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The Stock Price Response of Palm Oil Companies to Industry and Economic Fundamentals

Arintoko ARINTOKO[1]

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Abstract

This study aims to examine empirically the industry and economic fundamental factors that affect the stock prices of the leading palm oil company in Indonesia. The dynamics of stock price are analyzed using the autoregressive distribution lag (ARDL) model both for symmetric and asymmetric effects. The data used in this study are monthly data for the period from 2008:01 to 2020:03. In the long run, the company stock price moves in line with the competitor company stock price at the current time. The palm oil price has a positive effect on the stock price. Meanwhile, inflation negatively affects the stock price in the short run. The estimated equilibrium correction coefficient indicates a reasonably quick correction of the distortion of the stock price equilibrium in monthly dynamics. However, fundamental factors have asymmetric effects, especially the response of stock price when these factors decrease rather than increase in the short run. Stock prices that are responsive to declines in fundamental performance should be of particular concern to both investors and management in their strategic decision making. The results of this study will contribute to the enrichment of literature related to stock prices from the viewpoint of economic analysis on firm-level data.

Keywords: Stock Price, ARDL Model, Fundamental Factors, Asymmetric Effects

JEL Classification Code: C22, G19, G39

1. Introduction

In the realm of stock investment, the law of supply and demand can explain stock prices at a given time (Jain, 2014). At the level of study, the impact of the law of supply and demand is considered in the stock market analysis. The company stock price is a reflection of investors' perceptions of the ability of stocks to generate earnings and increase profits in the future. The rise and fall of stock prices will be a clue for the company to reduce or increase the sale of additional shares. Milošević-Avdalović and Milenković (2017) stated that economists believe that securities prices are influenced by the forces of supply and demand in a free economic system. Stock prices change due to their supply and demand. If more people want to buy stocks than people who sell them, the stock price tends to increase, vice versa.

There are differences in the types of assets on the stock market between individual stocks and aggregate stocks, which are stated in the market index (Callado & Leitão, 2018). Referring to these differences, research on stock prices can also be aimed at both types of stocks. Nowadays, research on stock prices has become a favorite of researchers on financial issues. However, research on stock prices still relies heavily on aggregate stock price analysis, both in general and by sector or by type of business. There are still very few studies that focus on individual stock price or firm-level data analysis.

Research on stock prices has been widely carried out in various countries, especially in developing countries. However, most of the stock prices studied are aggregate stock prices measured in an index. Also, the factors that influence the stock price are generally seen from internal factors of company performance and external factors, which are generally macroeconomic variables. Several previous studies on the influence of internal company factors on stock prices include research conducted by Macharia and

[1]First Author and Corresponding Author. Lecturer, Department of Economics and Development Studies, Faculty of Economics and Business, Universitas Jenderal Soedirman, Indonesia [Postal Address: Jl. H.R. Bunyamin 708, Grendeng, Purwokerto, 53122, Indonesia] Email: arintoko@unsoed.ac.id

Gatuhi (2013), Mulyono, Suprapto, and Prihandoko (2018), Milošević-Avdalović (2018), Bhattarai (2018), Herawati and Putra (2018), and Ligocká and Stavárek (2019). Meanwhile, many previous studies regarding macroeconomic factors that affect the stock price index on the stock exchange are research conducted by Hunjra, Chani, Shahzad, Farooq, and Khan (2014), Mehrara, Farahani, Faninam, and Karsalari (2016), Giri and Joshi (2017), Epaphra and Salema (2018), Megaravalli and Sampagnaro (2018), and Vychytilová, Pavelková, Pham, and Urbánek (2019).

The factors that affect the stock price include internal and external factors and they can be selected based on different perspectives and methods (Özlen & Ergun, 2012). Some general factors can apply to all stock markets, but some specific factors only apply to particular company stock. In this study, a model is developed by selecting specific factors that affect the company stock price. The economic perspective views that stock prices are determined by the supply and demand for stocks. External factors related to company business prospects will also affect the company stock price. In this case, individual stock price analysis is very important. If the stock price of the company chosen is a palm oil company, the market price of palm oil and the substitute and complementary goods for palm oil will affect its stock price.

The palm oil production sector is very important to the Indonesian economy considering that the country is both the world's largest producer and consumer, providing about half of the world supply. This study aims to analyze the stock price of the leading palm oil company in Indonesia, namely, Astra Agro Lestari (AAL). This company is an oil palm plantation company that produces crude palm oil, which has earned the title as the company with the best governance. In this study, the autoregressive distributed lag model (ARDL) is applied concerning the dynamic analysis of monthly stock prices. Apart from including the stock price of the competitor company, the price of palm oil, and its substitute and complementary, macroeconomic variables are also added to the analysis model. With this method, the analysis aims to test whether the variables of competitor stock prices, palm oil product prices, substitute and complementary product prices, interest rates, exchange rates, and inflation significantly affect the company stock price in the short and long run.

2. Literature Review and Hypotheses

In general, investors in conducting the fundamental analysis can use the top-down approach as an alternative to the bottom-up approach. With a top-down approach, investors analyze by starting from the global economy along with international and national economic indicators. Factors considered include real GDP growth rates, inflation, interest rates, exchange rates, productivity, and energy prices. The analysis can then be narrowed down to regional or industry analyses related to total sales, price levels, effects of competing products, foreign competition, and entry or exit from the industry. After that, the analysis can be narrowed down to the best businesses in the field under study.

The determination of the price of securities is primarily driven by a balance between supply and demand for the liquidity of the securities in the market (Liu & Park, 2015). In the cycle of supply and demand for stocks, an increase in demand will increase the stock price. The stock price will fall as the demand decreases and the supply increases. In the economic and financial literature, economic data, interest rates, and company results can affect the demand for stocks. In macro terms, economic conditions, market dynamics, and changes in economic policies tend to have an impact on the overall supply of stocks.

2.1. Competitor Stock Price

Apart from following the forces of supply and demand in general, the movement of a company's stock tends to follow the market and with similar sectors or industries. It is argued by some of the leading investment firms that the combination of market movements and the sector as a whole, as opposed to the individual performance of the company, determines the majority of stock movements. Li and Zhao (2016) explain that according to the results of the study there is an effect of industry similarity on stock co-movement between the two companies. The two stock prices will tend to move linearly with each other. Company stocks whose earnings are correlated because they are in a related industry will move together in response to changes that cause changes in earnings or because they respond to the common effects of changes in macroeconomic variables (Pindyck and Rotemberg, 1993). Likewise, the stock returns at the same market and industry level will tend to experience synchronicity when more information is reflected in their stock prices (Vu, 2020). Based on the previous description up to the last paragraph in the section, the first hypothesis can be derived as follows:

H1: *Company stock price is positively related to the competitor stock price.*

2.2. Commodity price

From the investor perspective, factors from the demand side are seen as fundamental factors affecting stock prices. This is because the demand for stocks is much more responsive to changes in external environmental factors that affect the business prospects of companies that issue shares. In stock price analysis, there are fundamental and technical

analyses. Cohen, Kudryavtsev, and Hon-Snir (2011) stated that fundamental analysis is more often used by investors than technical analysis in making decisions. Fundamental analysis is a way of studying the economic, industrial, and company conditions to determine the intrinsic or fundamental value of a company's stocks (Westerhoff, 2006). The preference for fundamental analysis is due to the relatively long investment horizon rather than the short-term investment horizon in investment decisions. In the long run, economic fundamentals are considered more appropriate to be factors affecting the company stock price. This is also because economic fundamental factors will affect a company's performance.

The market price of commodities sold by a company can have a positive effect on stock prices. The more the price increases, the more revenue the company gets so that in turn it can increase its profit. Empirically, the increase in the price of crude palm oil has a positive effect on the profitability of the company, as found in the research conducted by Mubarok, Hartoyo, and Maulana (2019). In the case of fishery firms, a study by Vo (2019) found evidence that company profitability has a significant positive relationship with stock returns. A sustainable increase in profit can then improve a company's performance and business prospects, which will encourage an increase in demand for stocks. The increase in demand for these stocks will push up stock prices. The increase in stock prices was due to increased investor expectations, which made company performance increase and in turn, the stock price increased (Antono, Jaharadak, & Khatibi, 2019).

Commodity prices produced by a company generally have a positive effect on the company stock price performance. Specifically, several studies have found a positive relationship between commodity prices and stock price performance. Nordin and Ismail (2014) and Nordin, Nordin, and Ismail (2014) conducted studies where the results showed that the price of palm oil had a significant positive effect on stock price performance. Furthermore, palm oil prices consistently have a positive effect on the stock price index. The findings of a study conducted by Musawa and Mwaanga (2017) show that copper prices have a positive impact on stock prices. In a study conducted by Mongale and Eita (2014), gold and platinum prices have a positive effect on stock market performance. Likewise, the research results of Putra and Robiyanto (2019) show that the commodity prices of gold, silver, and crude oil each have a positive effect on the stock price performance of mining companies. In investigating fundamental factors based on indicators of investor demand that it makes sense if sentiment from investors drives stock prices (Shleifer & Summers, 1990; Tvaronavičiene & Michailova, 2006). Based on the theoretical explanation and the results of previous studies, the second hypothesis statement can be formulated as follows:

H2: *Company stock price is positively related to the palm oil price.*

2.3. Substituted and Complementary Commodities Price

In the theory of demand, the prices of substituted and complementary goods affect the demand for a good. In the case of palm oil products, an increase in the price of soybean oil, as a substitute, will increase the demand for palm oil, which will drive the price up (Rahman, Balu, & Shariff, 2013). In the context of the stock market as the results of the studies by Nordin and Ismail (2014) and Nordin, Nordin, and Ismail (2014), an increase in the market price of palm oil will increase the earnings of palm oil producers, which in turn will increase the stock price. Meanwhile, an increase in the price of sunflower oil, as complementary goods, will reduce the demand for palm oil and push the price down. Decreasing demand for palm oil can reduce company earnings, thereby lowering the company stock price. A study conducted by Alao and Oloni (2015) shows that commodity prices have a positive effect on firm value. For investors, in particular, an increase in company value indicates an increase in company performance in generating profits. Based on the description in the paragraph above, the third and fourth hypothesis statements can be derived as follows:

H3: *Company stock price is positively related to the soybean oil price.*

H4: *Company stock price is negatively related to the sunflower oil price.*

2.4. Macroeconomic Fundamentals

A study conducted by Naik (2013) stated that there is a theoretical relationship between macroeconomic factors and stock market movements. The relationship between the two can be explained through the present value model and arbitrage pricing theory. The long-run relationship between stock market movements and macroeconomic fundamentals is explained by the present value model, while the short-run relationship between the two is explained by the arbitrage pricing theory. Information about macroeconomic fundamentals such as real output, money supply, inflation, interest rates can influence stock prices or returns through expected dividends, discount rates, or both (Rahman, Sidek, & Tafri, 2009).

A fundamentalist whose aim is to estimate the expected future cash flows of a company can use an interest rate projection to assess the present value of these cash flows. The interest rate is one of the main macroeconomic variables that affect stock prices. With fundamental analysis techniques, an increase in interest rates can reduce the present value of a company's future cash flow. Therefore, an increase in interest rates will lower the company stock price. Several studies on the effect of interest rates and the impact of monetary policy that examine the effect of interest rates on stock

prices are research conducted by Ioannidis and Kontonikas (2008), Alam and Uddin (2009), Rifat (2015), Epaphra and Salema (2018), and Tursoy (2019). The results of empirical studies show that interest rates negatively affect stock prices. Research conducted by Panda (2008) also found a negative relationship between long-term interest rates and stock prices. Furthermore, a study by Eldomiaty, Saeed, Hammam, and AboulSoud (2020) shows that there is cointegration between the stock price and the interest rate where the change in stock prices is due to interest rates. From the theoretical explanation and the results of the previous research review, the fifth hypothesis can be formulated as follows:

H5: *Company stock price is negatively related to the interest rate.*

Regarding the exchange rate, in theory, a negative relationship between stock prices and exchange rates occurs when the value of the local currency increases (appreciates) and the products produced by local companies become less competitive, which leads to a decline in their exports. This will result in the shrinkage of a company's profits, which in turn will lower the stock price and vice versa. The relationship between two variables is proven in empirical studies including the results of a study by Amado and Choon (2020). A study conducted by Mgammal (2012) found evidence that in the long run, the exchange rate negatively affects the stock price. Likewise, a study conducted by Poornima and Ganeshwari (2015) shows that the exchange rate and stock market index have a negative correlation. Based on the theoretical explanation and the results of previous research reviews, the sixth hypothesis can be formulated as follows:

H6: *Company stock price is negatively related to the exchange rate.*

In stock investing, inflation is one of the factors that affect the portfolio. In theory, stocks should provide a hedge against inflation, because company earnings and profits must grow at the same rate as inflation, after a period of adjustment. When inflation is rising, the price of the income share generally falls. So owning a stock that pays dividends when inflation increases usually means the stock price will go down. A study by Eldomiaty, Saeed, Hammam, and AboulSoud (2020) shows that there is cointegration between stock prices and inflation, where the change in stock prices is due to the inflation rate. The inflation rate is negatively related to stock prices. The findings of a study conducted by Epaphra and Salema (2018) support this relationship that most of the estimation results of individual firm models show a negative effect of inflation on stock prices. Likewise, the results of a study by Bhattarai (2018) show a negative effect of inflation on stock prices in banking and insurance companies. The theoretical explanation and the results of the previous research review can formulate the seventh hypothesis as follows:

H7: *Company stock price is negatively related to inflation.*

3. Research Methods

3.1. Model Approach

This study is motivated to use the ARDL model approach as has been widely used in previous studies, but specifically related to the small sample properties and monthly stock price dynamics that are interesting to study collectively in the short and long run. Since the appearance of articles from Pesaran and Shin (1999), Pesaran, Shin, and Smith (2001), and Shin, Yu, and Greenwood-Nimmo (2014), the ARDL approach has been widely adopted in economic and financial research. In macroeconomic research, this model approach has been carried out by, among others, Halicioglu (2008), Latif, Adullah, and Razdi (2015), and Elfaki, Anwar, and Arintoko (2020). Meanwhile, in financial research especially on the stock market, the ARDL method has been used, among others, by Türsoy (2017), Kwofie and Ansah (2018), and Amado and Choon (2020).

According to Pesaran and Shin (1999) and Pesaran, Shin, and Smith (2001), the ARDL method with the bound test is a technique for the solution of determining long-run relationships between non-stationary series. Furthermore, this approach is used to test for the existence of a long-run relationship between variables in levels regardless of whether the underlying regressor is purely I(0), purely I(1), or mixed. With this approach, we can estimate the level effect and short-run dynamics of the dependent variable adjustment. The advantage of this approach is confirmed by Narayan (2004), that the properties of small samples based on the bound test approach are far superior to multivariate cointegration. In macroeconomic and financial analysis, the problem commonly encountered is the unit root problem where the data series is not stationary at the level. The ARDL approach becomes a solution when researchers are faced with unit root problems. In the ARDL model approach, reparameterized results provide short-run dynamics and long-run relationships of the variables considered in the developed research model.

3.2. Variables and Data

The variables used in the model are variables that represent economic and industrial variables that have an impact on the performance and business prospects of the palm oil company. Furthermore, the increase in a company's performance and prospects will be associated with a company's stock price. Industry or market variables include the stock price of the competitor company, crude palm oil

price, palm oil substitute, and complementary commodity prices, namely, soybean oil and sunflower oil, respectively. Meanwhile, the selected economic variables include interest rate, exchange rate, and inflation. The period for the data analyzed was January 2008 to March 2020. The list and definitions of each variable are presented in Table 1.

3.3. Econometric Modeling

In this study, the analysis of company stock prices is based on the use of the ARDL model, which is applied to long-run relationship analysis when the underlying variables are I(1). The ARDL method can be used to solve the stationary problem in time series regression. The ARDL method can be applied to the model whether the independent variable is stationary at I(0) or I(1), while the dependent variable must be stationary at I(1). To determine the stationarity of a time series in what order, unit root tests are required. Referring to the model developed by Pesaran and Shin (1999), the more detailed equation in this study is expressed in the ARDL (*k*, *l*, *m*, *n*, *p*, *q*, *r*, *s*) model as in equation (1). The optimal lag determination of *k*, *l*, *m*, *n*, *p*, *q*, *r*, and *s* orders in this analysis is based on the Akaike Information Criterion (AIC) statistic as used in Pesaran, Shin, and Smith (2001).

$$\begin{aligned}\mathrm{LOSP}_t = {} & \alpha_0 + \sum_{j=1}^{k} \mathrm{f_j LOSP}_{t-j} + \sum_{j=0}^{l} \beta_j \mathrm{LCSP}_{t-j} \\ & + \sum_{j=0}^{m} \delta_j \mathrm{LPCPO}_{t-j} + \sum_{j=0}^{n} \gamma_j \mathrm{LPSOY}_{t-j} \\ & + \sum_{j=0}^{p} \varphi_j \mathrm{LPSUN}_{t-j} + \sum_{j=0}^{q} \lambda_j \mathrm{IR}_{t-j} \\ & + \sum_{j=0}^{r} \rho_j \mathrm{LER}_{t-j} + \sum_{j=0}^{s} \sigma_j \mathrm{INF}_{t-j} + \mathrm{u}_{1t}\end{aligned} \tag{1}$$

where it is assumed that $u_{1t} \sim iid(0, \sigma^2)$. All variables in natural logarithm, except IR and INF.

From the conditional equilibrium correction model (ECM) according to Pesaran, Shin, and Smith (2001), in this study, case V (unrestricted intercept and unrestricted trend) was taken to describe how the deterministic components were determined. Statistically, the long-run relationship is expressed in terms of cointegration between time series variables. A long-run relationship in economic analysis is a theory-based relationship between variables. The ARDL model is a method used in determining the long-run relationship based on the selected variables. The test for cointegration or long-run relationship in this study uses the bound test to equation (2).

$$\begin{aligned}\Delta y_t = {} & \alpha_0 + \beta_1 y_{t-1} + \delta_1 x_{t-1} + \sum_{j=1}^{p} \gamma_j \Delta y_{t-j} \\ & + \sum_{j=0}^{q} \varphi_j \Delta x_{t-j} + u_{2t}\end{aligned} \tag{2}$$

Where y = LOSP and x = (LCSP, LPCPO, LPSOY, LPSUN, IR, LER, INF).

The form of ECM regression based on the results of the bound test, which follows equation (2) is generally expressed in the form of equation (3). The equation (3) is called ARDL Error Correction regression with the dependent variable of ΔLOSP and the independent variables include ΔLCSP, ΔLPCPO, ΔLPSOY, ΔLPSUN, ΔIR, ΔLER, and ΔINF as well as with unrestricted constant and trend.

$$\begin{aligned}\Delta\mathrm{LOSP}_t = {} & \alpha_0 + \alpha_1 t + \sum_{j=0}^{k} \beta_j \Delta\mathrm{LCSP}_{t-j} + \sum_{j=0}^{l} \delta_j \Delta\mathrm{LPCPO}_{t-j} \\ & + \sum_{j=0}^{m} \gamma_j \Delta\mathrm{LPSOY}_{t-j} + \sum_{j=0}^{n} \varphi_j \Delta\mathrm{LPSUN}_{t-j} \\ & + \sum_{j=0}^{p} \lambda_j \Delta\mathrm{IR}_{t-j} + \sum_{j=0}^{q} \rho_j \Delta\mathrm{LER}_{t-j} \\ & + \sum_{j=0}^{r} \sigma_j \Delta\mathrm{INF}_{t-j} + \mathrm{ECT}_{t-1} + \mathrm{u}_{2t}\end{aligned} \tag{3}$$

Table 1: Definition of Variables

Variable	Term	Unit of Measurement	Source
Own stock price of palm oil company (AAL)	OSP	Current price in rupiah traded on the stock market	Indonesia Stock Exchange
Stock price of the competitor company (SMART)	CSP	Current price in rupiah traded on the stock market	Indonesia Stock Exchange
Price of crude palm oil	PCPO	US Dollars per metric ton	IndexMundi
Price of soybean oil	PSOY	US Dollars per metric ton	IndexMundi
Price of sunflower oil	PSUN	US Dollars per metric ton	IndexMundi
Bank Indonesia benchmark interest rate	IR	percent per annum	Bank Indonesia
Indonesian Rupiah exchange rate	ER	US Dollars per Rupiah	Bank Indonesia
Inflation	INF	Percent, year on year (yoy)	BPS-Statistics Indonesia

Where

$$ECT_{t-1} = LOSP_{t-1} - (\beta_1 LCSP_{t-1} + \beta_1 LPCPO_{t-1} + \beta_3 LPSOY_{t-1} + \beta_4 LPSUN_{t-1} + \beta_5 IR_{t-1} + \beta_6 L ER_{t-1} + \beta_7 INF_{t-1}) \quad (4)$$

The ARDL model has a reparameterization in the form of error correction (Hassler & Wolters, 2006). Models in the error correction form are useful in forecasting and for disentangling long-run relationships from short-run dynamics. The parameters β_1, β_2, β_3, β_4, β_5, β_6, and β_7 in equation (4) are long-run coefficients, while the parameters β_j, δ_j, γ_j, ϕ_j, λ_j, ρ_j, and σ_j in equation (3) are short-run coefficients. The long-run coefficients represent the equilibrium effects of the independent variables on the dependent variable. Meanwhile, the short-run coefficients take into account short-run fluctuations that are not due to deviations from the long-run equilibrium.

In the final section, estimation is carried out to investigate the possible asymmetry of the effect of the independent variables on stock prices as they rise and fall both in the short and long run. Following Shin, Yu, and Greenwood-Nimmo (2014), estimate the effect of asymmetry by providing variables of $\delta_1^+ LPCPO_{t-1}^+$ and $\delta_1^- LPCPO_{t-1}^-$ in the equation (2). The long-run asymmetric effect of increasing and decreasing palm oil prices on stock prices is calculated by $\theta^+ = -\frac{\delta_1^+}{\beta_1}$ and $\theta^- = -\frac{\delta_1^-}{\beta_1}$, respectively. Meanwhile, the short-run asymmetric effect of crude palm oil prices when they increase and decrease as measured by $\sum_{j=0}^{q} \varphi_j^+ LPCPO_{t-j}^+$ and $\sum_{j=0}^{q} \varphi_j^- LPCPO_{t-j}^-$ in the framework of the ARDL model. Testing of asymmetric effects is also carried out on other variables, in the same way, using the stepwise regression method.

4. Results and Discussion

To determine whether the independent variables are stationary at I(0) or I(1), or mixed, and to determine that the dependent variable is stationary at I(1), the unit root test is used. The unit root tests used were the Augmented Dickey-Fuller (ADF) tests. The use of the ADF test is commonly used in the ARDL method. In the analysis of time series data, the ADF test is a parametric test as stated by Shrestha and Bhatta (2018). The ADF test can also provide more reliable results in the unit root test. The results of the unit-roots test for the variables in this study are presented in Table 2.

Table 2: Unit Root Test of Variables

Variables	ADF Test	
	Level	First Difference
LOSP	−2.2713	−10.4906***
LCSP	−2.3638	−12.3172***
LPCPO	−3.3647*	−7.3579***
LPSOY	−2.7817	−8.3122***
LPSUN	−3.4035*	−7.6911***
IR	−2.6705	−4.7965***
LER	−1.9758	−9.9426***
INF	−3.1341	−7.5317***

***p-value < 0.01.
*p-value < 0.10.

The unit root tests are based on the optimal lag selection of the Schwarz Info Criterion (SIC). The test equation used includes trend and intercept. The results of the unit-roots test as presented in Table 2 show that all variables, both the dependent and independent variables, are I(1) with a p-value of 0.05. The ADF test with a critical value at the 5% level shows that all variables have unit roots and are integrated of order one, I(1), after the all series are transformed into the first difference. This condition fulfills the application of the ARDL method in this study as stated in Pesaran, Shin, and Smith (2001). In this case, the dependent variable, which is an I(1) is combined with the independent variables, which are purely I(1).

The ARDL model that includes the selected variables is shown in equation (1). According to the results of model selection with optimal lag based on AIC, the best model is the ARDL (2, 6, 6, 5, 6, 2, 2, 8) model. The diagnostic checks of the result are shown in Table 3. The results are fit reasonably and pass the diagnostic test for non-normal errors, serial correlation, heteroscedasticity, and model instability. The ARDL model is then tested for the existence of a long-run relationship by applying the bound test. The test results are presented at the bottom of Table 3.

Based on the F statistic (bound test), the F statistic is greater than the critical upper limit value at the 1% level, so the test results reject the null hypothesis. The meaning of these results is that there is a long-run relationship between the company stock price and its independent variables. The results of long-run parameter estimates are reported in Table 4.

In the long run, the stock price of the competitor company and the crude palm oil price have significant positive relationships with the company stock price. Meanwhile, soybean oil and sunflower oil prices have significant negative relationships with the company stock price. The

Table 3: ARDL Model Diagnostic Checks and Bounds Test of Cointegration

Diagnostic Elements	Statistical Value	Annotation
R^2	0.9577	
Adjusted R^2	0.9372	
F-Stat	46.7444***	*** *p*-value < 0.01
AIC	−2.0855	
SIC	−1.1144	
JB Stat	0.0192	
LM test *F*-stat (2,91)	1.4910	
Het. test *F*-stat (45,93)	0.9947	
CUSUM Test		Stable
F-statistic (Bound test)	6.4590***	*** significant at the 1% level and rejected H_0 (H_0: no levels relationship) Lower bound value = 3.31 Upper bound value = 4.63

Table 4: Long-Run Coefficients

Variable	Coefficient	Std. Error	*t*-statistic	Annotation
LCSP	0.7446***	0.0734	10.1493	*** *p*-value < 0.01, support the hypothesis of H_1 in the long run
LPCPO	1.2855***	0.1798	7.1492	*** *p*-value < 0.01, support the hypothesis of H_2 in the long run
LPSOY	−1.0794***	0.3567	−3.0260	*** *p*-value < 0.01, but does not support the hypothesis of H_3 in the long run
LPSUN	−0.9415***	0.2176	−4.3276	*** *p*-value < 0.01, support the hypothesis of H_4 in the long run
IR	−0.0403	0.0263	−1.5355	Does not support the hypothesis of H_5 in the long run
LER	−0.0986	0.4208	−0.2343	Does not support the hypothesis of H_6 in the long run
INF	0.0100	0.0185	0.5436	Does not support the hypothesis of H_7 in the long run

short-run parameter estimates are reported in Table 5. The results show that the price of soybean oil and inflation affect the stock price in the short run according to the expected sign. Although the other variables are statistically significant, the estimated sign is not following the hypothesis.

To complement the results, the model estimation also includes investigating the asymmetric effects of independent variables on stock prices. Following the methods and steps of Shin, Yu, and Greenwood-Nimmo (2014), the estimation results on the effect of asymmetry on stock prices are reported in Table 6. The results were obtained employing stepwise regression estimation. The effects of asymmetry in the short run were found in the variables of competitor stock price, palm oil price, soybean oil price, sunflower oil price, and the exchange rate on the company stock price. Generally, the effect of these variables works when they decrease. Meanwhile, the effect of asymmetry in the long run only occurs in the variable of the competitor stock price when it decreases. Other variables as a whole do not show any asymmetric effects because they are partially insignificant for both the direction at a *p*-value of 0.05.

Table 5: Results of ARDL Error Correction and Short-Run Coefficients

Variable	k	Sort-Run Coefficient	Wald *t*-stat	Annotation
Constant		5.5625***		*** *p*-value < 0.01
Trend		−0.0050***		*** *p*-value < 0.01
$\sum_{j=1}^{k}\phi_j\Delta\text{LOSP}_{t-j}$	1	−0.1711*		* *p*-value < 0.10
$\sum_{j=1}^{k}\beta_j\Delta\text{LCSP}_{t-j}$	5	−0.7186	−2.3677**	Does not support the hypothesis of *H*1 in the short run
$\sum_{j=0}^{k}\gamma_j\Delta\text{LPCPO}_{t-j}$	5	−0.8774	−1.7815*	Does not support the hypothesis of *H*2 in the short run
$\sum_{j=0}^{k}\delta_j\Delta\text{LPSOY}_{t-j}$	4	1.8082	2.3767**	Support the hypothesis of *H*3 in the short run
$\sum_{j=0}^{k}\varphi_j\Delta\text{LPSUN}_{t-j}$	5	1.3610	2.0864**	Does not support the hypothesis of *H*4 in the short run
$\sum_{j=0}^{k}\lambda_j\Delta\text{IR}_{t-j}$	1	0.0307	0.5886	Does not support the hypothesis of *H*5 in the short run
$\sum_{j=0}^{k}\rho_j\Delta\text{LER}_{t-j}$	1	1.8903	4.1247***	Does not support the hypothesis of *H*6 in the short run
$\sum_{j=0}^{k}\sigma_j\Delta\phi\text{INF}_{t-j}$	7	−0.1075	−2.4982**	Support the hypothesis of *H*7 in the short run
ECT_{t-1}		−0.6451***		*** *p*-value < 0.01

Table 6: Results of Short-Run (SR) and Long-Run (LR) Asymmetric Effects

Variable	Short-Run Coefficient	Wald *t*-stat for SR Asymmetric Effect	Long-Run Coefficient	Wald *t*-stat for LR Asymmetric Effect
LCSP^+	−0.0035	5.2916***	0.2533	−3.8525***
LCSP^-	0.8675***		0.3974***	
LPCPO^+	0.1098	4.5661***	−0.2940	−2.0482**
LPCPO^-	1.9418***		0.0464	
LPSOY^+	−0.0654	3.6179***	−0.6497	−2.6362***
LPSOY^-	2.3793***		−0.1405	
LPSUN^+	0.3122	1.4808	−0.4436	−1.4295
LPSUN^-	1.2138***		−0.0306	
IR^+	−0.1662	−0.5916	−0.1346	−1.5546
IR^-	−0.0821		0.0058	
LER^+	0.0871	2.3576**	−0.2341	−1.0755
LER^-	2.6765***		0.2321	
INF^+	−0.0320	−0.6319	−0.0789	−1.7836*
INF^-	−0.0012		−0.0476	

*** *p*-value < 0.01.
** *p*-value < 0.05.
* *p*-value < 0.10.

The results provide evidence in the short run that previous stock prices affect current stock prices. The stock price, which is reflected in the previous period stock price, shows an autocorrelation of stock prices that supports evidence that stock prices move not randomly. This result is in line with the findings of several previous studies including the study by Hawaldar, Rohit, and Pinto (2017).

In the long run, there is a significant positive relationship between the stock price of the company and the stock price of the competitor. There is a tendency for co-movement at the same time between two stock prices of companies in the same industry, in this case, the palm oil industry. This evidence is in line with the results of the study by Li and Zhao (2016) and the explanation of Pindyck and Rotemberg (1993). However, for the asymmetric effect, stock prices positively respond to the stock price of the competitor when they fall, both in the short and long run.

With the asymmetric effect, the price of palm oil has a positive effect on stock prices when the price falls in the short run. Under the symmetric assumption, the effect of palm oil prices on stock price only occurs in the long run. The company stock price has a positive relationship with the price of palm oil in the long run. In this case, the stock price reflects all available information, especially the increase in palm oil prices, which affects stock price. An increase in stock prices refers to an increase in the price of palm oil, which increases the company earnings and profitability and in turn increases investor expectations. However, a long-run relationship is much more important and meaningful in theory. These results confirm that the long-run positive relationship between commodity prices and producer company stock prices is robust. These results are in line with the findings of the studies conducted by Nordin and Ismail (2014), Nordin, Nordin, and Ismail (2014), and Alao and Oloni (2015).

The price of soybean oil negatively affects the company stock price in the long run. The estimation results do not support the previous hypothesis. It is assumed that the increase in the price of soybean oil will increase the stock price of soybean oil producers and have an inverse effect on the stock price of the palm oil company. According to Kiatmanaroch and Sriboonchitta (2014), there is still a dependence on imported soybeans from outside the ASEAN region, as well as problems with limited capacity and performance of soybean oil production in the ASEAN region. However, in the short run, the price of soybean oil has a positive effect and so it supports the hypothesis. The price of soybean oil only affects when its price decreases. An asymmetric effect is found in this relationship.

The price of sunflower oil has a negative effect on the stock price. These results support the hypothesis in the long run. When the price of sunflower oil rises, the demand for palm oil can fall, so that the price of palm oil falls. The decline in palm oil prices will reduce profitability so that the stock price will fall.

Of the selected macroeconomic variables, none of the variables have an effect on stock prices in the long run. In the long run, stock prices only respond to industry fundamentals, namely, competitor stock price and commodity prices. In the term of the aggregate stock price in the index, the findings of the relation between stock price and macroeconomic fundamentals can be different. For example, the Ditimi and Ifeoluwa (2018) study found evidence of a long-run relationship between macroeconomic fundamentals and stock price.

Meanwhile, in the short run, only inflation has a significant effect on stock prices. Stock prices respond negatively to inflation. Although the exchange rate is significant, it has a positive effect on stock prices and so it does not support the hypothesis. When the rupiah depreciates, it will only become a negative sentiment for the stock market and cause the company stock price to fall in the short run. However, the finding of the asymmetric effect is open to the possibility of empirical evidence of the effect of exchange rates on stock prices as the results of research by Dang, Le, Nguyen, and Tran (2020). Also, stock prices do not respond to interest rates in the short run and have no significant relationship in the long run. These findings are in line with the findings of a study by Vo (2019).

In line with the theory, the negative effect of inflation on stock prices has an economic meaning in the stock investment portfolio. This finding supports the previous hypothesis. This result is at least in line with the findings of Naik (2013), Epaphra and Salema (2018), dan Eldomiaty, Saeed, Hammam, and AboulSoud (2020). Inflation affects decreasing a company's stock price.

Finally, the ECT value is –0.6451, which means that stock prices converge to long-run equilibrium with 64.51 percent in one period through independent variables that have a relationship with them. Referring to Pesaran, Shin, and Smith (2001), the estimated equilibrium correction coefficient shows a reasonably quick correction of the equilibrium distortion of the company stock price in monthly dynamics.

5. Conclusions

The stock price does not move randomly because of influenced by the previous stock price in the short run. In the long run, the company stock price has a significant positive relationship with the stock price of competitor and the price of crude palm oil. However, the positive response of stock prices to the two variables only occurs asymmetrically, that is when they both fall especially in the short run. Competitor stock price has an asymmetric and significant effect on the downturn, both in the short and long run. The positive

effect of the competitor stock price supports the previous hypothesis. This result shows evidence of the effect of industry similarity, which leads to a co-movement between the two stock prices. Meanwhile, the positive effect of crude palm oil prices shows empirical evidence to support the hypothesis. The price of soybean oil only effects in the short run and has an asymmetric effect when the price falls. On the other hand, the price of sunflower oil only affects stock prices in the long run.

Of the selected macroeconomic variables only inflation has a significant negative effect on stock prices in the short run and has no significant relationship in the long run. Meanwhile, in the short run, the positive effect of the exchange rate occurs because the depreciation of the local currency becomes bad news and tends to be a negative sentiment for investors in determining stock prices. In the short run, market sentiment responds more quickly to changes in macroeconomic variables.

Investors need to always observe and evaluate industry and economic fundamental factors in investing in stocks, especially in palm oil companies. This consideration is important in forecasting future stock prices amid the dynamics of the macroeconomic environment. Meanwhile, the company needs to consider more industry and economic fundamentals, particularly the price dynamics of commodities and their competitors' products in management and decision making related to business development.

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