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UNVEILING THE DYNAMICS OF DOMESTIC PRICES OF CACAO BEANS IN INDONESIA

MENGUNGKAP DINAMIKA HARGA BIJI KAKAO DALAM NEGERI DI INDONESIA

Olivia Kristianti Kusuma[1], Jessica[2], Yohan Chandrasukmana[3], Ferry Vincenttius Ferdinand[4]

[1,2,3,4] *Department of Mathematics, Pelita Harapan University, Tangerang, Indonesia*

E-mail: olivia.kristianti@gmail.com[1], zhangjessica28@gmail.com[2], yohan.chandrasukmana@uph.edu[3], ferry.vincenttius@uph.edu[4]

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Correspondent

Olivia Kristianti Kusuma
olivia.kristianti@gmail.com

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ABSTRACT

This study is crucial for understanding the factors affecting cacao bean prices in Indonesia. Cacao is a vital commodity in the country's economy, and fluctuations in its price impact various stakeholders. By analyzing these factors, we can make informed decisions benefiting the government, industry, and cacao farmers. The purpose of this study is to analyze the domestic price of cacao beans in Indonesia. The dependent variable in this study is the domestic price of cacao in Indonesia, while the independent variables are volume of cacao bean exports, volume of cacao bean imports, global price of cacao beans, volume of domestic production of cacao beans, Rupiah to USD exchange rate, the federal reserve rate, Gross Domestic Product (GDP) annual growth rate of Indonesia, and export duties imposed on export of cacao beans. This research design utilizes time series data from 1996 to 2022 to analyze the factors influencing the domestic price of cacao beans in Indonesia. The results of the analysis show that the variables of the volume of cacao bean imports, the global price of cacao beans, Rupiah to USD exchange rate, and dummy variable for export duties imposed on export of cacao beans are significant affecting the domestic price of cacao. While volume of cacao bean exports, the federal reserve rate, volume of domestic production of cacao beans and GDP annual growth rate of Indonesia are not significant. The non-significance of volume of cacao bean exports, the federal reserve rate, volume of domestic production of cacao beans, and GDP annual growth rate could be caused by weak relationships, multicollinearity, data issues, or model specification limitations.

INFO ARTIKEL

Koresponden
Olivia Kristianti Kusuma
olivia.kristianti@gmail.com

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Website:
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ABSTRAK

Studi ini penting untuk memahami faktor-faktor yang memengaruhi harga biji kakao di Indonesia. Kakao adalah komoditas penting dalam ekonomi negara ini, dan fluktuasi harganya memengaruhi berbagai pihak terkait. Dengan menganalisis faktor-faktor ini, kita dapat mengambil keputusan yang tepat untuk kepentingan pemerintah, industri, dan petani kakao. Tujuan penelitian ini adalah untuk melakukan analisis terhadap harga domestik biji kakao. Variabel dependen dalam penelitian ini adalah harga domestic biji kakao di Indonesia, sedangkan variabel independennya adalah volume ekspor biji kakao, volume impor biji kakao, harga dunia biji kakao, volume produksi domestik biji kakao, nilai tukar Rupiah ke USD, suku bunga The Fed, pertumbuhan ekonomi setiap tahun di Indonesia, dan bea cukai keluar barang. Hasil analisis menunjukkan bahwa variabel volume impor biji kakao, harga dunia biji kakao, nilai tukar USD ke Rupiah, dan bea cukai keluar barang berpengaruh signifikan terhadap harga domestik biji kakao. Sedangkan volume ekspor biji kakao, suku bunga The Fed, volume produksi domestik biji kakao dan pertumbuhan ekonomi setiap tahun di Indonesia tidak signifikan harga domestik kakao. Tidak signifikannya volume ekspor biji kakao, suku bunga The Fed, volume produksi domestik biji kakao dan pertumbuhan ekonomi setiap tahun bisa disebabkan oleh hubungan yang lemah, multikolinearitas, masalah data, atau keterbatasan spesifikasi model.

INTRODUCTION

In the past decade, the cacao industry has witnessed significant changes in terms of price fluctuations, production, and global trade dynamics. As one of the world's largest cacao producers, Indonesia plays a key role in the global cacao ecosystem. In 2022, the country managed to rank third in the world's cacao production with a total output of 739,483 tons, a feat that places it behind Ivory Coast and Ghana (Ghosh, 2022). This placement not only highlights Indonesia's national production capacity but also underscores the importance of cacao to the country's economy.

Despite Indonesia's achievements as one of the world's cacao production giants, the national cacao industry is facing an alarming phenomenon: a continuous increase in domestic cacao prices. This upward trend threatens the sustainability of the industry, potentially impacting both farmers' profits and the competitiveness of downstream chocolate producers. A swift investigation into the factors driving this price surge is crucial to ensure the long-term health of the Indonesian cacao sector

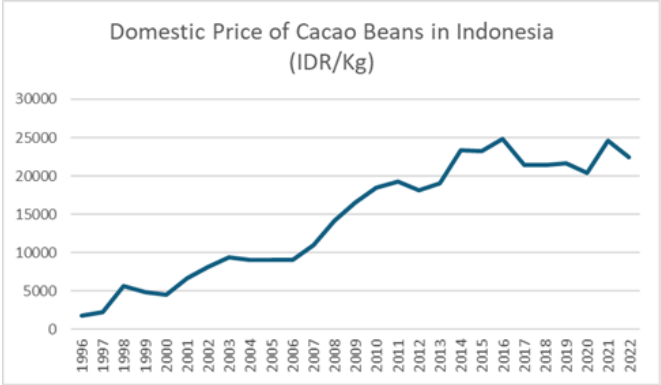

Figure 1. Domestic Price of Cacao Beans in Indonesia (IDR/Kg)
Source: Statistics Indonesia (https://www.bps.go.id/en)

Cacao prices in the domestic market experience ups and downs that are influenced by various economic factors. Therefore, by employing a time series analysis of data from 1996 to 2022, this study will explore the influence of several key economic variables on the rise and fall of cacao prices in Indonesia. This analysis will provide valuable insights for policymakers and industry stakeholders to develop strategies that promote price stability and ensure the continued success of the Indonesian cacao industry.

Literature Review

Domestic prices are the prices of goods and services prevailing in a country's domestic market (Sukirno, 2013). The domestic price of cacao is influenced by various economic factors, both domestic and foreign. These factors are interrelated and can cause complex changes in cacao prices. Understanding the factors that influence the domestic price of cacao in Indonesia requires an exploration of several interrelated variables. Each variable contributes to the complex dynamics of the cacao market, and their impacts are well-documented in economic literature.

Firstly, the volume of cacao bean exports and imports plays a crucial role in determining domestic prices through the basic principles of supply and demand. Higher export volumes can lead to reduced domestic supply, thereby pushing prices up if domestic demand remains constant (Gilbert, 2010). Conversely, increased import volumes can help stabilize or even lower domestic prices by augmenting the domestic supply of cacao beans (Abbott, 2009).

The global price of cacao beans is another significant factor, as fluctuations in these prices directly affect domestic markets. Variations in global prices can ripple through to domestic markets, affecting the behavior of both producers and the broader market (Frankel, 2005). This linkage is pivotal for commodities like cacao that are heavily traded on international markets. Domestic production levels also impact domestic cacao prices, where higher production can lead to lower prices and vice versa. Agricultural outputs, including cacao, are highly sensitive to factors such as weather conditions and farming practices, which in turn influence pricing (Mendelsohn, 2009).

Exchange rates and economic policies further complicate the price dynamics. The Rupiah to USD exchange rate affects the cost of cacao imports and the revenue from exports, illustrating how currency volatility can significantly impact trade and

commodity prices (Frankel, 2005). Additionally, the Federal Reserve rate in the U.S. influences global financial markets and economic activity, which can affect commodity prices including those of cacao (Caceres et al., 2016).

Furthermore, Indonesia's economic environment, indicated by its GDP growth rate, affects consumer demand for cacao. Economic growth influences consumer purchasing power, which can lead to increased demand for goods like cacao, potentially driving prices (Loayza & Raddatz, 2007). Finally, government policies such as export duties have a direct impact on the cacao industry. Export duties can increase domestic supply by making exports less profitable, thereby potentially reducing domestic prices. Such policies can also affect the global competitiveness of Indonesian cacao (Putri & Khairati, 2014).

Each of these variables interlinks to create a complex web of influences on the domestic price of cacao in Indonesia, necessitating a comprehensive and nuanced analysis to understand their collective impact. It was found from the research that export duties imposed on export of cacao beans have a significant effect on the domestic price of cacao (Putri & Khairati, 2014). This paper will examine 8 variables that affect domestic cacao prices, namely volume of cacao bean exports, volume of cacao bean imports, global price of cacao beans, volume of domestic production, Rupiah to USD exchange rate, the federal reserve rate, GDP (Gross Domestic Product) annual growth rate of Indonesia, and dummy variable for export duties imposed on export of cacao beans. By conducting research, it is expected to answer the paper's claim plus other variables.

RESEARCH METHOD

This research aims to analyze the different factors that influence the domestic price of cacao beans in Indonesia from 1996-2022. The research utilized quantitative data sourced from the Central Bureau of Statistics Indonesia, The Ministry of Agriculture Indonesia, and the World Bank. The data from the years 1996-2022 is in the form of discrete time series. Where time series refers to a collection of data that are taken at a particular time *t* (Brockwell & Springer, 2002). The method of analysis for this research is quantitative using multiple regression analysis with Ordinary Least Squares (OLS) regression, utilizing Eviews 10 as the analytical tool.

Research Terminology

OLS refers to a regression method that minimizes the square error, $\sum e_i^2$. (Sofia Yanti, 2010). This method holds several assumptions and when these assumptions are fulfilled, this method poses as a robust mathematical model to estimate the parameters of a regression model.

The assumptions of a multivariate linear regression are as follows (Gujarati & Porter, 2009).

1. Variance of the error term is constant (homoscedasticity)
2. Zero correlation between the error term and each independent variable.
3. No collinearity between the independent variables.
4. Errors are normally distributed.

This method is chosen for this research due to its simplicity and ability to determine the strength as well as the nature of the relationship between the dependent

variable. To demonstrate the relationship between domestic prices and the influencing factors, the multicollinear linear regression equation is as follows:

$$DP = \beta + \alpha_1 V_{exp} + \alpha_2 V_{imp} + \alpha_3 W_{price} + \alpha_4 Pd + \alpha_5 E_x + \alpha_6 GDP + \alpha_7 D_{dut} + \alpha_8 Fed + \varepsilon_0$$

Where

DP	: Domestic price of cacao beans in Indonesia
β	: Constant
$\alpha_1, \alpha_2, \dots, \alpha_8$	: Regression equation coefficients
V_{exp}	: Volume of cacao bean exports (Ton)
V_{imp}	: Volume of cacao bean imports (Ton)
W_{price}	: Global price of cacao beans (USD/Kg)
Pd	: Volume of domestic production of cacao beans (Ton)
E_x	: Exchange rate (IDR/USD)
GDP	: GDP annual growth rate of Indonesia
D_{dut}	: Dummy variable for export duties imposed on the export of cacao beans. 0 representing the year without the enforcement of the policy (before 2010), 1 representing when the policy is enforced (2010 onwards)
Fed	: The Federal Reserve Rate
ε_0	: Error term

Test of Classical Assumptions

a) Multicollinearity Test

A multicollinearity test is required to see if there exists a linear correlation between the independent variables in a regression model. There are a few methods for this test, and the test conducted in this research is the Variance Inflation Factors (VIF) test. Conclusions can be drawn from its respective centered VIF values. To satisfy the assumption of negligible collinearity, values should be lower than 10 (Gujarati & Porter, 2009).

b) Normality Test

The utilized test is the Jarque-Bera (JB) test of normality. This method first determines the skewness and kurtosis of the OLS residuals and follows the following equation:

$$Jarque\ Bera = n\left[\frac{S^2}{6} + \frac{(K-3)^2}{24}\right]$$

Under the null hypothesis:

H_0 = Residuals are normally distributed

H_1 = Residuals are not normally distributed

When the probability is greater than 0.05, we can conclude that the residuals are normally distributed.

c) Autocorrelation Test

The autocorrelation test is used to see the correlation between time series data. The test utilized in this research is the Breusch-Godfrey LM test. This test follows the null hypothesis.

H_0 = The model has no autocorrelation

H_1 = The model has autocorrelation

When the f probability is greater than 0.05, we can conclude that the model has no autocorrelation between the data and passes the autocorrelation test.

d) Heteroscedasticity Test

The test used is the Glejser test and the result is determined from the F statistic probability. This test follows the null hypothesis:

H_0 = The model has homoscedasticity

H_1 = The model has heteroscedasticity

When the probability is greater than 0.05, we can conclude that the the model passes the heteroscedasticity test

HASIL DAN PEMBAHASAN

Regression Analysis Results

Table 1. OLS Regression Analysis Results

Dependent Variable: DP
Method: Least Squares
Date: 03/21/24 Time: 19:02
Sample: 1996 2022
Included observations: 27

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-6276.410	2189.088	-2.867135	0.0102
DDUT	3665.946	985.2160	3.720956	0.0016
EX	0.843360	0.135033	6.245580	0.0000
FED	-310.4317	216.4886	-1.433940	0.1687
GDP	86.23953	62.73860	1.374585	0.1861
PD	0.000249	0.003295	0.075576	0.9406
VIMP	0.009091	0.004042	2.249309	0.0372
VEXP	0.001066	0.004471	0.238461	0.8142
WPRICE	4232.817	702.3707	6.026471	0.0000

R-squared	0.984415	Mean dependent var	14467.81
Adjusted R-squared	0.977488	S.D. dependent var	7594.128
S.E. of regression	1139.422	Akaike info criterion	17.17563
Sum squared resid	23369100	Schwarz criterion	17.60758
Log likelihood	-222.8710	Hannan-Quinn criter.	17.30407
F-statistic	142.1176	Durbin-Watson stat	2.462587
Prob(F-statistic)	0.000000		

Source: Data Results of Eviews 10

The observed F statistic is found to be 142.1176 where $F_{obs}(142.1176) > F_{table}(2.89)$ at 5% significance level. Therefore, we can conclude that the regression model is significant. Furthermore, the probability of the f-statistic is 0.0000, which is smaller than 0.05, therefore we can conclude that the independent variables have a partial and siginificant effect on the domestic price of cacao beans. The R^2 value of the estimated regression model is 0.984415 which implies that the independent variables in the regression model account 98.4415% of the changes that occur with the domestic price of cacao beans in Indonesia. Based on the regression model, among the 8 independent variables, four exhibit a significant impact on the domestic price of cacao beans: import volume, world price, exchange rate, and export duties.

The volume of import variable is observed to have a p-value of 0.0372 and a coefficient of 0.009091. As the p-value is smaller than 0.05, this represents that the volume of imports has a significant effect on the change in domestic prices. It also implies that an increase of 1 ton in exports result in a 0.009091 increase in the domestic price of cacao beans.

The world prices variable is observed to have a p-value of 0.0000, less than 0.05, and a coefficient of 4232.817 thus concluding that the world prices of cacao beans have a significant effect on the domestic price, with an increase in $1 in world prices will result in an increase of Rp 4.323,817 on the domestic price of cacao beans. Likewise, the foreign exchange rate is also observed to have a p-value of 0.0000 and a coefficient of 0.843360. This suggests a substantial impact of the IDR/USD exchange rate on domestic prices, indicating that a one-unit increase in the exchange rate corresponds to a 0.43360 increase in domestic prices.

Conversely, the production variable has a p-value of 0.9406 and a coefficient of 0.000249. A p-value greater than 0.05 concludes that there is not enough evidence to reject the null hypothesis. This indicates that the volume of production of cacao beans is positively correlated but not significant to the change in domestic prices and an increase in 1 ton of production will result in an increase of 0.000249 in domestic prices. The GDP variable has a p-value of 0.1861 and a coefficient of 86.23953. This implies that the annual growth rate of GDP does not have a significant effect on the domestic price and an increase of 1 percent in annual GDP will result in an increase of 86.23953 in domestic prices. The Fed variable has a p value of 0.1687 and a coefficient of -310.4317. This shows that the interest rate has a negative relationship with the prices of cacao beans however not significant. This result also indicates that with an increase of 1% in the Fed interest rate, will cause a decrease of 310.4317 in domestic prices.

Table 2. OLS Regression Analysis Results in Significant Variable

Dependent Variable: DP
Method: Least Squares
Date: 03/26/24 Time: 14:38
Sample: 1996 2022
Included observations: 27

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-8177.066	1319.848	-6.195460	0.0000
DDUT	3762.833	896.0956	4.199143	0.0004
EX	0.883975	0.129815	6.809494	0.0000
WPRICE	5045.126	544.9184	9.258498	0.0000
VIMP	0.008879	0.004063	2.185234	0.0398

R-squared	0.978954	Mean dependent var	14467.81
Adjusted R-squared	0.975127	S.D. dependent var	7594.128
S.E. of regression	1197.682	Akaike info criterion	17.17974
Sum squared resid	31557731	Schwarz criterion	17.41971
Log likelihood	-226.9265	Hannan-Quinn criter.	17.25110
F-statistic	255.8281	Durbin-Watson stat	2.253486
Prob(F-statistic)	0.000000		

Source: Data Results of Eviews 10

By eliminating the insignificant variables and re-running the model, this research concludes that the domestic price of cacao beans follows the following regression equation:

$$DP = -8177.066 + 0.0088791V_{imp} + 5045.126W_{price} + 0.883975E_x + 3762.833D_{dut}$$

To conclude that the regression model has best linear unbiased estimators and is able to give and conclude the required results, a test of classical assumptions is to be done.

Test of classical assumptions

a. Multicollinearity test

Table 3. Multicollinearity Test Results for VIF Testing

Variance Inflation Factors
Date: 03/26/24 Time: 14:42
Sample: 1996 2022
Included observations: 27

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	1741999.	32.78903	NA
DDUT	802987.3	7.277278	3.773403
EX	0.016852	37.85786	2.985120
WPRICE	296936.1	27.57050	2.318920
VIMP	1.65E-05	5.683912	2.897480

Source: Data Results of Eviews 10

From the table 3, it is shown that all four variables have centered VIF below 5. Thus, from this test we can conclude that the model is free from multicollinearity.

b. Normality Test

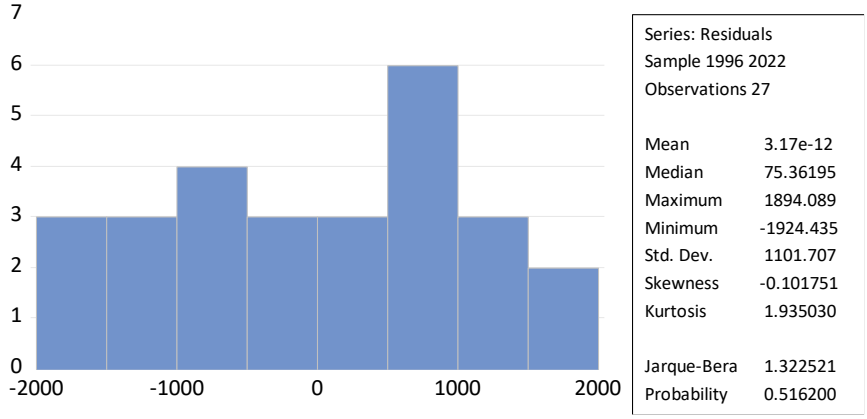

Figure 2. Normal Test Results for JB Test
Source: Data Results of Eviews 10

The estimated Jarque-Bera probability from the table above is 0.516200 which is larger than 0.05, indicating that there is not enough evidence to reject the null hypothesis and conclude that the model has residuals that follow the normal distribution.

c. Autocorrelation Test

Table 4. Breusch-Godfrey LM Test Results

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 2 lags

F-statistic	0.421941	Prob. F(2,20)	0.6615
Obs*R-squared	1.093117	Prob. Chi-Square(2)	0.5789

Source: Data Results of Eviews 10

From table 4, the observed f probability is 0.516200 which is greater than 0.05. This thus concludes that the model does not not have autocorrelation.

d. Heteroscedasticity Test

Table 5. Glejser Test Heteroscedaticity Test Results

Heteroskedasticity Test: Glejser
Null hypothesis: Homoskedasticity

F-statistic	0.696195	Prob. F(4,22)	0.6027
Obs*R-squared	3.033681	Prob. Chi-Square(4)	0.5522
Scaled explained SS	1.765388	Prob. Chi-Square(4)	0.7788

Source: Data Results of Eviews 10

From table 5, the probability is 0.6027 which is greater than 0.05, thus this concludes that the model has homoscedasticity.

Hence, this model satisfies all classical assumptions, absence of multicollinearity and autocorrelation. Additionally, it exhibits homoscedasticity with residuals conforming to a normal distribution.

Discussion

This research indicates that imports do have a significant effect on domestic prices. From Figure 2 shown below, there has been a constant uptrend in domestic from the year 1996-2020. Various factors contribute to the rise in domestic prices, including an upsurge in domestic demand, particularly within the processed cacao beans sector. This sector encompasses products such as cacao powder, cacao paste, and cacao butter where exports of these products experienced notable growth, with cacao powder, cacao paste, and cacao butter exports increasing by 11.35%, 12.89%, and 11.96%, respectively, from 2010 to 2020 (Suryana et al., 2022).

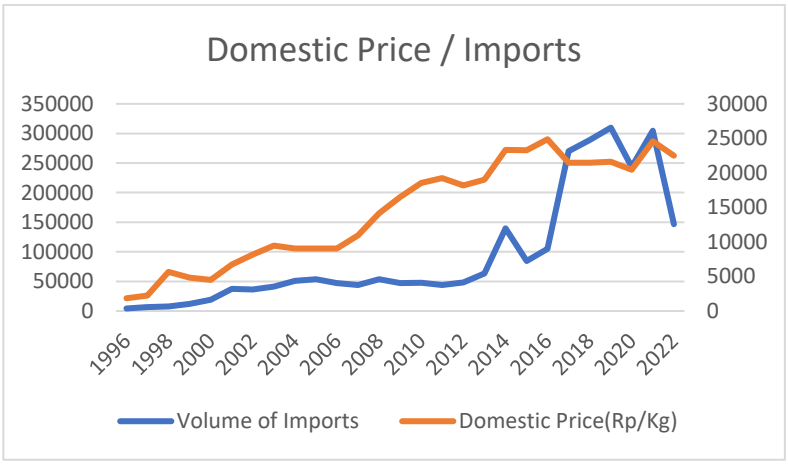

Figure 3. Domestic Price / Imports

Source: Statistics Indonesia (https://www.bps.go.id/en)

The volume of exports variable on the other hand is observed to have a p value of 0.8142 and coefficient of 0.001066. Thus, it concludes that the volume of exports of cacao beans does not have a significant effect on the domestic price. This is due to the implementation of export duties that have a very significant effect on the domestic prices as seen from its p-value of 0.0016. This result aligns with previous research that concluded that export duty has a significant effect on the domestic price and show (Putri & Khairati, 2014b). This has proven to have lowered the incentives to import cacao beans with increasing cost and would shift to increase production of processed cacao goods. Since the implementation of export duties in

April 2010, the production of processed cacao beans had increased from 20% in the year 2005-2010 to 41% after 2010 (Syadullah, 2012).

Moreover, the domestic price of cacao beans is also significantly influenced by global prices. This aligns with the macroeconomic theory of international trade on domestic and world prices. This theory states that when a country's economy is open to international trade given that the world price is above the domestic price, it would be more profitable for exporters to increase their prices and eventually become in equilibrium with the world prices (Krugman & Wells, 2015). [1]An illustrative instance occurred in August 2018 when global prices surged to $2,364 per ton. Soetanto Abdoellah, Chairman of the Indonesian Cacao Council, noted that this uptick in global prices would prove advantageous for the domestic cacao industry, leading to an increase in the domestic price from an average of Rp 27,000 to Rp 30,500 the subsequent month.

Similar to the fluctuation in global prices, a rise in exchange rate implies an increase in the price of the commodity from the domestic viewpoint, hence explaining the positive correlation between the two variables. Similarly, based on the findings of this research suggest that there is no significant relationship between the domestic price and volume of production. This outcome aligns with the research conducted by (Gultom et al., 2023) that concluded that the domestic price of CPO is not affected significantly by the volume of production.

Furthermore, it can be inferred that the annual GDP growth rate does not significantly impact domestic cacao bean prices. Though by macroeconomic definition, the Gross Domestic Product refers to the total value of all final goods and services produced in an economy (Krugman & Wells, 2015), this could signify that there had been an increase in domestic prices that includes the domestic price of cacao beans. However, it is important to recognize that cacao beans represent just one among numerous commodities in Indonesia's market landscape. Moreover, GDP is subject to various influences including inflation and government policies, highlighting that fluctuations in annual GDP may not necessarily directly correlate with changes in domestic prices.

Ultimately, it can also be concluded that the Fed interest rate does not have a significant relationship with domestic cacao bean prices. This negative correlation is consistent with the macroeconomic theory when interest rates rise, the demand for money increases and the incentive to invest in the domestic cacao industries decreases. This also indicates that it has become more expensive to loan money and dampen consumer spending, consequently increasing domestic prices. The insignificance of the Fed variable can be explained by previous research conducted by (Luter Purba et al., 2023), which concludes that the change in the Fed interest rates does not necessarily correlate directly with the change in the BI reference interest rates. The BI interest rate on the other hand is concluded to have a significant effect on the circulation of money and affects consumption as well as investment.

[1] Maulida, A. (2018, August 27). Terkerek harga global, kakao domestik dikisaran Rp 30 ribu per kg. Kontan. https://industri.kontan.co.id/news/terkerek-harga-global-kakao-domestik-dikisaran-rp-30-ribu-per-kg

CONCLUSION

Through this study, it can be concluded that the domestic price of cacao can be influenced by various economic factors, both from within the country and abroad. External factors such as the volume of cacao bean imports, global price of cacao beans, Rupiah to USD exchange rate, and export duties imposed on export of cacao beans can significantly affect the domestic price of cacao. However, other external factors such as volume of cacao bean exports and The Federal Reserve rate do not affect the domestic price of cacao. On the other hand, internal factors such as volume of domestic production of cacao beans and GDP annual growth rate of Indonesia also do not affect the domestic price of cacao. Further analysis with different models and additional variables such as processing capacity and regional data can equip policymakers with valuable insights for crafting targeted policies like strategic stockpiling, export duty adjustments, and domestic processing investments, ultimately promoting industry stability.

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