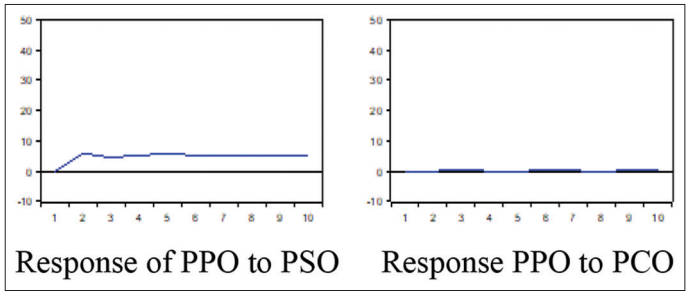
and vice versa. Then the price of coconut oil (PCO) has One-way relationship with palm oil prices (PPO), this means the changes in coconut oil prices (PCO) do not affect the palm oil prices (PPO), while the changes in palm oil prices (PPO) affect the coconut oil prices (PCO). Furthermore, there is two-way causality relationship between coconut oil (PCO) and soybean oil (PSO), meaning that the changes in the price of coconut oil (PCO) will affect the price of soybean oil (PCO) and vice versa.

4.7. Analysis of Shocks on Palm Oil Prices and Soybean Oil Prices Responded by World Palm Oil Price Variable

4.7.1. Impulse response

Figure 2 shows the impact of a change in soybean oil price (PSO) of one standard deviation on changes in palm oil price growth (PPO), using a 10-period time horizon. In the first period soybean price growth (PSO) did not affect the shock palm oil price growth by one standard deviation. Then starting from the first period, the response variable of palm oil price (PPO) due to shock in soybean oil (PSO) shows a positive prescription to the balance. This is in line with Buyung et al. (2017), that the increase in soybean oil prices also pushed the price of palm oil up.

Figure 2: Impulse response function variable of palm oil price



Meanwhile, the change in coconut oil price (PCO) amounted to one standard deviation to the change in palm oil (PPO) price growth, using a 10-period time horizon, shows Variable coconut oil (PCO) starting from the first period continues to balance. This means that the shock of coconut oil prices is strongly responded to changes in palm oil prices.

4.7.2. Varian Decomposition

The results of the variance decomposition test to answer the third study goal, to find out how much the contribution of the independent variable to explain the dependent variable when shock occurs. This is in accordance with what Nugroho (2012) said, that variance decomposition is used to arrange forecast error variance of a variable, how large the differences between variance before and after shock. Internal shock or shock from other variables to observe the relative effect of research variables toward other variables.

Table 6 shows that at the time of the palm oil price variable shock, then the variable that can better explaining the variable is the price of palm oil itself which is 98.54%. While described by the soybean oil (PSO) variable by 3.68% and the price of coconut oil (PCO) by 0.01%. This means, the shocks that occur in the price of palm oil are more dominated by the variable price of palm oil itself.

Changes in palm oil prices may explain the shock in soybean oil prices greater than other independent variables, which is 84.82%. This illustrates that the movement of soybean oil prices is largely determined by changes in palm oil prices. This is in accordance with the findings in the previous explanation that soybean oil has a bivariate relationship with palm oil prices.

Furthermore, when there is a shock in coconut oil (PCO), the contribution of the variable itself is more dominant explained at 71.16%. While the variables described by PPO and PSO are 33.44% and 1.40%, respectively.

5. CONCLUSION

The short-term balance in palm oil prices variable in one and two previous periods negatively affect the palm oil prices now. The similar finding also true on soybean oil prices that soybean oil prices in the previous 1 and 2 years negatively affect the price of soybean oil now. Furthermore, the price of coconut oil in the previous two periods also negatively affects the price of coconut

oil now. Differently, the prices of coconut oil in the previous period had a positive and significant effect on the price of palm oil while in the long run the price of soybean oil variable negatively affects the price of palm oil, then the price of coconut oil has a positive effect on palm oil.

The results of bivariate causality tests prove that the variable relationship of palm oil prices has a two-way causality with soybean oil prices, then the price of coconut oil (PCO) has a one-way relationship with the price of palm oil (PPO). This means, the changes in coconut oil prices (PCO) do not affect changes in palm oil prices (PPO), while changes in palm oil prices (PPO) affect changes in coconut oil prices (PCO). Furthermore, there is two-way causality relationship between coconut oil (PCO) and soybean oil (PSO). Which means the changes in the price of coconut oil (PCO) will affect the price of soybean oil (PSO) and vice versa. The results of impulse response function and variance decomposition noted that the shock of palm oil prices responded to changes in soybean oil prices and coconut oil prices.

This vegetable oil competition for Indonesia as the world's largest palm oil country needs action in the form of policies in an effort to maintain the stability of palm oil prices by optimizing the function of the Palm Oil Producers Council (CPOPC) in controlling the world market demand. Then, in domestic market demand can be increased through the encouragement of the palm oil derivative industry in increasing derivative products of high economic value and implementing the Mandatory B50 to B100 palm oil program into biodiesel raw materials.

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