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Indonesia's Cocoa Export Trends (Comprehensive Analysis of Production, Inflation, and Exchange Rates)

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ABSTRACT— Indonesia would have ranked as the world's sixth-largest cocoa producer and third-largest cocoa exporter. Unfortunately, Indonesia's cocoa exports have fluctuated over the past 30 years. An improvement in cocoa exports should be supported by an increase in domestic cocoa production. However, an increase in cocoa production does not necessarily increase the value of cocoa exports if other factors, such as inflation and exchange rate stabilization, do not support it. This study aims to analyze the role of production, inflation, and exchange rate fluctuations on cocoa exports to optimize Indonesian cocoa exports. The analysis method uses the ARDL model to analyze the relationship and short-term and long-term influence among variables. The results show that the dominant variable affecting cocoa exports is the exchange rate variable. Therefore, efforts are needed to strengthen exchange rates and exchange rate risk management, change marketing strategies and partnerships, and maintain and expand export markets.

KEYWORDS: Cocoa export performance, overconfidence, financial assets

1. INTRODUCTION

The agricultural sector holds a significant position in Indonesia's economic landscape, exemplified by its substantial contribution to the Gross Domestic Product (GDP), accounting for approximately 13.28% in 2021 [3], [10], [15]. This places it second only to the Manufacturing sector, which comprises 19.25% of the GDP. One of the substantial sub-sectors with promising potential is the plantation sub-sector [19]. In 2021, this sub-sector contributed 3.94% to the total GDP and an impressive 29.67% to the Agriculture, Forestry, and Fisheries sector, ranking it first within this sector. A key product within the plantation sub-sector that significantly bolsters the nation's income through its export value is cocoa [1]. Indonesia stands as the 6th largest cocoa producer globally. Cocoa is among the top three export commodities in Indonesia, alongside oil and gas [5]. The export potential of cocoa in tropical countries like Indonesia is highly promising. According to Databoks data, in 2020, Indonesia was the world's thirdlargest cocoa producer, following Ivory Coast and Ghana, with Nigeria and Cameroon in the 4th and 5thpositions, respectively. This ranking establishes Indonesia as the sole Southeast Asian country and one outside of Africa among the world's top five largest chocolate-producing nations. The primary destinations for cocoa exports include Malaysia, Singapore, the United States, China, Brazil, India, Thailand, the Netherlands, Italy, and Germany. Notably, Germany controls 98.63% of Indonesia's cocoa exports Click or tap here to enter text.. The graph below illustrates Indonesia's cocoa export values over the past 30 years.

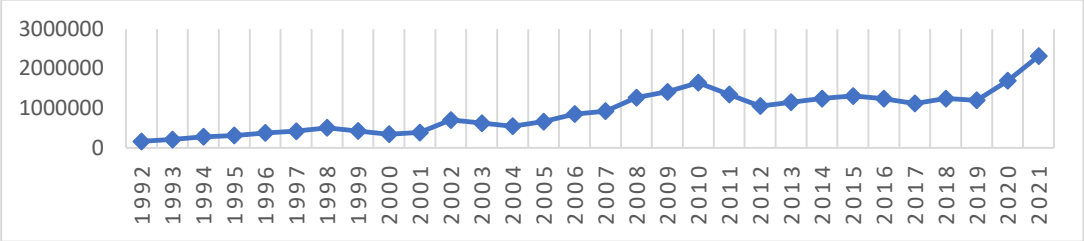

Figure 1 Cocoa Export Growth in Indonesia from 1992 to 2021

Based on the chart above, it's evident that the export value of cocoa has shown fluctuations over the last three decades. Despite Indonesia's position as the world's third-largest cocoa supplier, the consistent variability in export value highlights the instability of cocoa export performance. Achieving a consistent improvement in export performance is an indicator of enhanced competitiveness, which is crucial for a prosperous business sector within a country. Therefore, ensuring the enhancement and stability of exports is of utmost importance, especially for developing nations like Indonesia, as international trade, particularly exports, plays a pivotal role in boosting Indonesia's economic productivity [14]. When export performance is unstable, it can potentially reduce the country's foreign exchange revenue and hinder economic growth.

The fluctuation in cocoa export value is influenced by various factors, with cocoa production being one of the key contributors. An upswing in cocoa exports is closely correlated with the growth of domestic cocoa production. As local production increases, exports tend to follow suit [12]. The following chart illustrates the trajectory of cocoa production in Indonesia over the past 30 years.

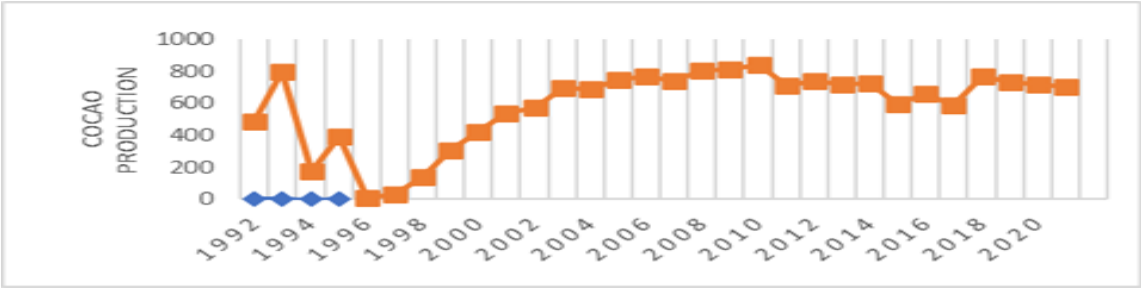

Figure 2 Cocoa Production in Indonesia from 1992 to 2021

According to Figure 2, it's evident that cocoa production in Indonesia has also exhibited fluctuations. A notable drop occurred in 2017, plummeting to 585,246 tons. This decline was primarily due to the diminishing availability of agricultural land, driven by factors such as population growth, industrial development, and the allocation of land for public facilities.

However, the data from both Figure 1 and Figure 2 reveal a disparity with the theory proposed by Ghozy (2017), which posits a positive correlation between exports and production. Over the past three decades, this theory doesn't hold for cocoa, as there were instances where cocoa production declined, yet cocoa exports increased, as observed in 2015, 2017, and 2020. Conversely, in 2017, when cocoa production dropped, cocoa exports increased. These discrepancies emphasize the need for further research to comprehend the short-term and long-term relationships and influences between cocoa production and cocoa exports. This understanding is essential for the formulation of policies aimed at optimizing Indonesia's cocoa exports. Besides production conditions, changes in Indonesia's cocoa export value can also be influenced by price equilibrium. The extent of domestic inflation has a bearing on cocoa prices. In theory, when inflation rises, production costs increase, leading to higher domestic cocoa prices [7]. When domestic pices surpass international prices, the product

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becomes more profitable in the domestic market, ultimately resulting in a reduction in exports [16].

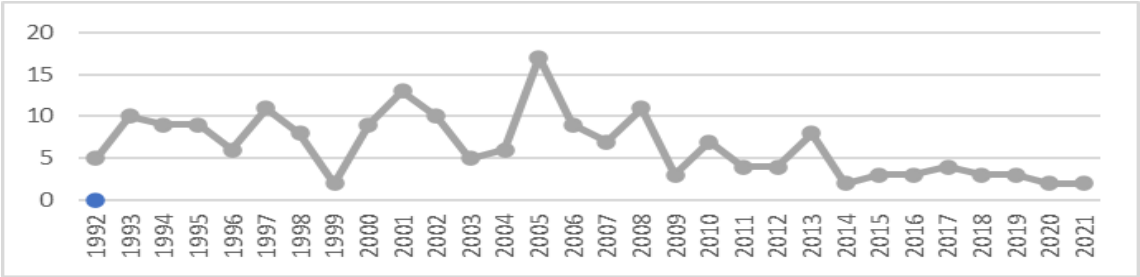

Figure 3 Inflation in Indonesia from 1992 to 2021

In Figure 3, it is evident that inflation has also displayed fluctuations over the past three decades. Notably, in 2020, there was a significant decrease, falling to 1.68%. Figure 1 and Figure 3 seem to suggest that when domestic inflation decreases (indicating a drop in cocoa prices), there should logically be an increase in cocoa exports. However, as indicated in Figure 1, a reduction in inflation does not necessarily translate to higher cocoa exports; in fact, cocoa exports tend to decline. Conversely, when inflation increases, theoretically causing production costs to rise and prices to escalate, cocoa exports do not necessarily decrease. For instance, in 2005 and 2013, when inflation increased, cocoa exports also increased. This situation contradicts the findings of Wardana (2012), who posited that increased inflation in a country would make domestically produced goods more competitive, resulting in a decrease in exports. Inflation leads to fluctuations in the prices of production factors. Increasing inflation affects the higher production costs of cocoa, making it challenging for producers to maximize their production, ultimately reducing the volume of cocoa produced. This decrease in cocoa production directly impacts the ability to export since exporting commodities requires substantial costs. Therefore, there exists a negative relationship between inflation and cocoa exports. Study conducted by Berata & Setiawina (2017) also concludes that inflation has a negative and significant impact on Indonesia's cocoa exports. This aligns with the theory that lower inflation is conducive to enthusiasm in cocoa purchases (Berata & Setiawina, 2017). However, research by Yatik (2018) suggests that inflation in Indonesia has a positive relationship with cocoa exports [12]. The positive influence of inflation on cocoa bean exports occurs because rising inflation escalates cocoa processing production costs, causing the cocoa processing industry to stagnate. This, in turn, leads to decreased domestic demand for cocoa, resulting in increased cocoa exports. These varying results underscore a phenomenon that necessitates further research on the impact of inflation on cocoa exports using dynamic models and ARDL approaches. In addition to production and inflation, the exchange rate of the Indonesian Rupiah against the US Dollar also plays a pivotal role in determining the value of cocoa exports. Globalization has intensified international interactions among countries, heavily influenced by each nation's interests in catering to the needs of others. The exchange of goods between countries hinges on exports, which, in turn, depends on the choice of currency for international trade, with the US Dollar being a primary preference. The use of the US Dollar leads to fluctuations in the exchange rate of the Rupiah against the Dollar over time, which can entail risks associated with currency exchange rate uncertainty. Depreciation in the exchange rate results in foreign currencies having a more favorable exchange rate, thereby stimulating an increase in exports. However, a different scenario unfolded in 2016, where a decline in the exchange rate coincided with a decrease in cocoa exports. This discrepancy contradicts the theory. Consequently, further comprehensive research is necessary to examine the consistency of the theory regarding the association between the exchange rate and cocoa exports, particularly for cocoa commodities, to optimize cocoa exports.

The conditions and dynamics of cocoa exports in Indonesia are intriguing subjects to explore, as cocoa is a pivotal component of Indonesia's economy. The fluctuations in cocoa export values over the years signify

suboptimal export performance in the global market. Therefore, in-depth research is needed to analyze the variables responsible for these fluctuations. This research concentrates on evaluating how cocoa production performance impacts cocoa exports in both the short and long term. Additionally, this study will investigate the influence of inflation and exchange rate fluctuations on cocoa exports in Indonesia, both in the short and long term.

2. The Theoretical

Inflation Fluctuations and Cocoa Exports in Indonesia

When inflation, which denotes the increase in the prices of goods and services within a country, escalates, it typically leads to a rise in domestic supply and exports. Conversely, when inflation decreases, domestic supply and exports tend to decrease as well [4], [6], [9]. The reason behind this lies in the fact that rising inflation prompts an increase in prices in the domestic market, subsequently driving up production costs. The impact of inflation on cocoa exports from Indonesia is both negative and significant. Consequently, an upsurge in inflation has an adverse effect on exports [4]. In situations where a country experiences inflation, products manufactured within that country may lose their competitive edge in international markets, resulting in a decline in exports. This is primarily due to the increasing cost of domestic goods, which, in turn, places constraints on producers, making it difficult for them to maximize their production capacity [13].

Moreover, inflation can create a ripple effect, extending its influence on various facets of the economy, including production and consumer behavior. When inflation is on the rise, production costs typically increase, which can lead to a reduction in the quantity of goods produced, including cocoa. The escalating costs make it challenging for producers to maintain or expand their output. In the context of cocoa exports, this limitation in production may result in decreased availability for international trade, subsequently impacting the overall volume of cocoa exports from Indonesia.. Furthermore, inflation can affect consumer purchasing power, which, in turn, can influence demand for cocoa products. When consumers face higher prices due to inflation, their ability to afford cocoa-based products may diminish, potentially leading to reduced consumption, both domestically and abroad.

Exchange Rate Fluctuations and Cocoa Exports in Indonesia

The exchange rate serves as a pivotal indicator within the realm of economics, determined by the interplay of supply and demand for currency in international trade, as it essentially functions as a medium for conducting international transactions. In the context of Indonesia's cocoa exports, the exchange rate can wield a substantial influence. When the exchange rate undergoes depreciation, indicating a decrease in the value of the country's currency, foreign currencies gain strength in terms of exchange rates. This phenomenon often results in an uptick in exports [20]. Thus, the exchange rate is intricately intertwined with cocoa exports in Indonesia. A concurrent study conducted by I Kadek Edi Wirya Berata and Nyoman Djinar Setiawina in 2017 substantiated the correlation between the exchange rate and exports. As mentioned by Arifin, as cited in Priyono (2019), the value of a nation's currency is a compelling factor that exerts a profound influence on export decisions. The magnitude of a currency functions as a yardstick for comparing the prices of goods and services in the realm of international trade. Given the dynamic nature of a country's economic landscape, the actual worth of its currency can fluctuate. Currency values may either depreciate, signifying a decrease, or appreciate, indicating an increase, rendering the exchange rate a crucial consideration for countries engaged in export activities.

Research conducted by Setyorani in 2018 yielded a significant conclusion regarding the impact of a country's currency on Indonesia's export growth. In many developing countries, long-term export activity tends to exert

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a negative influence on the exchange rate [17]. However, in the short term, the exchange rate typically exhibits a tendency to weaken. This intricate relationship between the exchange rate and exports underscores the need for policymakers and stakeholders to comprehensively analyze and consider currency dynamics when formulating strategies for enhancing cocoa exports in Indonesia. It highlights the importance of aligning exchange rate policies with the goal of optimizing international trade in cocoa commodities.

Cocoa Production and Export Performance in Indonesia

Production is the process of transforming raw materials into finished goods and has a direct impact on the export supply to foreign markets. When production increases, it often leads to an increase in export offerings to foreign countries [2]. Higher production levels typically occur when there is an increased demand for exports, and this production is allocated to meet foreign demands. Conversely, when production experiences a decline, export supplies tend to decrease. Consequently, greater production capacity generally leads to more significant export volumes [12]. The consistent increase in cocoa bean production each year has a notable impact on Indonesia's processed cocoa exports, even if the increment is not always substantial. This trend highlights the desirability of cocoa as a commodity with unique and distinct flavors in the international trade market. The high desirability of cocoa makes it essential for the Indonesian government to scrutinize the factors that can stimulate export performance and enhance competitiveness on the global stage [19]. The fascination with cocoa's value should prompt the Indonesian government to delve into various factors that can invigorate export performance and bolster the nation's international competitiveness. Cocoa's distinctive flavor and global appeal signify an opportunity for Indonesia to further explore strategies to maximize its cocoa exports, allowing the nation to capitalize on this valuable commodity and its potential in international trade. By studying the dynamics of cocoa production and export, Indonesia can develop policies and initiatives to maintain and enhance its position as a significant player in the global cocoa market. Understanding the relationship between production and exports is vital for shaping a sustainable and successful cocoa industry in Indonesia.

3. The Theoretical Model

This research employs the Autoregressive Distributed Lag (ARDL) analysis method. The ARDL method is an econometric analysis technique used to estimate short-term and long-term relationships among variables when these variables are non-stationary, meaning they have unit roots. The ARDL method is particularly useful when dealing with time series data that are cointegrated. Furthermore, the ARDL method is a regression technique that simultaneously includes lags of both dependent and independent variables. The ARDL model combines Auto-Regressive (AR) and Distributed Lag (DL) models. The AR model uses one or more past data points of the dependent variable, while the DL model is a regression model that combines current and past data of independent variables [18]. In a broad sense, the steps for conducting econometric analysis using this method are as follows: Testing the stationarity of the variables in the research model, both at the level and first difference, Determining the optimal lag, Conducting Granger causality test, Performing the bound test for cointegration, Estimating the ARDL model, Testing the stability of the ARDL model.
In general, the equation of the ARDL model can be formulated as follows:

$$\Delta Y_t = \beta_0 + \sum_{i=1}^{n} \beta_1 \Delta y_{t-1} + \sum_{i=0}^{n} \delta_1 \Delta x_{t-1} + \varphi_1 y_{t-1} + \varphi_2 x_{t-1} + \mu_t$$

Where: β1, δ1: Short-term coefficients, φ1, φ2: Long-term coefficients, and μt: Disturbance error (white noise). If the ARDL model equation is separated, the equation to examine the short-term relationship is as follows:

$$\sum_{i=1}^{n} \beta_1 \Delta y_{t-1} + \sum_{i=1}^{n} \delta_1 \Delta y_{t-1}$$

And the ARDL model equation for the long-term relationship is written as follows:

$$\varphi_1 y_{t-1} + \varphi_2 x_{t-1} + \mu_t$$

The ARDL model equation for this research is as follows:

$$Y_t = \alpha + \alpha_{1t} + \sum_{i=1}^{p} \alpha_1 Yt_{t-1} + \sum_{i=0}^{q} \alpha_2 X1_{t-1} + \sum_{i=0}^{r} \alpha_3 X2_{t-1} + \sum_{i=0}^{e} \alpha_4 X3_{t-1} + et$$

In this study, the stability of the ARDL model is tested using the CUSUM test at a 95% confidence level. Before using data in regression analysis, including the ARDL model, it's essential to check whether the data meets the criteria for Best Linear Unbiased Estimate (BLUE). This check includes testing the normality of data and examining classical assumptions such as multicollinearity, heteroskedasticity, and autocorrelation. Additionally, this research conducts hypothesis testing to examine the relationships between the study variables. The tests used include: Partial Test (t-test) to assess the individual influence of each independent variable on the dependent variable and Simultaneous Test (F-test) to determine the combined impact of all independent variables on the dependent variable.

4. RESEARCH RESULTS

Classical Assumption Tests

Classical assumption tests were carried out to ensure the accuracy and correct interpretation of statistical analysis. This research includes several classical assumption tests, including: Normality Test, Multicollinearity Test, Autocorrelation Test, Heteroscedasticity Test. And the results of this research are very good, the data is normally distributed and there is no multicollinearity, heteroscedasticity and autocorrelation. So it can be concluded that the model in this research is BLUE

ARDL Testing

Stationarity testing, a fundamental concept in time series analysis, is pivotal as it indicates that the statistical properties of a time series data do not change over time. In the context of dynamic model research, stationarity testing is an initial and essential step, as it helps identify any spurious regression that may occur when estimating a model. Multiple methods are available for assessing data stationarity, and in this study, the Phillips-Perron test is employed. The Phillips-Perron test follows a specific criterion for evaluating data stationarity. It involves comparing the Phillips-Perron probability (PP) with the pre-defined significance level. If the probability value falls below the significance level, it signifies that the variable data is stationary. Conversely, if the PP probability exceeds the significance level, the variable data is deemed non-stationary. The Philips-Perron Unit Root Test establishes that all variables in this study exhibit stationarity in their first differences when employing a constant regression (Intercept) at the 1%, 5%, and 10% significance levels. This conclusion is evident as the probability values (Prob) fall below the critical threshold of 0.05 (Prob < 0.05), indicating that all variables are suitable for further analysis using their first differences.

Determination of Lag Optimum, The Lag Optimum test plays a vital role in assessing the duration it takes for a variable's data to return to a state of stability or equilibrium after undergoing disturbances from other

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variables within the study (Marwanti, 2017). The outcomes of the Lag Optimum test in this study are presented in Table 5

Lag Optimum Test Results

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-261.5502	NA	19785.00	21.24402	21.43904	21.29811
1	-203.3218	93.16548*	689.5887	17.86574	18.84084	18.13619
2	-189.0734	18.23788	888.4290	18.00588	19.76106	18.49269
3	-170.7013	17.63723	1007.590	17.81611	20.35137	18.51928
4	-160.8552	6.301528	3462.754	18.30842	21.62376	19.22795
5	-98.21623	20.04447	**531.2210***	**14.57730***	**18.67272***	**15.71319***

* indicates lag order selected by the criterion

Analyzing Table reveals that the optimal lag selection in this study points to the fifth lag as the most suitable choice. This is evident from the preponderance of asterisks (stars) associated with the fifth lag. Specifically, the second lag exhibits the lowest values for LR (Sequential Modified LR test statistic, each test at the 5% level) and SC (Schwarz Criterion), whereas the fifth lag demonstrates the lowest values for FPE (Final Prediction Error), AIC (Akaike Information Criterion), and HQ (Hannan-Quinn Information Criterion). When considering these cumulative criteria, it becomes evident that the majority of asterisks align with the fifth lag. Consequently, it is reasonable to conclude that the lag optimum is situated at the fifth lag.

In summary, the interactions between the variables under scrutiny unfold over the subsequent five years. This implies that when one variable undergoes a change, its impact ripples through to other variables in the ensuing five years. For instance, if cocoa production experiences an increase, it is likely to result in an upturn in cocoa export variables over the following five years.

Granger Causality Test, The Granger Causality Test, a fundamental component of our analysis, is designed to shed light on the existence of a reciprocal relationship between variables. This test helps us explore the intricate dynamics between the key elements under investigation. The evaluation of causal relationships hinges on comparing the Granger probability values with a predetermined significance level. If the calculated Granger probability value surpasses the significance level, it suggests that no causal link exists between the variables. However, if the probability value falls below the significance level, it signifies the presence of a significant causality. The outcomes of the Granger Causality Test are detailed in Table 6, offering valuable insights into the intricate interplay between the variables at the core of our analysis. This examination of causal relationships provides a deeper understanding of how changes in one variable may influence others, a crucial facet of our research objectives

The results of the Granger Causality Test provide a clear and definitive conclusion. They indicate that no bidirectional relationship exists among the variables, signifying the absence of Granger causality. This absence of a causal relationship is established as the Granger probability values consistently exceed the predetermined significance level. Consequently, it can be confidently stated that there is no significant causal interplay between the variables under examination.

Cointegration Test (Bound Test) The cointegration test is conducted to examine whether there is a long-term relationship and the possibility of imbalance between independent and dependent variables. If there is

an imbalance, a error correction model is required. In this study, the cointegration test is performed using the bound test. The cointegration test results, The F-Statistic value of 6.538164 surpasses the I0 Bound value at multiple significance levels, including 10%, 5%, 2.5%, and 1%. This substantial difference in values strongly supports the conclusion that there is indeed cointegration among the variables within the tested model. This cointegration signifies the presence of both short-term and long-term equilibrium among the variables, underlining the interdependence and interconnectedness of these crucial elements in our analysis.

ARDL Model Estimation Results

Following the data input, stationarity tests, and cointegration analysis, the research proceeded with ARDL analysis. The data processing phase was segmented into two components, specifically focusing on short-term and long-term processing.

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
D(Y(-1))	-0.168244	0.232019	-0.725131	0.4777
D(LNX1)	159.1009	127.3500	**-1.249320**	**0.2276**
D(LNX1(-1))	116.1462	106.4412	1.0936091	0.2896
D(LNX1)	127.0545	135.7287	**0.936091**	**0.3616**
D(LNX1(-1))	182.3755	144.4192	1.262820	0.2228
D(LNX1(-2))	222.6000	128.9151	1.726718	0.1013
D(LNX2)	158.2374	75.89362	**2.084990**	**0.0516**
D(LNX2(-1))	94.69425	80.05913	1.182804	0.2523
C	87.20326	77.04391	**1.131864**	**0.2725**

The outcomes derived from the short-term test, as presented in Table, offer valuable insights into the dynamic interplay among the key variables. The short-term equation can be formulated as follows:

Exports = 87.20326 + 159.1009Ln X1+127.0545LnX1 + 158.2374*LnX2

This equation encapsulates the immediate impacts and relationships between the variables, allowing us to draw critical conclusions about their interdependencies. To delve into a deeper understanding of this short-term equation, the following interpretations are provided:

1. Constant (87.20326): This constant, approximately equal to 87.20, serves as a pivotal anchor in our analysis. It signifies that if factors such as production, inflation, and the exchange rate of the Indonesian Rupiah to the US Dollar remain constant in the short term, then exports will also remain steady at around Rp 87.20 million per year. Essentially, it establishes a baseline from which we can gauge the deviations caused by changes in these factors.
2. Coefficient for Production (X1, -159.1009): The coefficient for production, which amounts to approximately -159.10, is a crucial indicator. It tells us that in the short term, if there is a 1 percent increase in production, there will be a corresponding decrease in exports by roughly Rp 159.10 million per year. This suggests a negative relationship between production and exports in the short run. When production goes up, it appears to have a dampening effect on export levels during this immediate timeframe.
3. Coefficient for Inflation (X2, 127.0545): The coefficient for inflation, around 127.05, sheds light on the impact of inflation on exports in the short term. If there is a 1 percent increase in inflation, it will lead to an increase in exports by approximately Rp 127.05 million per year. This implies a positive relationship between inflation and exports during the short-term period. Higher inflation seems to stimulate exports in this immediate context.

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4. Coefficient for Exchange Rate (X3, 158.2374): The coefficient related to the exchange rate of the Indonesian Rupiah to the US Dollar, approximately 158.24, provides insights into the dynamics of exchange rates in the short term. A 1 percent increase in the exchange rate will correspond to an increase in exports by roughly Rp 158.24 million per year. This suggests a positive correlation between the exchange rate and exports during the short term. As the exchange rate strengthens, exports appear to benefit from this appreciation.

In sum, this short-term equation unveils the intricate relationships between these key variables within an immediate timeframe. It offers valuable insights for policymakers and stakeholders seeking to understand and anticipate the short-term effects of changes in production, inflation, and exchange rates on export levels. These insights can inform decision-making and strategy development within the realm of our analysis.

ARDL Model Estimation Results - Long-Term

Levels Equation Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNX1)	-36.76857	97.61069	-0.376686	0.7108
D(LNX2)	455.4098	326.4057	1.395227	0.1799
D(LNX3)	216.5058	117.3611	1.844784	0.0416
C	74.64471	65.57687	1.138278	0.2699

In the context of the long-term estimation results provided in Table, we can decode the implications of these coefficients to better understand the dynamics at play. Let's explore the long-term relationships between the variables:

- **Coefficient for Production (X1, -36.76857):** This coefficient indicates that in the long term, a change in production, specifically an increase, results in a decrease in exports. More precisely, a 1 percent increase in production will lead to a decrease in exports by approximately -36.77. This negative coefficient implies that in the long term, there is an inverse relationship between production and exports. When production increases, exports tend to decrease.
- **Coefficient for Inflation (X2, 455.4098):** The coefficient for inflation reveals that in the long term, a 1 percent increase in inflation corresponds to a substantial increase in exports, approximately 455.41. This positive coefficient suggests a strong positive relationship between inflation and exports in the long run. Higher inflation seems to boost exports significantly over an extended period.
- **Coefficient for Exchange Rate (X3, 216.5058):** The coefficient associated with the exchange rate showcases that in the long term, a 1 percent increase in the exchange rate leads to a substantial increase in exports, approximately 216.51. Similar to the effect of inflation, this positive coefficient indicates a significant positive correlation between the exchange rate and exports over the long term. As the exchange rate strengthens, exports experience a notable boost.
- **Constant (C, 74.64471):** The constant of 74.64471, or roughly 74.64, signifies the baseline for exports when the other variables remain constant. It indicates that in the long term, with production, inflation, and the exchange rate held constant, exports are expected to reach approximately Rp 74.64 million per year.

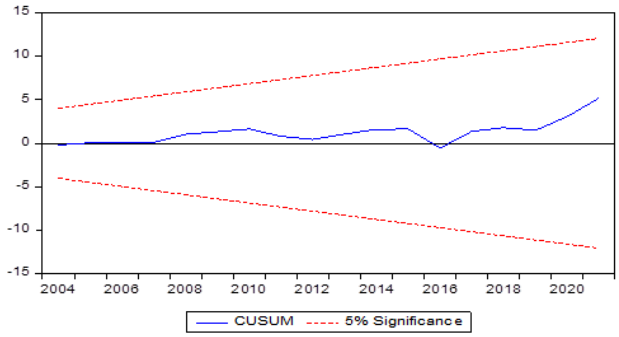
To summarize, the long-term equation offers a comprehensive view of how these variables interact over an extended timeframe. In this context: Production appears to exert a long-term negative influence on exports. Inflation demonstrates a substantial and positive long-term effect on exports. The exchange rate also displays a significant and positive long-term relationship with exports

4.1 MODEL STABILITY TEST

Model stability tests are essential in the ARDL method to ensure the reliability and consistency of the

structural model used. These tests help identify any potential structural breaks or instability in the model. There are two primary types of structural model stability tests: CUSUM (Cumulative Sum of Recursive Residual) and CUSUMQ (Cumulative Sum of Square of Recursive Residual).

In this context, we will focus on the CUSUM test results with the Export variable as the dependent variable. The CUSUM test is crucial for assessing the stability of the model. Below, Figure 4.16 illustrates the outcomes of the CUSUM test, enabling us to gauge the model's reliability and structural stability.



The outcomes of the CUSUM Test, as depicted in Figure, provide valuable insights into the stability of the model. It is noteworthy that the blue line does not intersect or touch the red boundary line, which is a positive sign. This observation leads us to conclude that the ARDL model under examination is stable and successfully passes the CUSUM test. All the variables considered in the analysis have been verified for stability. Essentially, this means that the quantity plot, represented by Wr, remains below the boundary line at the 5% significance level, affirming the model's structural integrity.

In addition to the CUSUM test, a Correlogram of Residuals Squared is presented as another diagnostic tool to assess the model's validity. This graphical representation will help further evaluate the model's overall stability and provide a more comprehensive understanding of its reliability and robustness.

STATISTICAL TESTING

Statistical testing in the context of the ARDL model plays a pivotal role in evaluating the model's appropriateness and gauging the significance of its parameters. Like many other statistical models, ARDL analysis necessitates a series of statistical tests to ensure that it aptly elucidates the relationships between variables, while also confirming that the parameters within the model have meaningful statistical interpretations. Among the array of tests employed, two fundamental types are commonly used: Partial Tests (t-tests) and Simultaneous Tests (F-tests).

Partial Tests (t-tests)

a. Cocoa Production (X1): In the short term, the t-statistic for cocoa production is lower than the t-table value (1.249320 < 1.70562). This suggests that cocoa production wields a negative effect on cocoa export value in the short term. However, it's important to note that this effect is not statistically significant. Similarly, in the long term, the t-statistic for cocoa production (0.376686) is below the t-table value (1.70562), indicating a negative but statistically non-significant influence of cocoa production on cocoa export value over a more extended time horizon.

b. Inflation (X2): Within the short term, the t-statistic for inflation is less than the t-table value (0.936091 < 1.70562), implying that inflation has a positive effect on cocoa export value in the short term. However, akin to the previous variable, this influence is not statistically significant. This pattern persists into the long term,

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as the t-statistic for inflation (1.395227) remains below the t-table value (1.70562), indicating that inflation lacks a statistically significant impact over the extended period.

c. Exchange Rate (X3): Contrastingly, the dynamics for the exchange rate are distinctive. In the short term, the t-statistic for the exchange rate exceeds the t-table value (2.084990 > 1.70562), signifying that the exchange rate has a positive and statistically significant effect on cocoa export value in the short term. Moreover, this effect extends to the long term, as the t-statistic for the exchange rate (1.844784) also surpasses the t-table value (1.70562), underscoring a significant and sustained impact of the exchange rate on cocoa export value over the extended horizon.

These insights unveil the intricate relationships between the variables and the temporal aspects that influence their significance, offering a comprehensive understanding of how cocoa production, inflation, and the exchange rate collectively shape cocoa export value in both short and long-term contexts.

The F-statistic test,
widely employed in ARDL models, plays a pivotal role in evaluating the model's global significance. It serves the purpose of ascertaining whether the entire model contributes substantially to elucidating the interconnections among the variables encompassed within the model. In essence, the F-test is instrumental in appraising the combined, or simultaneous, influence of the independent variables on the dependent variable.

The outcome of the F-statistic test, holds paramount significance as it demonstrates that the inclusion of all independent variables within the ARDL model isn't a mere coincidence. Instead, it showcases the comprehensive impact that these independent variables jointly exert on the dependent variable, in this case, the export value. The F-test, being a powerful statistical tool, doesn't merely focus on individual variable effects; rather, it unveils the interplay, the complex dynamics that these factors exhibit when analyzed in combination. By surpassing the critical F-table value, the F-statistic reflects the model's robustness. The model, in its entirety, is potent in explaining the relationships between the included variables. This means that the cumulative effect of cocoa production, inflation, and exchange rate of the Indonesian Rupiah to the US Dollar on cocoa export value is both substantial and statistically significant. The associated probability is less than the commonly accepted 5% significance level, further reinforcing the credibility of these results. This signifies that the explanatory power of the ARDL model isn't an outcome of random chance or noise; instead, it presents a meaningful understanding of how these variables interact to influence cocoa export values. In essence, the ARDL model proves to be a valuable framework for comprehending the complexities of these interactions, contributing to our insights into the broader dynamics of the cocoa export market in Indonesia.

5. Conclusions

This study employed the Best Linear Unbiased Estimate (BLUE) principle to ensure the robustness of the regression analysis. The chosen variables, examined through the ARDL model, exhibited a harmonious blend of characteristics that made them well-suited for inclusion in this analysis. These characteristics included co-integration, stationarity at the same order, and the absence of causal relationships between the variables. Furthermore, the short and long-term stability of the model was verified, indicating its reliability over time. One noteworthy observation made in this study was the dynamic nature of the variables. Changes in one variable were shown to exert effects on other variables over a period of five years. Specifically, Indonesia's cocoa production was found to have a negative and non-significant impact on cocoa export value in both the short and long term. In contrast, variations in inflation showed a positive relationship with cocoa export value, although not statistically significant, over the same time frames. Most notably, fluctuations in the exchange rate exhibited a positive and significant influence on cocoa export value in both the short and long term. When considering the combined effect of Indonesia's cocoa production performance, inflation fluctuations, and

exchange rate, they were found to exert a significant collective influence on cocoa export value in both the short and long term. This collective impact underscores the complex interplay of these variables in shaping Indonesia's cocoa export market, providing valuable insights for policymakers and industry stakeholders

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