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Analysis of determinants of palm oil exports in Indonesia

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Abstract

Palm oil is one of the leading export commodities for Indonesia. The high demand for world palm oil makes Indonesia one of the largest palm oil exporters in the world. During 2010-2018 the value of Indonesian palm oil exports fluctuated, therefore there is a need for research to analyze the factors that affect the export value of Indonesian palm oil. The purpose of this study was to determine the effect of the amount of palm oil production, area of oil palm plantations, world CPO prices and exchange rates on the export value of Indonesian palm oil in 2010-2018. The method in this research is quantitative with multiple linear regression analysis tools. The type of data obtained is secondary data of time series (time series). Based on the results of this study, it is known that partially the amount of palm oil production, oil palm plantation area, and world CPO prices have a positive effect on the export value of palm oil and the exchange rate has a negative effect on the export value of Indonesian palm oil in 2010-2018. Simultaneously the amount of palm oil production, the area of oil palm plantations, the world CPO price, and the exchange rate together have a significant effect on the value of Indonesian palm oil exports in 2010-2018.

Key words: Palm oil export value; palm oil production; land area; world cpo price; exchange rate

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INTRODUCTION

Plantation commodities are the mainstay for national income and foreign exchange, it can be seen from the export value of plantation commodities in 2017 which reached 31.8 billion USD or equivalent to Rp. 432.4 trillion. According to Ditjebun (2019), the development of the plantation sub-sector as part of the development of the agricultural sector and national development is one of the important potentials in efforts to increase national economic growth and community welfare. One of the commodities that have an important role in the Indonesian economy is palm oil. The prospects for the development of the palm oil industry are currently very rapid where there is an increase in both the area and production of palm oil. Based on the Ditjebun publication in 2018, the total area of oil palm plantations recorded reached 14,326,350 hectares, spread across various provinces in Indonesia.

During 2010-2018 the area of oil palm plantations in Indonesia continued to increase with an average growth rate of 6.36% per year except in 2016 the area of oil palm decreased slightly by 0.5% or decreased by 58,812 hectares. The amount of palm oil production in Indonesia from year to year always increases. Since 1980, the development of palm oil production in the form of CPO (Cruide Palm Oil) in Indonesia has continued to increase with an average growth of 11.48% per year. During the nine-year period from 2010-2018, the amount of CPO production in Indonesia has always increased with an average growth rate of 7.89% per year.

During 2010-2018 world demand for palm oil increased by 13.5 million tons, from 2010 where the total demand for palm oil was 36 million tons to 49.5 million tons in 2018. This means that every year the world demand for palm oil has increased. an average of 3.2%. The increase in world demand for palm oil has led to an increase in exports of palm oil. the value of Indonesian palm oil exports during 2010-2018 grew by an average of 0.93% per year. When viewed in terms of volume, Indonesia's palm oil exports during 2010-2018 increased with an average growth of 6.98% per year.

According to Maygirtasari, Yulianto, & Mawardi (2015) domestic and international palm oil prices fluctuate from time to time, palm oil prices are relatively difficult to predict with high accuracy. In general, the price of world palm oil always fluctuates every year, this is caused by various factors including the dynamics of supply and demand for world palm oil, as well as palm oil stocks. During the nine-year period from 2010 to 2018 the average world palm oil price has always fluctuated from year to year with an average decreasing trend of 5.81% every year.

Another factor that is considered to have influenced the value of palm oil exports is the exchange rate against the United States dollar (USD). According to Aprina (2014), because the contribution of palm oil is quite large compared to other commodities, the world palm oil price is considered to be able to affect the exchange rate, so that the role of export commodities is increasingly important in exchange rate movements. During 2010 to 2018 the price of the US dollar currency tends to fluctuate from year to year, with an average increase of 6.21% per year. In 2010 the price of one US dollar was Rp. 8,991 while in 2018 the price of one US dollar is Rp. 14,481.

Based on the above background, the authors are motivated to conduct more in-depth research on "Analysis of the Effect of Palm Oil Production Amount, Oil Palm Plantation Area, World Palm Oil Price, and Exchange Rate on Indonesian Palm Oil Export Value in 2010-2018".

METHOD

The type of data used in this study is secondary data periodically to see the development of the object of research over a certain period of time. Secondary data is data obtained from other parties related to this research both from institutions, government agencies, and individuals. The data used in this study include the export value of Indonesian palm oil, Indonesian palm oil production, the area of Indonesian oil palm plantations, world palm oil prices, and the 2010-2018 exchange rate. The data was obtained from the Directorate General of Plantations, BPS, and the Index Mundi website.

The data analysis method used in this study is multiple linear regression method, this model is used to determine changes in the dependent variable caused by changes in the independent variables. Before performing regression analysis, it is necessary to determine the regression model first. By assuming the dependent variable as Y and the independent variable as X, it can be determined that the multiple linear regression model is as follows:

$$\mathbf{Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + e}$$

Description:

Y	= Palm Oil Export Value
α	= Constant
X_1	= Total Palm Oil Production
X_2	= Area of Palm Oil Plantation
X_3	= Palm Oil Price
X_4	= Exchange Rate
$\beta_1, \beta_2, \beta_3, \beta_4$	= Regression Coefficient
e	= Error

RESULTS AND DISCUSSION

Classic Assumption Test

Normality Test

The normality test aims to test whether in the regression model, the dependent variable and the independent variable both have a normal distribution or not. Normality test can be done by comparing the calculated Jarque-Bera probability with an alpha level of 5%. When Prob. If the JB count is greater than 5%, it can be concluded that the residuals are normally distributed and vice versa if the value is smaller, it can be concluded that the residuals are not normally distributed.

Table 1.
Normality Test Results

Jarque-Bera	1.278190
Probabilitas	0.863188

Based on table 1, it can be seen that the Jarque-Berra probability value of 0.52770 is greater than the significance level used, namely alpha 5%, so it can be concluded that the data used is normally distributed.

Multicollinearity Test

Multicollinearity test is used to test whether the independent variables have a correlation or relationship with the multiple regression model. To detect the presence or absence of multicollinearity in a regression model, by looking at the tolerance value and the Variant Inflation Factor (VIF) value. If the tolerance value is > 10% and the VIF value is < 10, it can be concluded that there is no multicollinearity in the regression model. If the tolerance value is < 10% and the VIF value is > 10, it can be concluded that there is multicollinearity in the regression model. Multicollinearity test results can be seen in the following table.

Table 2.
Multicollinearity Test Results

Variable	Centered VIF
X1	1.754274
X2	1.734095
X3	1.093101
X4	1.105125
C	NA

Based on table 2, it can be seen that the variables X1 (Amount of Production), X2 (Land Area), X3 (World CPO Prices), and X4 (Exchange Rates) have no VIF values greater than 10. So it can be concluded that the variables X1, X2 , X3, and X4 there is no multicollinearity problem.

Heteroscedasticity Test

Heteroscedasticity test aims to determine whether in the regression model there is a similarity of variance from the residuals of one observation to another observation. If the variance of the residual from one observation to another observation remains, it is called Homoscedasticity and if it is different it is called Heteroscedasticity.

In this regression model, heteroscedasticity testing uses the Glajser Test model, namely by looking at the value of Prob. F-statistic (F count). If the value of Prob. The F-statistic is greater than the

5% alpha level, it can be concluded that there is no heteroscedasticity, whereas if the Prob value. The F-statistic is smaller than the 5% alpha level, so it can be concluded that there is heteroscedasticity.

Table 3.
Heteroscedasticity Test Results

F-statistic	0.167034	Prob. F(4,4)	0.9516
Obs*R-squared	0.865452	Prob. Chi-Square(4)	0.9295
Scaled explained SS	0.348089	Prob. Chi-Square(4)	0.9865

Based on table 3, it can be seen that the probability value of the F statistic is 0.9516 which is greater than the 5% alpha level, so it can be concluded that the regression model is free from heteroscedasticity problems.

Autocorrelation Test

The autocorrelation test aims to test whether in a linear regression model there is a correlation between the confounding error in period t and the error in period t-1 (previous) if there is a correlation then it is called an autocorrelation problem. To test the autocorrelation in the regression model, it can be done using the Brusch-Godfrey serial Corellation LM Test method. Autocorrelation test with Brusch-Godfrey test approach is done by comparing Prob. F count with an alpha level of 5%. If the value of Prob. F-count greater than 5% alpha level means that there is no autocorrelation. On the other hand, if the value of Prob. F-count less than 5% alpha means that there is an autocorrelation.

Table 4.
Autocorrelation Test Results

F-statistic	1.868487	Prob. F(2,2)	0.1966
Obs*R-squared	4.511827	Prob. Chi-Square(2)	0.1048

Based on table 4, the probability value of F-count, which is 0.1966, is greater than the significance level used, which is alpha 5%, so it can be concluded that the regression model is free from autocorrelation problems.

Multiple Linear Regression Analysis

In conducting an analysis of the effect of the variables X1 (Amount of Production), X2 (Land Area), X3 (World CPO Price), and X4 (Exchange Rate) on the value of palm oil exports in Indonesia in 2010-2018, the Ordinary Least Square (OLS) method was used.). The tools in this model use the Eviews 10 application. The test results of the regression model can be seen in the following table.

Table 5.
Multiple Linear Regression Analysis Test Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X1	4.207641	1.889527	2.226823	0.0398
X2	1.940038	5.472672	3.544956	0.0025
X3	9.259697	1.496996	6.185517	0.0000
X4	-2.250007	7.302294	-3.081233	0.0068
C	4.780000	3.580000	1.334532	0.1996

Based on the test results in table 5, the regression model equation can be written as follows:

$$\mathbf{Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + e}$$
$$\mathbf{Y = 4,78 + 4,21\ X1 + 1,94\ X2 + 9,26\ X3 - 2,25\ X4 + e}$$

Statistical Test

t Test

The t-test in multiple linear regression is intended to test how much influence the independent variables partially have on the dependent variable. The way in the t test is to compare if the probability with is 5% and also t count with t table. The decision-making criteria in the t-test are if the probability (significance) > 0.05 (α) or t count < t table, it means that the independent variable has no effect on the dependent variable. Meanwhile, if the probability (significance) < 0.05 (α) or t count > t table, it means that the independent variable has an effect on the dependent variable.

Table 6.
t Test Results

Variable	t-Statistic	t-tabel	Prob.	Kesimpulan
X1	2.226823	2.01954	0.0398	Berpengaruh positif signifikan
X2	3.544956	2.01954	0.0025	Berpengaruh positif signifikan
X3	6.185517	2.01954	0.0000	Berpengaruh positif signifikan
X4	-3.081233	2.01954	0.0680	Berpengaruh negatif signifikan

F Test

In principle, the F test is carried out to determine whether the independent variables together have an effect or not on the dependent variable. The way of making decisions on the F test is to compare the F value of the regression coefficient and F table with a significance level (α) of 5%. The criteria for making decisions are if F count < F table or probability F statistic > 5%, meaning that the independent variables together have no effect on the dependent variable. Meanwhile, if F count > F table or probability F statistic < 5%, it means that the independent variables together influence the dependent variable. The results of the F test in this study can be seen in the following table.

Table 7.
F Test Results

F-statistic	F-tabel	Prob.
13.72175	2.600	0.000036

Based on the results of the F-test in table 7, the F-count (F-statistics) value is 13.72175 > the F-table value is 2.600 and the F-statistical probability value is 0.000036 < the significance level (α) is 5%. It can be concluded that the variables of the amount of palm oil production, the area of oil palm plantations, the world price of palm oil, and the exchange rate simultaneously affect the variable value of Indonesian palm oil exports in 2010-2018.

Coefficient of Determination Test (R^2)

Test of determination to explain how big the proportion of changes in the dependent variable can be explained by the effect of changes in the independent variables. The coefficient of determination is a general measure used to measure the goodness of fit of a regression result. The value of R^2 has a range between zero (0) and one (1). If R^2 is getting closer to 1 (one), then it shows a stronger influence. Vice versa, if it is close to the value of 0 (zero) then the influence caused by the independent variable on the dependent variable is getting weaker. The results of the coefficient of determination test can be seen in the following table.

Table 8.
Determination Coefficient Test Results (R^2)

R-squared	0.763518
Adjusted R-squared	0.707875

Based on the results of the coefficient of determination test in table 8, the R-squared value of 0.76518 or 76.52% is obtained, which means that the variable amount of palm oil production (X1), oil palm plantation area (X2), world CPO prices (X3), and the exchange rate (X4) has a proportion of influence on the variable value of palm oil exports (Y) of 76.52%, while the remaining 23.48% is influenced by other variables not included in the regression model.

Discussion

Effect of Total Palm Oil Production on Palm Oil Export Value

Based on regression analysis, it shows that the amount of palm oil production has a significant positive effect on the value of palm oil exports in Indonesia. It can be seen from the t-count value of 2.226823 > t-table of 2.01954 and the t-count probability value of 0.0398 < 0.05 significance level. The estimation results show that the regression coefficient value of the variable amount of palm oil production is 4.2, meaning that when there is an increase in the variable amount of palm oil production by 1%, there will be an increase in the export value of palm oil by 4.2%, assuming other variables. fixed (ceteris paribus).

The increase in palm oil production will trigger an increase in the supply of palm oil both in the domestic and international markets. The increase in palm oil production is in line with the need for palm

oil consumption which is increasing year by year. This is due to the increasingly advanced food industry and palm oil as the main alternative source of vegetable oil used in food processing.

The Effect of Oil Palm Plantation Area on Palm Oil Export Value

Based on regression analysis, it shows that the variable area of oil palm plantations has a significant positive effect on the value of palm oil exports in Indonesia. This can be seen from the t-count value of 3.544956 > t-table of 2.01954 and the t-count probability value of 0.0025 < 0.005 significance level. The estimation results show that the regression coefficient value of the variable area of oil palm plantations is 1.9, meaning that when there is an increase in the variable area of oil palm plantations by 1%, there will be an increase in the value of exports by 1.9% assuming the other variables are fixed (ceteris). paribus).

Based on the publication of the Directorate General of Plantations that the area of oil palm plantations from year to year always increases, this will increase the amount of palm oil harvested and will also increase the number of raw goods that will be produced. As the largest palm oil producing country in the world, of course, the area of oil palm plantations has an important influence on the country's foreign exchange.

The Effect of World CPO Prices on Palm Oil Export Value

Based on the results of the regression analysis, it shows that the world CPO price variable has a significant positive effect on the value of palm oil exports in Indonesia. It can be seen from the calculated value of 6.185517 > the t-table value of 2.01954 and the t-count probability value of 0.0000 < the significance level of 0.005. The estimation results show that the regression coefficient value of the world CPO price variable is 9.3 meaning that when there is an increase in the world CPO price variable by 1%, there will be an increase in the value of palm oil exports by 9.3%, assuming the other variables remain constant (ceteris). paribus).

Even though the price of palm oil increases, importing countries will continue to demand Indonesian palm oil due to the cooperative relationship between palm oil importing countries and Indonesia. In addition, the price of palm oil is relatively cheaper than the price of similar substitute goods such as coconut oil, soybean oil, sunflower seed oil, and peanut oil.

Effect of Exchange Rate on Palm Oil Export Value

Based on the results of the regression analysis showed that the exchange rate variable had a significant negative effect on the value of palm oil exports in Indonesia. It can be seen from the t-count value of (-) 3.081233 > the t-table value of 2.01954 and the t-count probability value of 0.0068 < the significance level of 0.005. The estimation results show that the regression coefficient of the exchange rate variable is -2.3, meaning that when there is an increase in the exchange rate variable by 1%, there will be a decrease in the value of palm oil exports by 2.3%, assuming the other variables are fixed (ceteris paribus).

In this study, the increase in the price of the United States dollar causes a decrease in the value of palm oil exports. This is because the United States dollar is the currency used in international trade so that when the price of the United States dollar rises, importing countries will tend to minimize the use of American dollars for transactions with domestic substitute goods. Such as palm oil which can be replaced with various other alternatives, namely soybean oil, sunflower seed oil, olive oil and coconut oil.

The Effect of Palm Oil Production Amount, Oil Palm Plantation Area, World CPO Price, and Exchange Rate on Palm Oil Export Value

Based on the results of the F-test that has been carried out, it shows the F-count (F-statistics) value of 13.72175 > the F-table value of 2.600 and the F-statistical probability value of 0.000036 < the significance level (α) of 5% which means that the variable amount of palm oil production, area of oil palm plantations, world palm oil prices, and the exchange rate simultaneously affect the variable value of Indonesian palm oil exports in 2010-2018.

The Coefficient of Determination test results obtained an R-squared value of 0.76518 or 76.52%, which means that the variables of the amount of palm oil production, oil palm plantation area, world CPO prices, and exchange rates have a proportion of influence on the variable value of palm oil exports. of 76.52%, while the remaining 23.48% is influenced by other variables not included in the regression model.

Increasing the amount of palm oil production is important as an effort to increase the export value of palm oil. With the increase in the amount of production, it will trigger an increase in supply on the world market so that it will increase the value of palm oil exports. In an agricultural country such as Indonesia, the quantity of agricultural and plantation output is strongly influenced by land area, in general the higher the land area, the more agricultural or plantation output. Likewise, the area of oil palm plantations has an important role in increasing the amount of palm oil production which in turn will increase the export value of palm oil.

In general, importing countries will increase their purchasing power when world CPO prices fall and reduce their purchasing power when prices rise. This study shows that when world CPO prices fall, the volume of palm oil exports increases but the export value remains low. In international trade transactions, countries need the United States dollar currency. When the US dollar exchange rate rises or the rupiah depreciates, the value of palm oil exports falls. This shows that when the US dollar exchange rate rises, not only the rupiah weakens but other countries also experience a weakening so that importing countries will maximize the use of domestic products and reduce imports of palm oil.

CONCLUSION

Based on the results of the analysis and discussion in this study, it can be concluded as follows:

The amount of palm oil production has a significant positive effect on the export value of Indonesian palm oil in 2010-2018. The increase in the amount of palm oil production will increase the value of Indonesia's palm oil exports.

The area of oil palm plantations has a significant positive effect on the export value of Indonesian palm oil in 2010-2018. The increase in the area of oil palm plantations will increase the value of Indonesia's palm oil exports.

The world CPO price has a significant positive influence on the export value of Indonesian palm oil in 2010-2018. The increase in world CPO prices will increase the value of Indonesian palm oil exports.

The exchange rate has a significant negative effect on the export value of Indonesian palm oil in 2010-2018. The increase in the US dollar exchange rate will reduce the value of Indonesian palm oil exports.

Total palm oil production, oil palm plantation area, world CPO prices, and the exchange rate together have a significant effect on the value of Indonesian palm oil exports in 2010-2018.

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