Impact of Financial and Economic Factors to Palm Oil Price in Indonesia

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Abstrak

Dalam investasi saham, salah satu tantangan terbesar adalah untuk menganalisa dan memprediksi saham-saham yang berhubungan dengan harga minyak kelapa sawit. Ada banyak ketidakpastian di dunia, yang menyebabkan prediksi harga dari minyak kelapa sawit mentah dan performa dari saham-saham yang berhubungan, menjadi sulit. Tujuan dari penelitian ini adalah menguji hubungan antara harga minyak kelapa sawit dengan finansial dan ekonomi di Indonesia. Hasil penelitian menunjukkan bahwa minyak kelapa sawit cocok dijadikan variable tak bebas. Hasil lain menunjukkan bahwa adanya hubungan positif jangka panjang antara harga minyak kelapa sawit dengan import dan indeks Dow Jones, dan hubungan negatif jangka panjang antara harga minyak kelapa sawit dengan export, nilai tukar mata uang, IHSG, dan harga minyak bumi mentah. Selain itu, indeks USD dan volume perdagangan IHSG tidak mempunyai hubungan di model, sehingga kedua variable ini dihilangkan.

Kata kunci: Minyak kelapa sawit, VECM, faktor makro ekonomi

Abstract

In stock investing, one of the biggest challenges is to zanalyze and predict stocks related to palm oil price. There are many uncertainties in market, which cause the price prediction of crude palm oil and (CPO) and the performance of related stocks, are hard. The purpose of this paper is to test the association of palm oil price with the financial and economic in Indonesia. The result shows that palm oil is good for the dependent variable. Another finding indicates that palm oil price has a long-term positive association with import and Dow Jones index, and negative association with export, currency exchange, IHSG, and crude oil price. On the other hand, the USD index and IHSG Trading Volume have no relation in the model, then these two variables are excluded.

Keywords: Palm Oil, VECM, Macroeconomic factors

1 Introduction

Covid-19 changed the world. Covid-19 accelerated the changes in technologies implementation. People used to hesitate to fully implement the online technologies for learning, working, and collaborating. Now, barely everything is done online. If you do not have an internet access, you can hardly have access to the economy.

In the era of Covid-19, many real sectors are dying. Lots of small to middle industries went bankrupt in this new era. However, some industries got multiple profits. The survivors in this new era are the ones that are ready with the new technology, which is the online capability. Many online shops, online game vendors, information technology companies got double to triple profits. When an era changes, there will always be those that die and those that emerge as survivors.

One interesting fact is, even though the real sectors are dying, the money sector recorded a significant growth. There are about 8% new investors join the money markets, ranging many kinds of instruments. The scope of the new investors ranges from stocks, mutual funds, and obligations. This phenomenon shows the high awareness of new investors to utilize the momentum of investing in Indonesia money market (Okezone, 2020).

In stock investing, one of the biggest challenges is to analyze and predict stocks related to palm oil. Palm oil price leads to the stock price of the palm oil company (Nor & Masih, 2016).There are many uncertainties in market, which cause the price prediction of crude palm oil and the performance of related stocks, are hard. India has stopped importing palm oil from Indonesia with expectation to make the price goes lower. While Malaysia is trying to limit its production with expectation to make the prices goes higher. All of these policy wars cause so many uncertainties in palm oil market (Gumilar, 2020).

Palm oil is mostly consumed and produced in the world. This easy to be made oil is mainly used as for cooking ingredients, cosmetics, cleaning products, and biodiesel. Most palm oil is produced in Asia, Africa, and South America because the trees need warm temperature, sunlight, and high rainfall to maximize the productions (Indonesia-Investments, 2017).

Palm oil is derived from the fruit of oil palms. Palm oil has become one of the most significant agricultural commodities in the world. Many products can be produced from palm oil, like soap, cooking oil, shampoo, margarine, cookies, bread, ice cream, etc. Indonesia and Malaysia are the largest palm oil producers in the world for almost around 90% of the world production, with Indonesia as the biggest palm oil production country – followed by Malaysia and Thailand (Sawe, 2018).

Explaining factors that affect palm oil price have been quite a problem for investors. This study tests the association of palm oil price with the financial and economic factors. Therefore, investors can have better trading plans involving palm oil stock prices.

2 Literature Review

2.1 Grand Theory

The Palm Oil industry is vital as the primary economy industry of a country, especially for developing countries (Zabid & Abidin, 2015). There have been many studies on palm oil cases and issues. Some prior literatures are reviewed here.

Sekumade [1970] studied the effects of petroleum dependency on agricultural trade in Nigeria using the *error correction model* (ECM) from 1970 to 2003. The result of the ECM confirmed a long-run and short-run relationship between the cash crops and the exogenous variables. The *Ordinary Least Squares* (OLS) results showed that the value oil exports and imports increased with the agricultural export crops (cocoa, groundnut, cotton, rubber, palm oil, palm kernel, etc.) (Sekumade, 1970).

Awad et al. [2007] studied the palm oil import demand in some Middle East and North African (MENA) countries. The findings show that palm oil prices and national income are substantial factors in palm oil demand. Other results say that high palm oil discount price, during the 1970s world petroleum prices surge, and exchange rate are also important factors of demand for palm oil in some MENA countries (Awad, Arshad, Shamsudin, & Yusof, 2007).

Munadi [2007] used the *Error Correction Model (ECM)* to research the impact of export tax reduction on Indonesia palm oil export to India. The result shows palm oil quantity export from Indonesia to India is affected by the ratio of *local palm oil price* by *world palm oil price* (PSO/PWO), *goods production index* (IPI), and *previous year India export demand*. The coefficients of ECM are near to zero, which means that these variables have a small impact on India's long term export demand (Munadi, 2007).

Yulismi [2007] researched about a *dynamic econometric model* using *cointegration* and *error correction* to develop a model that could capture both short effects, long-run effects, and import-export market behavior. The import demand analysis shows that: (1) aggregate income is the main factor that affects palm oil import in China, India, and EU countries, and (2) the demand is elastic for the short and long term. The export demand-side analysis shows that: (1) the income and price have a strong relationship with palm oil importer's preference from Indonesia and Malaysia, and (2) Indonesia's total export supply has a negative association with an palm oil export price. The result also shows that palm oil import fee has an insignificant impact on palm oil trade amounts (Yulismi, 2007).

Iskandar [2015] studied the impact of palm oil price in the world market on the export value of palm oil and economic growth, inflation rate, exchange rate, and money supply as proxy in Indonesia during 2001-2013 using *Vector Autoregression* (VAR) model with *Impulse Response Function* and *Variance Decomposition*. The results show that: (1) the palm oil price in the world market has a positive impact on export value of palm oil, (2) it has positive impact

on economic growth, (3), it has positive impact on domestic inflation, (4), it negatively affects the exchange rate of Rupiah. Iskandar suggests for government-stakeholders collaboration and infrastructure optimization to deal with the negative effect of palm oil price shocks (Iskandar, 2015).

Kanchymalay et al. [2017] researched the correlation between crude palm oil price, some vegetable oil prices, crude oil, and the monthly exchange rate. The analysis was done using comparative analysis, and the forecasting was done using machine learning. The early result shows that there is a positive and strong relationship between the palm oil price and the soybean oil price, and between palm oil price and crude oil price. The forecasting was done using multi-layer perception, support vector regressions (SVR), and Holt Winter exponential smoothing method. The forecasting result shows that SVR shows better results than the other methods (Kanchymalay, Salim, Sukprasert, Krishnan, & Hashim, 2017).

May [2018] says that stock prices are affected by Dow Jones Industrial Index, foreign exchange, and sectoral price index of that stock. Even if those three factors do not directly influence the stock prices at time *t*, there is a possibility the effects happen at the lag values (May, 2018).

2.2 Hypothesis Development

Sekumade (1970) says say that import and export of crude oil have association with palm oil export values. Awad (2007) says that palm oil price has negative association with exchange rate and demand for palm oil. Awad did the study in MENA countries, while this study was done in Indonesia. So, USD/IDR will be used for exchange rate for this paper. Demand for palm oil is associated to Import value. While, Kanchymalay (2017) says that the palm oil price has a positive strong association between palm oil price and crude oil price.

Munadi (2007) used the ECM to show palm oil quantity export from Indonesia to India is affected by the ratio of *local palm oil price by world palm oil price* (PSO/PWO) and *previous year India export demand*. In India at that time, these variables had a small impact on India's long-term export demand. Based on the Munady's study, this paper uses VECM to study the lag association of the economic factors to the palm oil price.

Yulismi (2007) says the palm oil price has a strong relationship with palm oil importer's preference from Indonesia and Malaysia. Another important finding is the Indonesia's total export supply has a negative association with palm oil export price.

Iskandar (2015) also says that palm oil price is positively related with export value, and negatively related with exchange rate.

Based on these research, the hypothesizes are:

H_1: Foreign exchange (USDIDR) affects palm oil price

H_2: Import values (IMPORT) affect palm oil price

H_3: Export values (EXPORT) affect palm oil price

H_4: Crude oil price (OIL) affects palm oil price

May [2018] says that stock prices are affected by Dow Jones Industrial Index, foreign exchange, and Indonesia Composite Index. The variable Volume is added since it is related with IHSG, and variable USD index due to its relationship with foreign exchange. Even if those three factors do not directly influence the stock prices at time *t*, there is a possibility the effects happen at the lag values.

Therefore, the next hypothesizes are:

H_5: Dow Jones Industrial Index (DJIA) affects palm oil price

H_6: Indonesia Composite Index (IHSG) affects palm oil price

H_7: IHSG trading volume (VOLUME) affects palm oil price

H_8: USD index (USDIDX) affects palm oil price

3 Methodology

3.1 Unit Analysis and Sample

The data used in this research are explained with the following sequence: The sample is used monthly data from 2014 to 2019. The range was chosen because the palm prices are only available for monthly level frequency during those years. The total observations are 56. The Dow Jones Index, Indonesia Composite Index, and Indonesia Composite Index Volume are taken from the website http://finance.yahoo.com. Foreign exchange of USD/IDR data are taken from http://www.bi.go.id. The palm oil price, export, and import data are taken from http://www.capitaliq.com.

3.2 Vector Autoregression And Error Correction Models (VECM)

To find the long-term impact of the financial and economic factors on the palm oil price, we use the vector auto correlation model. Before the get the results to get the long-term relationships among the variables, we applied the Johansen cointegration test. The empirical VECM applied is as follows:

$$\Delta\log(CPO)_t = \sum_{i=1}^{k} \beta_i \Delta\log(DJI)_t + \cdots + \beta_i \Delta\log(USDIDX)_t + \delta_1[\log(CPO)_{t-1} - (\gamma_1\log(DJI)_t + \cdots + \gamma_8\log(USDIDX_t))] + \varepsilon_t$$

where $[\log(CPO)_{t-1} - (\gamma_1\log(DJI)_t + \cdots + \gamma_8\log(USDIDX)_t)]$ is the *error correction term* and ε is the error term.

CPO is the international monthly market palm oil price, USDIDR is the Indonesia's monthly currency exchange between USD and IDR, USDIDX is the monthly USD Index value, OIL is the international monthly crude oil price, Import is the monthly import value in Indonesia, Export is the monthly export value in Indonesia, IHSG is monthly data of Indonesia Composite Stock Price, VOL is monthly data of IHSG trading volume in Indonesia. The logarithm of all variables is used for a more straightforward and easier interpretation.

4 Empirical Results and Analysis

4.1 Descriptive Statistic

Table 4-1 shows the result of Descriptive Statistics. The result shows that only the log(VOLUME) is not in a normal distribution with Jarque-Bera probability values fewer than the significance level 5%. The log(VOLUME) also has the highest standard deviation, meaning it has high volatility.

Table 4-1 Descriptive Statistic Analysis of All the Time Series Variables

	Log(CPO)	Log(DJI)	Log(EXPORT)	Log(IHSG)	Log(VOLUME)	Log(IMPORT)	Log(USDIDR)	Log(OIL)	Log(USDIDX)
Mean	6.388593	9.931994	9.504456	8.607125	18.20326	9.474558	9.513955	3.966866	4.557745
Median	6.425984	9.911423	9.511074	8.598677	17.98977	9.451389	9.502665	3.937665	4.559814
Maximum	6.587791	10.18145	9.697981	8.791774	20.73409	9.814498	9.627660	4.388754	4.625493
Minimum	6.100935	9.699243	9.174661	8.372801	17.16948	9.106889	9.404662	3.515121	4.451838
Std. Dev.	0.116184	0.162405	0.113867	0.112735	**0.691854**	0.158854	0.045907	0.190587	0.035230
Skewness	-0.568256	0.191969	-0.489240	-0.246367	1.275848	0.123589	0.076955	0.094570	-0.702744
Kurtosis	2.483983	1.447611	2.968065	2.083672	4.989386	2.483153	3.283931	2.879217	3.714514
Jarque-Bera	3.635173	5.967079	2.236366	2.525698	24.42723	0.765865	0.243379	0.117512	5.800489
Probability	0.162417	0.050613	0.326873	0.282847	**0.000005**	0.681859	0.885423	0.942937	0.055010

4.2 Unit Root Test

The *unit root test* is done using the Augmented Dickey-Fuller Test (ADF). The test is done to all variables. The precondition is all variables must be non-stationary at level (d0). If a variable is stationary at level, this means there is no long-run relationship (Brooks, 2008).

Table 4-2 shows that the log(VOLUME) and the log(USDIDX) are already stationary at d0 with probability fewer than 0.05. These three variables will be excluded because they do not fit the precondition for Johansen Cointegration (Brooks, 2008). The results show that all variables are stationer at the first difference, which is level 1 (d1), with all probabilities fewer than 0.05. Unit root problems are all solved at the first difference.

Table 4-2 Augmented Dickey-Fuller Test Result at d0

Series	Probability at Level	Probability at d1
Log(CPO)	0.4385	0.0000
Log(DJI)	0.9346	0.0000
Log(EXPORT)	0.3233	0.0000
Log(IHSG)	0.5565	0.0009
Log(IMPORT)	**0.0000**	0.0000
Log(USDIDR)	0.6098	0.0000
Log(VOLUME)	0.2168	0.0000
Log(OIL)	0.0742	0.0000
Log(USDIDX)	**0.0270**	0.0000

Since VOLUME and OIL are excluded, then it can be said that H_7 and H_8 are rejected, meaning they do not have association with CPO.

4.3 Long term relations of CPO and other financial and economic variables

Table 4-3 shows the optimal lag length for Johansen Cointegration is obtained from the Lag Length Criteria test that shows the optimal lag is two. The long term cointegration is explained in table 4-4. It is tested using the Johansen cointegration test.

Table 4-3 Optimal lag length for Johansen Cointegration

Lag	LogL	LR	FPE	AIC	SC	HQ
1	694.5917	NA	2.41e-20	-25.31732	-23.46125*	-24.60806*
2	751.6780	**82.83114***	**1.92e-20***	-25.63443	-21.92230	-24.21592
3	800.0987	56.96551	2.56e-20	-25.61171	-20.04351	-23.48394
4	859.6864	53.74576	3.04e-20	-26.02692	-18.60265	-23.18988
5	935.0102	47.26199	3.64e-20	-27.05922*	-17.77888	-23.51293

Johansen Cointegration test suggests that the optimal deterministic trend assumption is no the intercept or trend in the cointegrating equation or test VAR. Table 4-4 shows the result of the Johansen Cointegration test, suggesting that at *None*, the null hypothesis is rejected, meaning there is a long-run relationship between the variables.

Table 4-4 Johansen Cointegration test for panel four and 2 lags for log(IHSG), log(CPO), log(DJI), log(USDIDR), log(IMPORT), log(EXPORT), log(OIL)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	**0.573549**	**122.3335**	**111.7805**	**0.0090**
At most 1	0.395194	77.16387	83.93712	0.1401
At most 2	0.322418	50.51292	60.06141	0.2458
At most 3	0.247670	29.88398	40.17493	0.3605
At most 4	0.179089	14.80121	24.27596	0.4714
At most 5	0.075190	4.342149	12.32090	0.6614
At most 6	0.003753	0.199300	4.129906	0.7108

Since there is a long run cointegration, the VECM model will be used. Table 4-5 shows the coefficient and t-statistic for the long-run equation variables for the VECM model.

Table 4-5 Cointegration Equation

Variables	Coefficient	t-statistic
LOG(CPO(-1))	1.00000	
LOG(DJI(-1))	1.704904	**3.90243**

LOG(IHSG(-1))	-2.068218	**-3.67359**
LOG(USDIDR(-1))	-0.893618	**-2.72846**
LOG(EXPORT(-1))	-2.028802	**-2.85008**
LOG(IMPORT(-1))	3.126031	**4.91301**
LOG(OIL(-1))	-1.868542	**-5.74686**

Table 4-5 shows the coefficient and t-statistic for the Cointegration equation variables, which all of them have a strong association with CPO. The log(DJI(-1)) and the log(IMPORT(-1)) have positive impact on the log(CPO(-1)), while the rest has negative impact to log(CPO(-1)). Since all independent variables are significant, then H_1 to H_6 are not rejected, meaning DJI, IHSG, USDIDR, EXPORT, IMPORT, and OIL have strong association with CPO.

Table 4-6 Error correction Equation

Variables	Coefficient	t-statistic
CointEq1	0.110257	**2.15345**
D(LOG(CPO(-1)))	-0.125121	-0.74990
D(LOG(CPO(-2)))	-0.473172	**-2.44470**
D(LOG(DJI(-1)))	0.183677	0.54566
D(LOG(DJI(-2)))	-0.601577	-1.83411
D(LOG(IHSG(-1)))	0.175804	0.32924
D(LOG(IHSG(-2)))	0.452107	0.97155
D(LOG(USDIDR(-1)))	0.515040	0.64924
D(LOG(USDIDR(-2)))	-1.236328	-1.70774
D(LOG(EXPORT(-1)))	0.191599	1.07647
D(LOG(EXPORT(-2)))	0.279884	1.44795
D(LOG(IMPORT(-1)))	-0.264178	-1.60239
D(LOG(IMPORT(-2)))	-0.181987	-1.26917
D(LOG(OIL(-1)))	0.086140	0.79437
D(LOG(OIL(-2)))	0.018539	0.18104

Table 4-6 shows the coefficient and t-statistic for the error correction equation variables. The result shows that only the CointEq1 has a positive association and log(CPO(-2)) has a negative association.

4.4 Analysis and Interpretation

One fundamental weakness of the VAR approach to modeling is the a-theoretical nature, and many parameters involved make the interpretation of the model is hard to do. To alleviate this problem, three sets of statistics are constructed for an estimated VAR model: block significance tests, impulse response, and variance decompositions (Brooks, 2014).

4.4.1 Granger Causality/Block Exogeneity Tests

Granger Causality/Block Exogeneity test result at table 4-7 shows that the probability of the model is significant, meaning there is strong evidence of short-term lead-lag interactions between the variables, and the CPO fits to be a dependent variable.

The long-term model result complies with the outcome of Sekumade (1970), Awad (2007), Yulismi (2007), and Iskandar (2015) that the IMPORT and EXPORT are significant factors to explain the CPO price. However, the result is a bit different from Munadi's (2007) study. Munadi's study says only EXPORT is a significant factor, and the effect is small. While this study says, all DJI, IHSG, USD IDR, IMPORT, EXPORT, and OIL have a strong association with the palm oil price. The difference in result is possibly caused by the difference in time of study and country location. For long term association, all H_1 to H_6 are not rejected, meaning all the independent variables have strong relationship to the CPO.

Table 4-7 Granger Causality/Block Exogeneity Tests

Excluded	Chi-sq	df	Prob.
D(LOG(S_DJI))	3.477539	2	0.1757
D(LOG(S_IHSG))	2.223346	2	0.3290
D(LOG(S_USDIDR))	2.919848	2	0.2323
D(LOG(S_EXPORT))	2.159208	2	0.3397
D(LOG(S_IMPORT))	2.607611	2	0.2715
D(LOG(S_OIL))	0.638207	2	0.7268
All	21.31376	12	**0.0460**

4.4.3 Impulse Response

From Figure 4-1, the CPO has a long-run positive association with the IMPORT and the DJI, and negative association with the EXPORT, the USDIDR, the OIL, and the IHSG. The graphic result complies with the VECM model result.

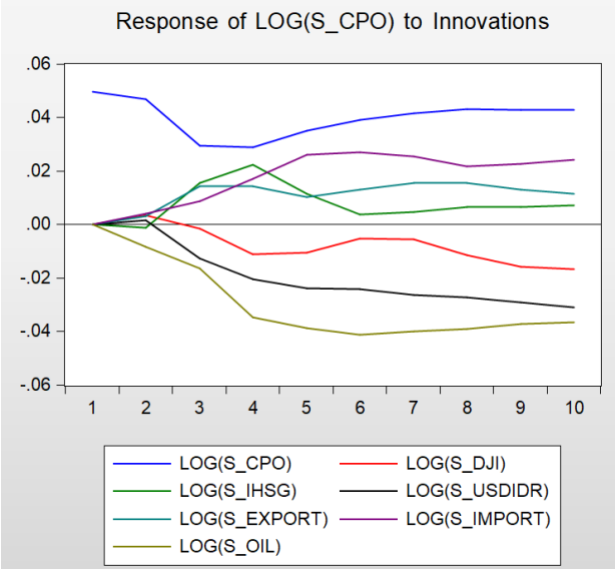

Figure 4-1 Impulse Response Graph CPO to Innovations

4.4.4 Variance Decomposition

Figure 4-2 shows the variance decomposition graph of the VAR model. The chart shows that the CPO has a long-run positive association with the IMPORT and the DJI, and negative association with the EXPORT, the USDIDR, the OIL, and the IHSG.

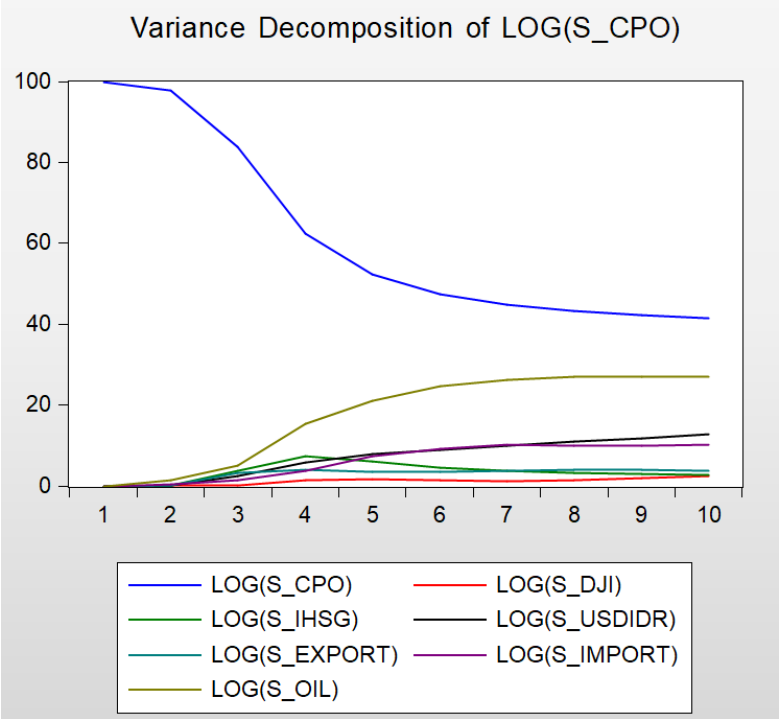

Figure 4-2 Variance Decomposition of CPO

4.5 Empirical Interpretation

The empirical results from the statistical analysis show that the palm oil prices have positive long-term association with Dow Jones Index and Indonesia Import values, and negative long-term association with currency exchange, export, and crude oil price.

The positive association of palm oil price and Dow Jones Index means higher palm oil price tends to make US economy stronger. This result is unexpected since US does not have palm oil farms. Further study is needed to explain this phenomenon.

The positive association of palm oil price and Indonesia Import values is caused by the high consumption of local market to palm oil. Indonesia is the highest importer palm oil country in 2020 (Tradenumbers, 2020). Another factor is the China *stocking policy* to buy palm oil in big volumes has positive impact to the palm oil market price (Pranata, 2020).

The negative association from currency exchange indicates that the raise in palm oil price in the international market causes the depreciation of Rupiah to US dollar. The depreciation can be analyzed because there is an increase in the demand of US dollar to play the import of palm oil into Indonesia. This finding is supported by the study done by Awad (2007) and Iskandar (2015) who found that the currency exchange has negatively significant association to the palm oil price.

One interesting finding is the negative association of the export value to the palm oil price. The finding is contradicted with the study done by Iskandar (2015). Further study is needed to explain the phenomenon.

The last finding is about the negative association of the crude oil price and the palm oil price. The result contradicts with Kanchymalay (2017). This study says that crude oil is negatively associated with palm oil prices while Kanchymalay says the opposite. The different location of the study might cause different results. Another reason is the highly increase of using bio diesel from palm oil. People try to find replacement for crude oil, and palm oil is one very potential energy replacement.

The R^2 of this model is 0.478619 and *the adjusted* R^2 is 0.286531. There are many factors are still uncaptured in this model.

5 Conclusion and Suggestion

5.1 Conclusion

In stock investing, one of the biggest challenges is to analyze and predict stocks related to palm oil. There are many uncertainties in market, which cause the price prediction of crude palm oil and the performance of related stocks, are hard. This study tests the association of palm oil price with the financial and economic factors

Understanding the explanatory factors of the palm oil price are a problem for investors. Palm oil price have positive association to the stock price of the palm oil company (Nor & Masih, 2016). Explaining factors that affect palm oil price have been quite a problem for investors. This study tests the association of palm oil price with the financial and economic factors. Therefore, investors can have better trading plans involving palm oil stock prices.

The results of this study show that palm oil price has a long-run positive association with the Indonesia import values and the Dow Jones Industrial Index. On the other hand, palm oil price has a negative association with the Indonesia export values, the foreign exchange between USD and IDR, the crude oil price, and the Indonesia composite stock index.

5.2 Limitation and Future Research

Due to the limitation of CPO data, this research uses monthly data from 2014 – 2019. There are only about 56 observations for the time series. The R^2 of this model is 0.478619 and *the adjusted* R^2 is 0.286531. There are still many factors that are still uncaptured in this model. The unexpected results of palm oil price have a positive association with Dow Jones Index, and a negative association with Indonesia's export values also need further research. In the future, it is suggested to do more in-depth exploration research with a bigger sample of data, like using daily data with a longer time range and adding more economic factors.

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