Factors affecting the volume of Indonesian CPO exports in international trade

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Abstract. Palm oil is one of the commodities of plantation products that has an important economic role in Indonesia and is also an export commodity as foreign exchange earner for oil and gas. Palm oil produces the main product Crude Palm Oil (CPO). As main product, CPO continues to experience an increase in export volumes in line with the growing need for CPO in export destination countries, both as food raw material and biodiesel. However, when the implementation of the customs policy was issued in 2009, there was a change in the composition of exports from CPO to palm-derived products, namely RBD palm olein and PFAD. The main markets for Indonesian palm oil products are in Asia and Europe, the four largest countries, including India, Malaysia, the Netherlands, and Italy. This research aims to analyze the factors that influence the volume of Indonesian CPO exports in export destination countries. Based on the results of Ordinary Least Square (OLS), the variables that significantly affect Indonesia's CPO exports in export destination countries are (1) India: export volume lag, (2) Malaysia: soybean oil prices, (3) Netherlands: RCA, and (4) Italy: estimates of sunflower oil, RCA, exchange rates and dummy exit fees.

1. Introduction
The agricultural sector that is Indonesia's flagship comes from the plantation sub-sector. The contribution of the plantation sub-sector to the formation of the Gross Domestic Product (GDP) of the agricultural sector was 3.77 percent in 2014 or was first, which was then followed by food crops, horticultural crops and livestock [1]. Besides, the plantation sub-sector is also a provider of raw materials for the industrial sector, absorbing labor and producing foreign exchange. One of the commodities from the plantation sub-sector that has a significant contribution and is excellent is oil palm. Palm oil is a commodity with an increase in land area and its production is the highest compared to other plantation commodities. In 1980 the area of oil palm plantations was still around 300 thousand hectares and then increased to 11 million hectares in 2015, while palm oil production increased from approximately 700 thousand tons in 1980 to 31 million tons in 2015 [2].

GAPKI [3] notes that the consumption of the world's main vegetable oils in 2020 is projected to increase by 12.49 percent, which only the share of palm oil has increased compared to other sources of...
vegetable oil. This share change is influenced by the growth rate of palm oil consumption. In 2015-2030, the average growth rate of palm oil consumption was 3.15 percent per year and tends to increase in 2030-2050, which is 3.46 percent per year. The increase in world consumption can be seen as an opportunity for Indonesian palm oil export products. Indonesia as the largest palm oil producing country must pay more attention to the right market opportunities of the export destination countries of palm oil, with an increase in exports of Indonesian palm products and an increase in world consumption of palm oil, showing that the market potential for palm oil products is still high and added with free trade conditions that make the international market will be controlled by countries that have competitiveness. The export of palm oil products has a significant opportunity to be increased because the government's downstream oil palm policy has changed the composition of domestic palm oil exports. The export of Indonesian palm oil products in various regions can be seen in Table 1.

| Year | Asia            | Europe         | Amerika       | Oceania    | Africa       |
|------|-----------------|----------------|---------------|------------|--------------|
| 2011 | 5,043,415       | 1,051,459      | 241,492       | 114,222    | 1,561,577    |
| 2012 | 8,466,976       | 1,215,105      | 276,249       | 10,507     | 1,623,664    |
| 2013 | 9,016,378       | 1,948,341      | 724,886       | 12,988     | 2,290,651    |
| 2014 | 10,040,041      | 2,826,269      | 816,631       | 85,026     | 3,397,437    |
| 2015 | 12,011,396      | 2,416,395      | 816,739       | 16,836     | 3,417,648    |

The export destination countries of Indonesian palm oil products have different characteristics, so based on the theory several variables will affect export activities to importing countries, such as export lag, competitiveness, the price of the commodity itself, the price of substitute commodities, exchange rate and government policy. An analysis of Indonesia's CPO trade flows to export destination countries needs to be carried out to determine what determinants can affect the volume of Indonesian CPO exports in international trade. From this description, the next research question is: What factors influence the amount of Indonesian CPO exports in export destination countries.

2. Method

2.1. Analysis of Time Series Data with Ordinary Least Square (OLS)

Ordinary Least Square (OLS) is a method of estimating the regression function used in this study. The OLS criterion is the line of best fit or in other words, the sum of the squares of the deviations between the observation points and the regression line is minimum. The aim is to find out what factors influence the value of Indonesia's CPO exports in the main destination countries. Before processing data using the OLS time series method, it is necessary to do a classical assumption test analysis to determine whether the CPO export model is considered to be Best linear Unbiased Estimator BLUE or best, linear, unbiased and estimator. The four tests include multicollinearity test, heteroscedasticity test, autocorrelation test, and normality test.

2.2. Classic assumption test

OLS is linear, unbiased, and has the smallest variance in the linear impartial estimator group of a parameter [4]. If the assumptions of normality, linearity, independence, and homogeneity are not met, the significance level obtained will be invalid. For the model to have BLUE properties, the following tests are performed:

2.2.1. Normality test. Normality test is used to test the error term distribution. If the error term is normally distributed, then the model meets the normality assumption. Normality testing is carried out using graphical analysis through fallow Jarque tests
2.2.2. **Multicollinearity test.** Multicollinearity test is a test to measure the linear relationship between independent variables in a multiple linear regression model. Multicollinearity causes the value of $R^2$ to be high, but a few significant variables and the direction of the variable coefficients become invalid for economic theory interpretation. Multicollinearity detection can be done by calculating the Variance Inflation Factor (VIF). If the VIF value <10, it means that there is no multicellularity [4].

2.2.3. **An autocorrelation test.** An autocorrelation test is used to measure the correlation between independent variables. Autocorrelation makes OLS inefficient because it no longer has the smallest variant, although OLS is still linear and unbiased. Another consequence is the estimated variance of the OLS estimator is biased so that the combined and partial tests are not reliable. Autocorrelation test uses the Breusch Godfrey test.

2.2.4. **A heteroscedasticity test.** A heteroscedasticity test is a test to detect variations of error variants from each observation. The consequence of heteroskedasticity is that the OLS estimator is still linear and unbiased, but no longer efficient because it has no longer has minimum variance. Heteroscedasticity makes ordinary testing hypotheses unreliable. Heteroscedasticity detection can be done using the Breusch-Pagan-Godfrey test.

2.3. **Model specifications**

Another focus in this study is to obtain a relationship between Indonesia's CPO export offers to the central export destination countries namely India, Malaysia, Singapore, the Netherlands, and Italy. The Indonesian CPO export supply model is built on the framework of economic theory and relevant empirical studies and can represent Indonesia's CPO exports in terms of export supply. The equation formulated in this study is Indonesia’s CPO exports to India, Malaysia, Singapore, the Netherlands, and Italy.

\[
\ln Y = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \beta_5 \ln X_5 + \beta_6 \text{DBK} + \varepsilon \tag{1}
\]

**Note:**
- $Y$ = The volume of Indonesia's CPO exports to destined countries in the t-year (tons)
- $X_1$ = Lag volume of Indonesia's CPO exports to India in t-1 (tons)
- $X_2$ = International CPO price in the t-year (USD/tons)
- $X_3$ = Substitution oil price in the t-year (USD/tons)
- $X_4$ = RCA value of Indonesian CPO to India in the t-year
- $X_5$ = Rupiah exchange rate to USD in the t-year (Rp/USD)
- DBK = Export Duty Dummy ($d = 1$ of the 2009-2015 export duty and $d = 0$ export duty has not yet been applied < 2009)
- $\beta_0$ = Constants / Intercepts
- $\beta_1, \beta_2, \beta_3, \beta_4$ = Estimated parameters
- $\beta_5, \beta_6$
- $\varepsilon$ = Error term

3. **Results and Discussion**

3.1. **Factors affecting Indonesia’s CPO Exports in India**

F test results show the $p$-value is 0.00000. This shows the F-test value is significant at the 5 percent alpha level. It can be concluded that the estimated regression model is feasible to be used to explain the effect of independent variables on the dependent variable.
T-test results based on the p-value, three variables have a significant influence on the real level of alpha 1 percent, namely the variable lag in export volume, RCA and the exchange rate of the rupiah to the USD (exchange rate). While the international CPO price variable, the price of sunflower oil and dummy export duty have no significant effect, T-Test results can also be seen in table 2 below.

Table 2. The estimated results of Indonesia's CPO export volume model in India

| Variable                  | Coefficient | Error Standard | T-Count | P-Value |
|---------------------------|-------------|----------------|---------|---------|
| Constants                 | -33.75657   | 6.793679       | -4.968821 | 0.0001  |
| Export volume Lag         | 0.336132    | 0.106990       | 3.141723 | 0.0056* |
| International CPO price   | 0.830834    | 1.065155       | 0.780013 | 0.4455  |
| Sunflower oil price       | -0.696690   | 1.045832       | -0.666158 | 0.5138  |
| RCA                       | 2.154629    | 0.250285       | 8.608712 | 0.0000* |
| Exchange rate             | 3.957399    | 0.512238       | 7.725709 | 0.0000* |
| Export Duty Dummy         | 0.792211    | 0.616257       | 1.285521 | 0.2149  |

Note: * Significant correlation at 1% real level

Furthermore, the R-squared value model of Indonesia's CPO export volume in India is 0.952. This shows that variations in the volume of Indonesian CPO exports to India can be explained together with by 95.2 percent by a lag in export volumes, international CPO prices, sunflower oil prices, Indonesian RCA CPO values in Malaysia, exchange rates and dummy exit fees. While the remaining 4.8 percent is explained by other factors outside the model. Interpretation of the effect of each independent variable on the dependent variable can be explained as follows:

3.1.1. Lag export volume. The CPO export volume lag variable has a significant effect on Indonesia's CPO export volume to India. This can be seen from the p-value of the variable is smaller than the real level of alpha 1 percent (0.0056 < 0.01). Furthermore, the coefficient of the export volume lag variable is 0.336. These results indicate that if there was an increase in the volume of CPO exports of the previous year by 1 percent, it would increase the volume of CPO exports to India by 0.336 percent, ceteris paribus. In the short term, there is information that from year to year CPO exports tend to increase. India is one of the countries with the most population in the world. The population growth is also in line with the needs of vegetable oil, especially CPO, data from the KEMENDAG [5] noted that India imports about 69 percent of the consumption needs of palm oil.

3.1.2. International CPO prices. The international CPO price variable does not significantly influence the volume of Indonesian CPO exports to India. This is indicated by the value of the p-value of the variable, which is greater than the alpha level of 5 percent (0.4455 > 0.05). Furthermore, the coefficient of the International CPO price variable is 0.830. This shows that if there is an increase in international CPO prices by 1 percent, it will increase the volume of Indonesia's CPO exports to India by 0.830 percent, ceteris paribus. This result is under the hypothesis that the amount of goods offered is directly proportional to the price level. This is also consistent with research conducted by Widyastutik and Ashiqin [6] that an increase in the average international CPO price also encourages an increase in the volume of CPO exports in export destination countries.

3.1.3. Price of sunflower oil. Based on the estimation results of the model, it is known that the variable price of sunflower oil does not significantly influence the volume of Indonesia's CPO exports to India. This result can be seen from the p-value smaller than the alpha level of 5 percent (0.5138 > 0.05).
Furthermore, the coefficient of the variable price of sunflower oil is -0.696. These results indicate if an increase in sunflower oil prices by 1 percent, it will reduce the volume of Indonesia's CPO exports to India by 0.696 percent, ceteris paribus. This result is not under the hypothesis that an increase in the price of a substitute commodity will increase the export volume of a commodity. India decreases import duties on oil-based oils (oilseeds) from year to year. In 2014 India reduced oilseeds import duties significantly from 30 percent to 5 to 10 percent. This policy will encourage imports of oilseeds such as sunflower oil. With so in terms of prices of oilseeds and palm oil products to be competitive. This was also exacerbated by Indonesia's share of palm oil which experienced a significant decline from 78 percent in 2008 and 57 percent in 2014, whereas Malaysia in the same period recorded a rapid increase from 22 percent to 43 percent [7].

3.1.4. Revealed Comparative Advantage (RCA). The variable RCA value of Indonesian CPO to India significantly influences the volume of Indonesian CPO exports to India. This is indicated by the value of the p-value of this variable which is smaller than the alpha level of 1 percent (0.0000 < 0.01). Furthermore, the coefficient of the variable RCA CPO value of Indonesia to India is 2.154. These results indicate that each increase in the value of Indonesia's RCA CPO to India by 1 percent will increase the volume of Indonesia's CPO exports to India by 2.154 percent, ceteris paribus. These results are consistent with the hypothesis that the higher the comparative competitiveness of a commodity, the higher the export volume of the commodity.

3.1.5. Rupiah exchange rate to USD. The variable Rupiah exchange rate to USD significantly influences the volume of Indonesian CPO exports to India. This is indicated by the p-value of the exchange rate variable is smaller than the real level of alpha 1 percent (0.0000 < 0.01). The result of the calculation shows that the coefficient of the exchange rate variable is 3.957, this result indicates that if there is a decline in the value of the rupiah to USD or a currency depreciating by 1 percent, it will cause the volume of Indonesian CPO exports to India to increase by 3.957 percent. Based on the estimation results, this variable has a coefficients sign that is under the hypothesis that the depreciation of the exchange rate will increase the volume of exports. This is also supported by the results of research by Thorbecke and Kato [8] which states that the appreciation of the German exchange rate will reduce the country's exports and the results of Ahmed [9] where the higher appreciation of the Chinese exchange rate will reduce export growth, both for exports of processed and non-manufactured goods school. The weakening of the rupiah brings profits for exported CPO because the depreciation of the rupiah increases the income of exporters.

3.1.6. Customs exit. The export duty dummy variable has no significant effect on the volume of Indonesia's CPO exports to India. This can be seen from the p-value of the dummy export duty variable is higher than the real alpha level of 5 percent (0.2149 > 0.05). Furthermore, the coefficient value of the export duty variable is 0.792, meaning that the export duty will increase the volume of CPO exports to India by 0.792 percent, ceteris paribus. This is certainly not under the theory which states that there is a negative relationship between export duties and a country's exports. The discrepancy of the estimation results with the argument is probably caused by the export duty period that is too short, namely from the period 2009 to 2015 or 6 samples from a total of 26 samples used in the model from 1990 to 2015. These results are also the same as that of [10] that the implementation of the policy on the export duty of cocoa increased the export of Indonesian cocoa beans, this was due to the export duty period that was too short, which was only 4 samples from a total of 24 samples used.

3.2. Factors affecting Indonesia's CPO Export in Malaysia

F test results show the p-value is 0.004598. This shows the F-test value is significant at the 5 percent alpha level. It can be concluded that the estimated regression model is feasible to use to explain the effect of independent variables on the dependent variable.
T-test results based on the p-value, only one variable that has a significant effect on the real level of alpha 10 percent, namely the soybean oil price variable. Whereas the variable lag in export volume, international CPO prices, RCA, the exchange rate of the rupiah to the USD (exchange rate) and dummy export duty have no significant effect. T-test results can also be seen in the following table 3.

### Table 3. Results of estimated CPO export volume models in Malaysia

| Variable              | Coefficient | Error Standard | T-Count | P-Value |
|-----------------------|-------------|----------------|---------|---------|
| Constants             | -2.978268   | 6.867633       | -0.433667 | 0.6697  |
| Export volume         | 0.153765    | 0.127074       | 1.210044 | 0.2419  |
| Lag                   | -0.641698   | 1.036083       | -0.619350 | 0.5434  |
| International CPO price | 1.844009   | 1.057483       | 1.743772 | 0.0983***|
| Sunflower oil price   | 0.603279    | 0.585790       | 1.029856 | 0.3167  |
| RCA                   | 0.357828    | 0.401992       | 0.890137 | 0.3851  |
| Exchange rate         | 0.445816    | 0.521804       | 0.854375 | 0.4041  |

Note: *** Significant correlation at 10% real level

Furthermore, the R-squared value model of Indonesia's CPO export volume in Malaysia is equal to 0.612. This shows that variations in the volume of Indonesian CPO exports to Malaysia can be explained together with by 61.2 percent by a lag in export volumes, international CPO prices, soybean oil prices, the RCA value of Indonesian CPO to Malaysia, the exchange rate and the export duty dummy. While the remaining 38.8 percent is explained by other factors outside the model. Interpretation of the effect of each independent variable on the dependent variable can be explained as follows:

3.2.1. Lag export volume. The CPO export lag variable has no significant effect on Indonesia's CPO exports to Malaysia. This can be seen from the p-value of the variable which is smaller than the real level of alpha 5 percent (0.2419 > 0.05). Furthermore, the coefficient of the export volume lag variable is 0.153. These results indicate that if there was an increase in the volume of CPO exports of the previous year by 1 percent, it would increase the volume of CPO exports to Malaysia by 0.153 percent, ceteris paribus. In the short term, there is information that from year to year CPO exports tend to increase. Widyaustutik and Ashiqin's research [6] supports this research, that the lag of CPO export volume has a positive effect on the volume of exports to China, Malaysia, and Singapore.

3.2.2. International CPO prices. The international CPO price variable does not significantly influence the volume of Indonesian CPO exports to Malaysia. This is indicated by the value of the p-value of the variable which is higher than the significance level of alpha 5 percent (0.5434 > 0.05). Furthermore, the coefficient of the International CPO price variable is -0.641. The negative sign of the coefficient shows that if an international CPO price increases by 1 percent, it will reduce the volume of Indonesia's CPO exports to Malaysia by 0.641 percent, ceteris paribus. This result is not following the hypothesis that the amount of goods offered is directly proportional to the price level. Research with the same results was also conducted by Huda and Widodo [11] that the international CPO price variable both in the long term and short term is negatively related to Indonesia's CPO exports. The negative relationship is also due to Malaysia being the world's largest CPO exporting country so that when international CPO prices rise, Malaysia is also trying to export more CPO to various export destination countries. This explanation is also supported by Hasbullah [12] which states that the price of CPO on the international market is influenced by the supply of competing countries.
3.2.3. *Price of soybean oil*. Based on the estimation results of the model, it is known that the variable price of soybean oil has a significant effect on the volume of Indonesia's CPO exports to Malaysia. This result can be seen from the p-value is smaller than the real level of alpha 10 percent (0.0983 < 0.1). Furthermore, the coefficient of the variable price of soybean oil is 1.844. These results indicate if an increase in soybean oil prices by 1 percent, it will increase the volume of Indonesia's CPO exports to Malaysia by 1.844 percent, ceteris paribus. This is consistent with the hypothesis that an increase in the price of a substitute commodity will increase the supply volume of a commodity. The Malaysian state focuses more on the activities of developing palm oil-based derivative products so that the price movement of CPO substitution materials such as soybean oil prices will not affect Indonesia's CPO export volume supply to Malaysia.

3.2.4. *Revealed Comparative Advantage (RCA)*. The variable RCA value of Indonesian CPO to Malaysia has no significant effect on the volume of Indonesian CPO exports to Malaysia. This is indicated from the value of the p-value of the variable which is greater than the real level of application of 5 percent (0.3167 > 0.05). Furthermore, the coefficient of the variable RCA CPO value of Indonesia to Malaysia is 0.603. These results indicate that each increase in the value of Indonesia's CPO RCA to Malaysia by 1 percent will increase the volume of Indonesia's CPO exports to Malaysia by 0.529 percent, ceteris paribus. This is consistent with the hypothesis that the higher the comparative competitiveness of a commodity, the higher the export volume of the commodity.

3.2.5. *Rupiah exchange rate to USD*. The variable Rupiah exchange rate against US$ does not significantly influence the volume of Indonesian CPO exports to Malaysia. This is indicated by the p-value of the exchange rate variable is greater than the real level of alpha 5 percent (0.3851 > 0.05). The result of the calculation shows that the coefficient of the exchange rate variable is 0.357, this figure states that if the rupiah weakens against US$ or the currency depreciates by 1 percent it will cause the volume of Indonesian CPO exports to Malaysia to increase by 0.357 percent. Based on the estimation results, this variable has a coefficient sign that is under international trade theory which states that a country's nominal exchange rate has a positive effect on its net exports. The results of this calculation are also in line with the results of Kusuma's research [13] if there is a weakening of the rupiah (depreciation), the importing country will import more CPO because the price is relatively decreasing. The fall in CPO prices was a result of the weakening rupiah exchange rate.

3.2.6. *Customs exiz*. The export duty dummy variable has no significant effect on Indonesia's CPO export volume to Malaysia. This can be seen from the p-value of the dummy export duty variable is greater than the real level of alpha 5 percent (0.4041 > 0.05). Then the coefficient value of the variable export duty is 0.445, meaning that the export duty will increase the volume of CPO exports to Malaysia by 0.445 percent, ceteris paribus. This result can also be said that the results of the coefficient variable of the export duty to the volume of Indonesian CPO exports to Malaysia before and after did not differ significantly. This is also allegedly due to the growing needs of the Malaysian downstream palm oil industry and the need for more CPO material supplies from Indonesia so that the imposition of export duty on Indonesian CPO does not significantly affect Indonesia's CPO export activities to Malaysia.

3.3. *Factors affecting Indonesia's CPO Export in the Netherlands*

F test results show the p-value that is equal to 0.000826. This shows the F-test value is significant at the 5 percent alpha level. It can be concluded that the estimated regression model is feasible to use to explain the effect of independent variables on the dependent variable.

T-test results based on the p-value, only one variable that has a significant effect is the RCA variable at the alpha level of 5 percent. Whereas the variable lag in export volume, international CPO prices, soybean oil prices, the exchange rate of the rupiah against the US$ (exchange rate) and dummy export duty have no significant effect. T-test results can also be seen in table 4.
Table 4. Results of estimated CPO export volume models in the Netherlands

| Variable          | Coefficient | Error Standard | T-Count | P-Value |
|-------------------|-------------|----------------|---------|---------|
| Constants         | 15.6361     | 3.993416       | 3.915522| 0.0010  |
| Export volume     | -0.092355   | 0.257283       | -0.358960| 0.7238  |
| Lag               |             |                |         |         |
| International CPO| 0.204197    | 0.451821       | 0.451943| 0.6567  |
| price             |             |                |         |         |
| Sunflower oil     | -0.186849   | 0.440943       | -0.423749| 0.6768  |
| price             |             |                |         |         |
| RCA               | -0.379629   | 0.161611       | -2.349020| 0.0304**|
| Exchange rate     | 0.028735    | 0.130080       | 0.220905| 0.8277  |
| Export Duty       | 0.198001    | 0.234008       | 0.846130| 0.4068  |
| Dummy             |             |                |         |         |

Note: ** Significant correlation at 5% real level

Furthermore, the R-squared value model of Indonesia’s CPO export volume to the Netherlands is 0.686. This shows that variations in the volume of Indonesian CPO exports to the Netherlands can be explained together with by 68.6 percent by the lag in export volumes, international CPO prices, soybean oil prices, RCA value of Indonesian CPO in the Netherlands, exchange rates and dummy exit fees. While the remaining 31.4 percent is explained by other factors outside the model. Interpretation of the effect of each independent variable on the dependent variable can be explained as follows:

3.3.1. Lag export volume. The CPO export lag variable has no significant effect on Indonesia’s CPO exports to the Netherlands. This can be seen from the p-value of the variable is greater than the real level of alpha 5 percent (0.7238 > 0.05). Furthermore, the coefficient of the export volume lag variable is -0.092. The negative sign of the coefficient shows that if there was an increase in the volume of CPO exports of the previous year by 1 percent, it would reduce the volume of CPO exports to the Netherlands by 0.092 percent, ceteris paribus. In the short term, there is information that from year to year Indonesia’s CPO exports to the Netherlands tend to decrease. This proves that negative issues, especially the issue of environmental destruction, deforestation, and other issues, continue to be intensified by developed countries in the European region when Indonesia’s CPO increased export volumes. Various issues were issued to protect the country’s vegetable oil industry, such as sunflower oil and soybean oil so as not to compete with Indonesia’s CPO.

3.3.2. International CPO prices. The international CPO price variable does not significantly influence the volume of Indonesian CPO exports to the Netherlands. This is indicated from the value of the p-value of the variable which is greater than the alpha level of 5 percent (0.6567 > 0.05). Furthermore, the coefficient of the international CPO price variable is 0.204. This shows that if there is an increase in international CPO prices by 1 percent, it will increase the volume of Indonesia’s CPO exports to the Netherlands by 0.204 percent, ceteris paribus. This result is under the hypothesis that the amount of goods offered is directly proportional to the price level. The Netherlands is a potential market for Indonesian CPO, considering that CPO is an important raw material used by the Netherlands in the manufacture of cooking oil, salad oil, and other food ingredients. The existence of the Cargill company in the Netherlands as the biggest crude vegetable oil processing company in Europe is one of the factors of Indonesia’s CPO exports to Europe concentrated in the Port of Rotterdam. Besides, there are also Unilever and the beauty industry that uses CPO as one of the important raw materials for use with other ingredients in making lotions, soaps and so on. Therefore, the price of CPO does not significantly influence the volume of Indonesian CPO exports.
3.3.3. **Price of soybean oil.** Based on the estimation results of the model it is known that the variable price of soybean oil does not significantly influence the volume of Indonesian CPO exports to the Netherlands. This result can be seen from the p-value greater than the alpha level of 5 percent (0.6768 > 0.05). Furthermore, the coefficient of the soybean oil price variable is -0.186. This negative sign indicates if an increase in soybean oil prices by 1 percent, it will reduce the volume of Indonesia's CPO exports to the Netherlands by 0.186 percent, ceteris paribus. This result is not following the hypothesis that an increase in the price of a substitute commodity will increase the supply volume of a commodity, as well as the results of the research of Akbar [14] which shows that the price of soybean oil has a positive effect on exports. This can be caused when soybean oil prices rise, the Netherlands will also import more soybean oil from soybean oil-producing countries such as America and Brazil, this is done to protect producing countries from soybean oil and increase the production of soybean oil in the European region. Countries in the European region continue to work in various ways so that soybean oil and other CPO substitution commodities are no less popular than CPO produced by Indonesia.

3.3.4. **Revealed Comparative Advantage (RCA).** The variable RCA value of Indonesian CPO to the Netherlands has a significant effect on the volume of Indonesian CPO exports to the Netherlands. This is indicated by the value of the p-value of the variable, which is smaller than the alpha level of 5 percent (0.0304 < 0.05). Furthermore, the coefficient of the variable RCA value of Indonesia to the Netherlands is -0.379. These results indicate that each increase in the value of Indonesia's CPO RCA to the Netherlands by 1 percent will reduce the volume of Indonesia's CPO exports to the Netherlands by 0.379 percent, ceteris paribus. This result is not following the hypothesis that the higher the comparative competitiveness of a commodity, the higher the export volume of the commodity. It can also be said that there is an effort from the Netherlands to prevent the entry of Indonesia's CPO export volume. So that the competitiveness of CPO substitution commodities is also no less competitive.

3.3.5. **Rupiah exchange rate to USD.** The variable Rupiah exchange rate against US$ does not significantly influence the volume of Indonesian CPO exports to the Netherlands. This is indicated by the p-value of the exchange rate variable is greater than the real level of alpha 5 percent (0.8277 > 0.05). The result of the calculation shows that the coefficient of the exchange rate variable is 0.028, this figure states that if the rupiah weakens against US $ or the currency depreciates by 1 percent it will cause the volume of Indonesian CPO exports to the Netherlands to increase by 0.028 percent. Based on the estimation results, this variable has a coefficient sign that is under the hypothesis that the depreciation of the exchange rate will increase the volume of exports. The results of this calculation are also in line with the results of research conducted by Ginting [15] which shows the stronger exchange rate (appreciation) will cause a decline in Indonesian exports. Depreciation makes the price of goods in the country relatively cheaper compared to the prices of the same goods abroad, so the demand for goods abroad tends to increase so that it encourages exports of a country.

3.3.6. **Customs exit.** The export duty dummy variable has no significant effect on the volume of Indonesian CPO exports to the Netherlands. This can be seen from the p-value of the dummy export duty variable is greater than the real level of alpha 5 percent (0.4068 > 0.05). Furthermore, the coefficient value of the export duty variable is 0.198, meaning that the export duty will increase the volume of CPO exports to the Netherlands by 0.198 percent, ceteris paribus. This result can also be said that the results of the coefficient of export duty on the volume of Indonesian CPO exports to the Netherlands before and after did not differ significantly. The discrepancy in results and hypotheses could be due to the large percentage of the export duty imposed on CPO commodities which is still relatively small because the international CPO price from 2009 to 2015 was still around the US$ 858 per ton. The Netherlands is the second-largest market after India, so with a large supply of export duty policies, it has little effect on Indonesia's CPO export volume. Besides, the imposition of export duties
further reduces the volume of exports to countries that are not the main destination of Indonesia's CPO exports such as Germany, Britain, Bangladesh, and Pakistan.

3.4. Factors Affecting Indonesia's CPO Exports in Italy
The results of the F test show a p-value of 0.000000. This shows that the F-test value is significant at the 5 percent alpha level. It can be concluded that the estimated regression model is feasible to use to explain the importance of the independent variables on the dependent variable.

T-test results based on p-values are the two variables that are considered significant at alpha 1 percent real level, namely RCA and dummy exit tax, then a variable is needed that is significant at 5 percent alpha actual level, namely the exchange rate and one real variable at the 10 percent level is the price of sunflower oil. While the export lag variable, international CPO prices, and RCA are not significant. The results of the t-statistic test can also be seen in the following table 5.

**Table 5. Results of estimated CPO export volume models in Italy**

| Variable               | Coefficient | Error Standard | T-Count   | P-Value  |
|------------------------|-------------|----------------|-----------|----------|
| Constants              | 1.931885    | 2.930383       | 0.659260  | 0.5181   |
| Export volume lag      | -0.117747   | 0.202569       | -0.581267 | 0.5683   |
| International CPO price | 0.349207    | 0.596445       | 0.585480  | 0.5655   |
| Sunflower oil price    | 1.051080    | 0.502102       | 2.093360  | 0.0507***|
| RCA                    | 1.123950    | 0.321106       | 3.500248  | 0.0026*  |
| Exchange rate          | -0.491839   | 0.183573       | -2.679252 | 0.0153** |
| Export Duty Dummy      | 2.125689    | 0.474559       | 4.479288  | 0.0003*  |

*Note*: * Significant correlation at 1% real level  
 ** Significant correlation at 5% real level  
 *** Significant correlation at 10% real level

Furthermore, the R-squared value model of Indonesia's CPO export volume to Italy is 0.896. This shows that variations in the volume of Indonesian CPO exports to Italy can be explained together with by 89.6 percent by a lag in export volumes, international CPO prices, sunflower oil prices, Indonesian RCA CPO values in the Netherlands, exchange rates and dummy exit fees. While the remaining 10.4 percent is explained by other factors outside the model.

3.4.1. Lag export volume. The CPO export lag variable has no significant effect on Indonesia's CPO exports to Italy. This can be seen from the p-value of the variable is greater than the real level of alpha 5 percent (0.5683 > 0.05). Furthermore, the coefficient of the export volume lag variable is -0.117. The negative sign of the coefficient shows that if there was an increase in the volume of CPO exports of the previous year by 1 percent, it would reduce the volume of CPO exports to Italy by 0.117 percent, ceteris paribus. In the short term there is information that from year to year, Indonesia's CPO exports to Italy tend to decrease. This decrease is related to the use of other vegetable oils as a substitute for CPO. Besides, there is a Renewable Energy Directive (RED) regulation aimed at protecting European biofuel-based vegetable oil products such as soybean oil so that it will not compete with CPO based biofuel products.

3.4.2. International CPO prices. The international CPO price variable does not significantly influence the volume of Indonesian CPO exports to Italy. This is indicated by the p-value of the variable, which is greater than the alpha level of 5 percent (0.5655 > 0.05). Furthermore, the coefficient of the
International CPO price variable is 0.349. This shows that if there is an increase in International CPO prices by 1 percent, it will increase the volume of Indonesia's CPO exports to Italy by 0.349 percent, ceteris paribus. This result is by the hypothesis that the amount of goods offered is directly proportional to the price level. Indonesia has a huge opportunity to increase exports to the European Union market, especially Italy. Factors of Indonesia's geographical conditions in the tropical climate are very suitable for oil palm plantations so that Indonesia can supply CPO in larger quantities. Besides, the Italian economy is improving and continuing to recover from the economic crisis that occurred in 2008 so that demand for CPO also increased.

3.4.3. Price of sunflower oil. Based on the estimation results of the model, it is known that the variable price of soybean oil significantly influences the volume of Indonesian CPO exports to Italy. This result can be seen from the p-value is smaller than the real level of alpha 10 percent (0.0507 < 0.1). Furthermore, the coefficient of the variable price of sunflower oil is 1.051. These results indicate if an increase in sunflower oil prices by 1 percent, it will increase the volume of Indonesia's CPO exports to Italy by 1.051 percent, ceteris paribus. These results are consistent with the hypothesis that an increase in the price of a substitute commodity will increase the supply volume of a commodity. Italy is one of the largest CPO markets among the European Union countries. The Italian general market for CPO is dominated by multinational companies such as Unigra and Cargill, which handle large quantities of CPO. So that Italy still needs more supplies to meet the needs of industries made from CPO when compared to sunflower oil.

3.4.4. Revealed Comparative Advantage (RCA). The variable RCA value of Indonesian CPO to Italy has a significant effect on the volume of Indonesian CPO exports to Italy. This is shown from NIAI. The p-value of this variable is smaller than the alpha level of 1 percent (0.0026 < 0.01). Furthermore, the coefficient of the variable RCA CPO value of Indonesia to Italy is 1.123. These results indicate that each increase in the value of Indonesian CPO RCA to Italy by 1 percent will increase the volume of Indonesian CPO exports to Italy by 1.123 percent, ceteris paribus. These results are consistent with the hypothesis that the higher the comparative competitiveness of a commodity, the higher the export volume of the commodity. This is also supported by the KEMENDAG [5] that the performance of Italian imports of CPO products from Indonesia showed a positive trend of 19.83 percent during the period 2010 to 2014. The performance of Italian imports of CPO products from Indonesia experienced a significant increase in 2012 due to the recovery of the Italian economy from the global economic crisis in 2008 increasing import consumption. This proves that Italy is a very good market share for Indonesian CPO exports.

3.4.5. Rupiah exchange rate to USD. The variable Rupiah exchange rate against US $ has a significant effect on the volume of Indonesian CPO exports to Italy. This is indicated by the p-value of the exchange rate variable is greater than the real level of alpha 5 percent (0.0153 <0.05). The result of the calculation shows that the coefficient of the exchange rate variable is -0.491, this negative sign states that if there is a decline in the value of the rupiah against US $ or a depreciated currency of 1 percent it will cause the volume of Indonesian CPO exports to Italy to decrease by -0.491 percent. Based on the estimation results, this variable has a coefficient sign that is not following the hypothesis that the depreciation of the exchange rate will increase the volume of exports. Italy experienced an economic crisis in 2008 which caused economic instability in both exports and imports. Data from the KEMENDAG [5] shows that Italian trade in 2012 experienced a slowdown in exports compared to other EU countries. While in terms of imports, Italy experienced a decline with considerable differences from other import partner countries, except the United States, Russia, the Middle East, North Africa far away which gradually seemed to improve. Therefore, the turmoil of the Italian economy could be a factor in Indonesia’s CPO exports in the country.
3.4.6. Customs exit. The export duty dummy variable has a significant effect on the volume of Indonesia's CPO exports to Italy. This can be seen from the p-value of the dummy export duty variable is smaller than the real level of alpha 1 percent (0.0003 < 0.01). Furthermore, the coefficient value of the export duty variable is 2.125, meaning that the export duty will increase the volume of CPO exports to Italy by 2.125 percent, ceteris paribus. This result can also be said that the results of the coefficient of the variable export duty on the volume of Indonesian CPO exports to Italy before and after did not differ significantly. The percentage of CPO export duty is directly proportional to the increase in international CPO prices. So that with the low international CPO price, the implementation of the export duty policy has not hampered Indonesia's CPO export volume. Italy is also the second-largest market in the European Union after the Netherlands, CPO needs in Italy continue to be needed for the needs of the food and non-food industries.

4. Conclusion
Based on the results of ordinary least square, the results (F test) for all variables, namely export lag, international CPO prices, soybean/sunflower oil prices, exchange rates, and export duty dummy, have a significant effect on Indonesia's CPO export models in export destination countries. Furthermore, partially (t-test) in each export destination country is influenced by variables that significantly influence, namely: (1) India: lag of export volume; (2) Malaysia: soybean oil prices; (3) Netherlands: RCA; (4) Italy: prices of sunflower oil, RCA, exchange rates and dummy exit fees.

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