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Endonezya'dan Amerika Birleşik Devletleri'ne Kahve İhracatının Belirleyicileri Üzerine Bir Araştırma

Hilmy PRİLLİADİ*, Avni BİRİNCİ

Öne Çıkanlar:
- Endonezya kahve ihracat değeri 2015'ten 2020'ye kadar düşmüş
- Enflasyon ve döviz kuru önemli bir etki göstermemiş
- Kahve dikim alanı en büyük etkiye sahip olmuş

Anahtar Kelimeler:
- Kahve ihracatı
- ARDL modeli
- Endonezya
- ABD
- Eşbütünleşme

ÖZET:

Bu araştırma, Endonezya'nın ABD'ye yaptığı kahve ihracatının belirleyicilerini ortaya koymak amacıyla yapılmıştır. Ayrıca, kahve ihracatında son dönemlerde meydana gelen değer düşüşlerinin nedenlerini ortaya koymak ve Endonezya'dan ABD'ye yapılan kahve ihracatının değerini artırmak için alternatif politikalar üretmeye çalışmak araştırmanın alt amaçları olarak belirlenmiştir. Bu araştırmada, EViews 12 yazılım programı ile Autoregressive Distributed Lag (ARDL) eşbütünleşme analizi tahmin yöntemi kullanılmıştır. Analiz sonucunda, hem kısa hem de uzun dönemde ABD dolarının Endonezya rupisi karşısındaki döviz kuru ve Endonezya yıllık enflasyon oranının istatistiksel olarak kahve ihracat değeri üzerinde önemli bir etki göstermediği belirlenmiştir. Ayrıca dünya kahve fiyatları, ABD kahve tüketimi, dünya çay fiyatları, Endonezya'nın ABD'ye kahve ihracat fiyatları, dış ticaret hadleri, ticari dışa açıklık ve Endonezya'nın kahve dikim alanı değişkenleri istatistiksel olarak anlamlı bulunmuştur. Bu arada, kısa dönemde ABD kahve tüketimi ve Endonezya'nın ABD'ye kahve ihracat fiyatı olumlu bir etki verdiği ancak uzun dönemde olumsuz olarak etkilediği tespit edilmiştir. Tüm bağımsız değişkenler arasında Endonezya kahve dikim alanı değişkeninin en büyük etkiye sahip olduğu ortaya konmuştur. Buradan, politika yapıcılar Endonezya kahvesinin ABD'ye ihracat değerini artırmak için ihracatın zorluklarını ele almaya çalışmaları gerektiği ve Endonezya kahvesi ihracat değeri üzerinde hiçbir etkisi olmadığı için döviz kuru sabitlemesine veya enflasyon hedeflemesine aşırı odaklanmamaya dikkat etmeleri gerektiği ifade edilebilir. Ayrıca katma değeri artıran ürün geliştirme konusuna dikkat edilmesi elde edilen sonuçlardan yola çıkarak yapılabilecek önerilerden en önemlileri olarak ifade edilebilir.

A Study on Determinants of Coffee Export from Indonesia to The United States of America

Highlights:
- Indonesian coffee export value fell from 2015 to 2020
- Inflation and exchange rate did not show a significant effect
- The coffee planting area had the biggest impact

Keywords:
- Coffee export
- ARDL model
- Indonesia
- USA
- Cointegration

ABSTRACT:

This research was conducted to reveal the determinants of Indonesia's coffee exports to the USA. In addition, it has been determined as the sub-objectives of the research to reveal the reasons for the recent decline in coffee exports and to try to produce alternative policies to increase the value of coffee exports from Indonesia to the USA. In this research, Autoregressive Distributed Lag (ARDL) cointegration analysis estimation method was implemented by using EViews 12 program. As a result of the analysis, it was determined that the exchange rate of the US Dollar against the Indonesian Rupiah and the annual inflation rate of Indonesia did not have a statistically significant effect on the value of coffee exports in both the short and long run. In addition, variables of world coffee prices, US coffee consumption, world tea prices, Indonesia's coffee export prices to the USA, terms of trade, trade openness, and Indonesia's coffee planting area were found to be statistically significant. Furthermore, it has been determined that the US coffee consumption and Indonesia's coffee export price to the USA have a positive effect in the short term, but have a negative effect in the long term. Among all the independent variables, it was revealed that the Indonesian coffee planting area variable had the greatest effect. Therefore, it can be stated that policymakers should try to address the challenges of exporting to increase the export value of Indonesian coffee to the US and be careful not to overly focus on exchange rate fixing or inflation targeting as these two variables have no significant impact on export value. In addition, paying attention to the issue of product development that increases added value can be expressed as the most important of the suggestions that can be made based on the results obtained.

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This study was produced from Hilmy Prilliadi's Master's thesis

INTRODUCTION

Indonesia, as a country engaged in international trade for a long time, is in the world market. Efforts are always made to increase exports on the basis of both quantity and type of goods or services with various strategies. Export development, especially non-oil and gas exports is carried out as a strategy to increase exports of both goods and services. This export development program aims to support efforts to increase the global competitiveness of Indonesian products and increase the role of exports in promoting economic growth (Komaling, 2013). In the free trade regime that has emerged in the world recently, global competition is getting tighter and forcing Indonesia as well as other countries to be competitive in order to develop the economy.

While the economic growth of the US decreased by only 1.6% in 2016, it increased to 2.37% in 2017 (World Bank, 2022). It can be said that this situation caused the US coffee import from Indonesia to be 60 thousand tons/year on average between 2016 and 2020 and the average export value to be 247360000 US dollars. It implied that while the economic growth of the US showed a positive trend, so was the coffee import volume. The average coffee consumption in the United States is 1145800 kg/year (Indonesian Statistical Institute, 2020). Demand for United States coffee from Indonesia is expected to continue to increase each year due to increasing population and Per Capita Gross National Product (US Per Capita Income). Moreover, if we take a look at the relationship between caffeine (including coffee) consumption and economic growth, we could refer to Quadra et al. (2020) who indicated a high positive correlation between caffeine consumption per capita with HDI and GDP found for coffee-importing countries in Europe.

According to Figure 1, it can be seen that there has been a decrease in the value of coffee exports from Indonesia to the USA in recent years. However, the coffee trade in Indonesia still has many serious hurdles. One of the most important of these is the emergence of overproduction. Regarding this situation, the government and related parties have made and are making various efforts to overcome it, including increasing the value of exports and the level of domestic consumption (Indonesian Statistical Institute, 2020).

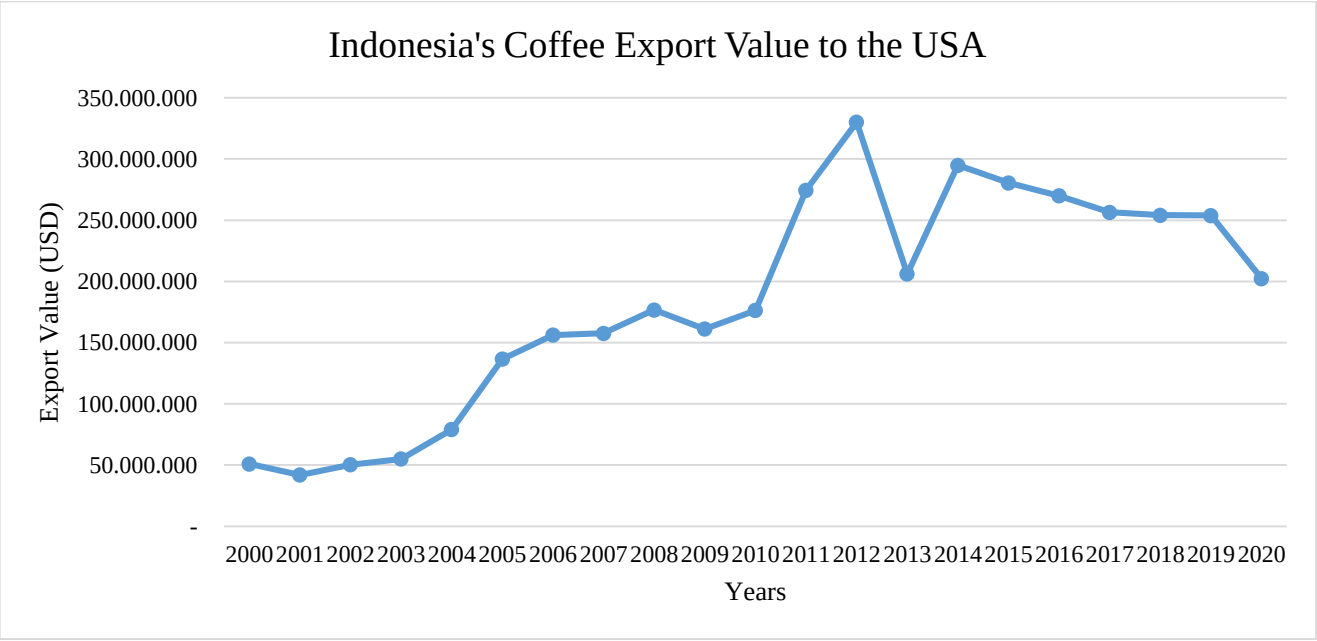


Figure 1. Indonesia's coffee export value to the USA

While a small part of the coffee products produced in Indonesia is consumed domestically, 75% is exported. According to the data of the Indonesian Statistical Institute, Indonesian coffee export value to the USA between 2000 and 2020 has followed a highly volatile course. In addition, there was a decrease between 2015-2020. These explanations show that there are many interesting aspects to the coffee product in Indonesia, especially coffee exported from Indonesia to the USA. Given that Indonesia's coffee export value was decreased from 2015-2020, the main objective of this study was to identify the factors that influence Indonesian coffee exports to the United States. The sub-objectives have been determined in order to reveal the reasons for the recent decline in coffee export exports value and to produce solutions. This study was also conducted to reveal the reasons for the recent decrease in coffee export value, to examine the Indonesian coffee industry with the latest developments by associating the problems addressed, to use the ARDL estimation procedure to reveal the determinants of Indonesian coffee exports to the United States, and finally based on the results of the analysis, to offer policy suggestions for increasing coffee exports to the USA, which has a decreasing trend.

MATERIAL AND METHOD

The ARDL bounds test is used in this study to examine the relationships of Indonesia's coffee export value to the USA, world coffee prices, exchange rate, USA coffee consumption, world tea prices, coffee export prices to USA, term of trade, Indonesia's trade openness, coffee planting area, and annual inflation rate. To ensure that no variable is stationary on second difference, the Augmented Dickey-Fuller (ADF) and Phillips and Peron (PP) tests are being used. If the bounds test model's F- and t statistics are significantly larger than the minimum and maximum values, then both the short and long-run ARDL models could be stipulated (Pesaran et al., 2001). The ARDL model was then estimated, with the optimal number of lags chosen, parameter significance considered, and residuals carefully examined. The optimal model is obtained after the diagnostic tests are completed. The bounds test is then used to determine whether or not cointegration exists. Finally, the short and long-run estimations, as well as the estimated long-run cointegrating equations, are computed.

Numerous studies have used a variety of techniques to determine the relation between the determinants of macroeconomic. Nonetheless, these methods require that all factors in the framework be linear and have the same integration order. As a result, the regression equation looks like this:

$$lnY_{it} = \alpha_i + \beta_1 lnX1_{it} + \beta_2 lnX2_{it} + \beta_3 lnX3_{it} + \beta_4 lnX4_{it} + \beta_5 lnX5_{it} + \beta_6 lnX6_{it} + \beta_7 lnX7_{it} + \beta_8 lnX8_{it} + \beta_9 lnX9_{it} + \varepsilon_{it} \quad (1)$$

The present the logs of world coffee prices, exchange rate, USA coffee consumption, world tea prices, coffee export prices to the USA, term of trade, Indonesia's trade openness, coffee planting area, and annual inflation rate at time t. α_i is the and constant and ε_{it} denotes the error term. β_1, β_2, β_3, β_4, β_5, β_6, β_7, β_8, β_9 are the coefficients of all independent variables for ARDL model.

The standard ARDL model is given by the equation below:

$$\Delta lnY_t = \alpha_0 + \sum_{i=1}^{p} \beta_1 \Delta lnX1_{t-i} + \sum_{i=1}^{p} \beta_2 \Delta lnX2_{t-i} + \sum_{i=1}^{p} \beta_3 \Delta lnX3_{t-i} + \sum_{i=1}^{p} \beta_4 \Delta lnX4_{t-i} + \sum_{i=1}^{p} \beta_5 \Delta lnX5_{t-i} + \sum_{i=1}^{p} \beta_6 \Delta lnX6_{t-i} + \sum_{i=1}^{p} \beta_7 \Delta lnX7_{t-i} + \sum_{i=1}^{p} \beta_8 \Delta lnX8_{t-i} + \sum_{i=1}^{p} \beta_9 \Delta lnX9_{t-i} + \delta_1 lnX1_{t-1} + \delta_2 lnX2_{t-1} + \delta_3 lnX3_{t-1} + \delta_4 lnX4_{t-1} + \delta_5 lnX5_{t-1} + \delta_6 lnX6_{t-1} + \delta_7 lnX7_{t-1} + \delta_8 lnX8_{t-1} + \delta_9 lnX9_{t-1} + \varepsilon_t \quad (2)$$

The preceding equation is defined as the unrestricted error correction model (UECM). Where the parameters' expected signs are as follows: $\alpha_0 \neq 0; \beta_1 \neq 0; \beta_2 \neq 0; \beta_3 \neq 0; \beta_4 \neq 0; \beta_5 \neq 0; \beta_6 \neq 0; \beta_7 \neq 0; \beta_8 \neq 0; \beta_9 \neq 0; \delta_1 \neq 0; \delta_2 \neq 0; \delta_3 \neq 0; \delta_4 \neq 0; \delta_5 \neq 0; \delta_6 \neq 0; \delta_7 \neq 0; \delta_8 \neq 0; \delta_9 \neq 0$. The

parameters $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8, \beta_9$ represent short-run dynamic coefficients, while $\delta_1, \delta_2, \delta_3, \delta_4, \delta_5, \delta_6, \delta_7, \delta_8, \delta_9$ explain the long-run multipliers of the equations. The null and alternative hypotheses for the equation variable co-integration test (2) are: $H_0: \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = \delta_7 = \delta_8 = \delta_9 = 0$ means there is no long-run relationship. Meanwhile $H_a: \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq \delta_5 \neq \delta_6 \neq \delta_7 \neq \delta_8 \neq \delta_9 \neq 0$ demonstrate the existence of long-run relationship. Similarly, to confirm the existence of the identified short-term relationship in Eq (1),, the null and alternative hypotheses can be constructed as follows: $H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = \beta_8 = \beta_9 = 0$ shows no short-run relationship is existing. Furthermore $H_a: \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_6 \neq \beta_7 \neq \beta_8 \neq \beta_9 \neq 0$ denotes the short-run relationship.

If there is proof of a long run relationship between the variables, the following long run model (equation 3) is estimated:

$$\Delta lnY_t = \alpha_0 + \sum_{i=1}^{p} \delta_1 lnX1_{t-i} + \sum_{i=1}^{p} \delta_2 lnX2_{t-i} + \sum_{i=1}^{p} \delta_3 lnX3_{t-i} + \sum_{i=1}^{p} \delta_4 lnX4_{t-i} + \sum_{i=1}^{p} \delta_5 lnX5_{t-i} + \sum_{i=1}^{p} \delta_6 lnX6_{t-i} + \sum_{i=1}^{p} \delta_7 lnX7_{t-i} + \sum_{i=1}^{p} \delta_8 lnX8_{t-i} + \sum_{i=1}^{p} \delta_9 lnX9_{t-i} + \quad (3)$$

Finally, if a long-run relationship exists, the Error Correction Model is used to obtain the short-run dynamic coefficient, which ECM (t-1) suggests the correction mechanism in stabilizing the model's disequilibrium, known as the speed of adjustment or feedback effect. As a consequence, the following ARDL short-run dynamics specification can be obtained:

$$\Delta lnY_t = \alpha_0 + \sum_{i=1}^{p} \beta_1 \Delta lnX1_{t-i} + \sum_{i=1}^{p} \beta_2 \Delta lnX2_{t-i} + \sum_{i=1}^{p} \beta_3 \Delta lnX3_{t-i} + \sum_{i=1}^{p} \beta_4 \Delta lnX4_{t-i} + \sum_{i=1}^{p} \beta_5 \Delta lnX5_{t-i} + \sum_{i=1}^{p} \beta_6 \Delta lnX6_{t-i} + \sum_{i=1}^{p} \beta_7 \Delta lnX7_{t-i} + \sum_{i=1}^{p} \beta_7 \Delta lnX7_{t-i} + \sum_{i=1}^{p} \beta_8 \Delta lnX8_{t-i} + \sum_{i=1}^{p} \beta_9 \Delta lnX9_{t-i} + \gamma ECM_{t-1} + \varepsilon_t \quad (4)$$

The Breusch–Godfrey serial correlation test, Breusch–Pagan–Godfrey heteroskedasticity test, and Jarque–Bera normality, CUSUM and CUSUM of squares tests are used to assess the model's validity, robustness, reliability, and stability.

RESULTS AND DISCUSSION

The Results of Unit Root Test and Descriptive Statistics

Table 1. Descriptive statistics summary

Variables	Mean	Median	Maximum	Minimum	Std. Dev.	Sum	Observations
Coffee Export Value (Thousand USD)	184046	176679	330146	41980	90054	3864968	21
World Coffee Prices (USD/kg)	1.28	1.26	2.53	0.54	0.53	26.91	21
Exchange rate (IDR)	9.27	9.24	9.59	9.04	0.19	194.6	21
USA Coffee Consumption (Ton/Year)	1355110	1307007	1638597	1124734	158013.7	28457300	21
World Tea Prices (USD/kg)	2.67	2.66	3.62	1.79	0.56	56.04	21
Coffee Export Prices to The USA (USD/Ton)	3028.7	2797.23	5707.39	1091.02	1495.15	63602.6	21
Terms of Trade (%)	108.1	105.65	125.92	92.79	10.13	2269.95	21
Trade Openness (% Indonesia's PDB)	50.9	49.58	71.44	33.19	10.54	1068.85	21
Planting Area (Hectare)	1266882	1252628	1372184	1210365	38451	26604528	21
Annual Inflation (%)	1.73	1.8	2.57	0.65	0.51	36.37	21

Table 1 provides descriptive statistics for Indonesia's coffee export value to the USA and all dependent variables from 2000 to 2020. The total sample size for each variable used in this study is 21.

During 2000 and 2020, the mean value of export value, world coffee price, exchange rate, USA coffee consumption, world tea price, export price to USA, term of trade, trade openness, plant area, and annual inflation were 184046 thousand dollars, USD 1.28/kg, IDR 9.27/USD, 1355110 ton/year, USD 2.67/kg, USD 3028.7/ton, 108.1%, 50.9%, 1266882 hectare, and 1.73%/year, respectively.

Table 2. Unit root test

	Augmented Dickey-Fuller (ADF Test)			Phillip-Perron (PP Test)		
Variable	**t-Statistic**	**P-value**	**Integration**	**t-Statistic**	**P-value**	**Integration**
Coffee export value	-4.134398[a] (0)	0.0053	-3.831511	-4.137921[a] (1)	0.0053	-3.831511
World coffee prices	-3.944418 [a] (0)	0.0079	-3.857386	-3.992825[a] (1)	0.0091	-3.831511
Exchange rate	-4.136847 [a] (0)	0.0029	-3.920350	-4.289913[a] (3)	0.0038	-3.831511
USA coffee consumption	-4.575682 [a] (0)	0.0024	-3.92035	-5.215453[a] (0)	0.0006	-3.831511
World tea prices	-6.301526 [a] (0)	0.0001	-3.831511	-6.328311 [a] (1)	0.0001	-3.831511
Coffee export prices to the USA	-4.809252 [a] (1)	0.0015	-3.857386	-6.412505 [a] (18)	0.0000	-3.831511
Term of trade	-4.703549 [a] (1)	0.0018	-3.857386	-9.117800 [a] (18)	0.0000	-3.831511
Trade openness	-5.831707 [a] (1)	0.0002	-3.857386	-7.754120 [a] (18)	0.0000	-3.831511
Coffee planting are	-6.239425[a] (0)	0.0001	-3.831511	-6.563977 [a] (2)	0.0000	-3.831511
Annual inflation rate	-5.995504[a] (4)	0.0003	-3.959148	-13.78330[a](13)	0.0000	-3.831511

Note: The values in parentheses of ADF are the lag lengths chosen using the Akaike Information criterion, and the maximum lag length is 4. The optimal lag length and Newey-West Bandwidth (automatic selection) criteria were used in the PP test. A represents significance at the 1% level.

All variables become stationary at the first difference, as observed. The results are the same as the stationary test on real data. As a result, the ARDL model can also be formed from these variables.

Lag Length Selection Criteria

Table 3 shows the results with the optimum lag lengths. As a result, the optimum lag length for the model was ascertained in the study as 1 using the AIC information criterion.

Table 3. Results of appropriate lag length determination

Model	LogL	AIC*	BIC	HQ	Adj.R-sq
1	70.482982	-5.248298	-4.352139	-5.073359	0.998684

Note: The * symbol indicates the appropriate delay length for the AIC information criterion.

The ARDL model's lag length was calculated utilizing Akaike Information Criteria (AIC). EViews 12 supports lag length selection by default. As shown in Figure 2, AIC recommends 1 as the maximum delay length and provides the best ARDL model.

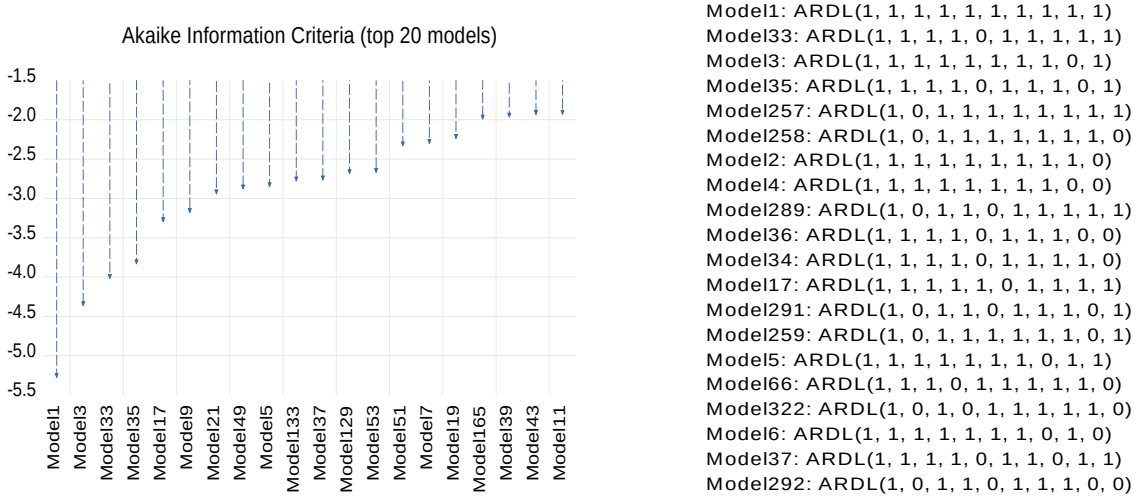


Figure 2. Graph of Akaike Information Criterion-based lag ARDL lag length selection

As seen in Figure 2, ARDL (1, 1, 1, 1, 1, 1, 1, 1, 1, 1) has been chosen as the optimal model since it has the lowest AIC value. After proving the existence of the cointegration relationship, the equation in question is estimated using the following ARDL (1, 1, 1, 1, 1, 1, 1, 1, 1, 1) property.

Results of the ARDL Bound Test

The central thesis of the ARDL model is that its variables should be integrated to order zero [I(0)], order one [I(1)], or both. As a result, the ARDL F statistics value for the long run relationship's bound test is 4.79308.

Table 3. ARDL bound test results

Significance	I [0] Bound	I [1] Bound	F Statistics	Inference
10%	1.85	2.85	4.79308	Co-integrated
5%	2.11	3.15		Co-integrated
2.5%	2.33	3.42		Co-integrated
1%	2.62	3.77		Co-integrated

Table 3 shows that the F statistics (4,79308) are clearly greater than the 3.77 upper bound critical value at a 1% significance level. This indicates that the dependent and independent variables have been integrated together.

Estimated Long-run Model

The long-run model was examined after determining the validity of cointegration between variables. Table 4 displays the estimation evidence of the long run model.

Table 4. ARDL long-run coefficient and short-run model results

Dependent variable: Coffee export value	Coefficients	Std. Error	t-Statistic	Prob
ARDL long run coefficient results				
World coffee prices	1.926260	0.279308	6.896538	0.0204*
Exchange rate	0.202810	0.318822	0.463304	0.2096
USA coffee consumption	-2.553016	0.339830	-7.512636	0.0173*
World tea prices	0.786191	0.388923	-2.021459	0.0604*
Coffee export prices to the USA	-0.713484	0.155009	-4.602865	0.0441*
Term of trade	0.840666	0.927589	-3.493644	0.0003*
Trade openness	0.062485	0.510308	-1.729318	0.0259*
Coffee planting is	7.512844	1.013455	7.413104	0.0177*
Annual inflation rate	-0.156037	0.135757	0.412775	0.6849
C	-67.42452	9.776293	-6.896737	0.0204*
Short-run model result				
World coffee prices	0.325532	0.010185	31.96341	0.0010
Exchange rate	0.173559	0.253618	0.364829	0.1672
USA coffee consumption	3.660761	0.139087	26.31999	0.0014
World tea prices	0.699842	0.020120	-34.78333	0.0008
Coffee export prices to the USA	0.050728	0.013937	3.639848	0.0679
Term of trade	0.659511	0.070167	-27.92643	0.0013
Trade openness	0.049238	0.027751	-15.10692	0.0044
Coffee planting is	7.056978	0.141705	49.80056	0.0004
Annual inflation rate	-0.094591	0.173642	0.319371	0.3618
C	-0.21167	0.068921	0.949544	0.0006
CointEq(1)	-0.638307	0.025716	-63.70729	0.0000

Note: * means significant at a 10% significance level

Table 4 shows that the world coffee price variables have a strong influence on the export value. This is consistent with Abimanyu (2016), who claims that there is a positive association between both Indonesian export prices and value, as well as between these prices and government revenue. Furthermore, the USD exchange rate has no discernible effect on export value. Because the United States is the biggest coffee purchaser, the dollar-rupiah exchange rate does not affect both the terms of value and volume of Indonesian coffee exports. These findings are consistent with the findings of Nyeadi et al. (2017), who found that exchange rate volatility has no serious influence on Ghanaian trade in goods and services.

The variable US coffee consumption has a significant effect on export value. This is because, in comparison to other exporting countries, Indonesia still has a small share of coffee exports to the United States. Brazil, Colombia, Vietnam, Mexico, and Honduras are the main import sources, accounting for roughly 70% of total import sources. Indonesia, among the most important coffee exporters on a country basis, showed negative growth according to the Balassa indices. While the Indonesian index stood at 1.49 from 2002 to 2008, it fell to 0.55 in 2015. According to this index, Uganda, Ethiopia, and Honduras have the strongest competitive benefits among the world's top coffee exporters, indicating a high level of competitiveness (World Bank, 2016). Torok et al. (2018) also stated that Uganda had the most competition and Indonesia had the least.

The world tea price variable showed a 0.0604 p-value which is smaller than the 10% significance level. Therefore, the world tea price variable shows that it has a significant effect on coffee export value. In the long run, a 1% increase in global tea prices results in a 0.78 percent growth in coffee export value. The cross elasticity of coffee and tea as substitute goods are represented by this coefficient value. Furthermore, the variable of coffee export price highlights an important effect and a positively related to the export value. According to Malvin and Norrbin (2017), the higher the product's export price, the higher the export value. It can also boost the country's productive capacity, as well as its income.

The terms of trade variable demonstrate that it has a substantial impact on export earnings. This is consistent with Bereket (2020), who claims that the terms of trade are statistically significant and positive for exports. Furthermore, trade openness has a significant effect on export value. Usman (2014) also stated that trade liberalization has a significantly positive impact on Pakistan's sectoral export performance.

Indonesian coffee planting area variable shows that it has a significant effect on export value. Segarani & Dewi (2012) also stated that land area has a significant impact on export volumes of Indonesian agricultural product exports. Moreover, the Indonesian annual inflation rate does not show that it has a significant effect on export value According to Ilmas (2022), a rise in inflation will contribute to higher manufacturing costs of export products, attempting to make export markets less efficient in manufacturing them and reducing competitiveness for export goods since exports are becoming increasingly expensive, contributing to the decline in exports. stated. According to Akalpler (2013), the rising inflation rate in 1990 did not affect on or expanded the number of exports in Turkey.

Error Correction Model

In the short run, the ECM (Error Correction Model) is used to demonstrate the relationship between variables. The short-run model (ECMT-1) can be approximated to obtain the correction towards the long run and the model.

The short-run model result of Table 4 indicated that the exchange rate and the annual inflation rate have no significant impact on coffee export value. The error correction term coefficient with an estimated value of -0.638307 is significant statistically at the 1% level of significance, with a properly negative sign, and implies a fairly rapid speed of equilibrium adjustment. (1/0.638307 = 1.567 years) after experiencing a financial shock or change. 0.638307% of the imbalances caused by the financial shock of the previous year show that this year's long-term balance has returned.

Diagnostics Test Result

The validity and robustness of the estimated equations were examined in terms of Breusch-Pagan-Godfrey, Breusch-Godfrey LM, Jarque-Bera, Ramsey RESET, the cumulative sum of recursive Residuals (CUSUM) and cumulative sum of squares (CUSUMQ) hypothetical diagnostic statistics tests and presented in Table 6. In these tests, the probability (p-value) values of serial correlation, heteroscedasticity,

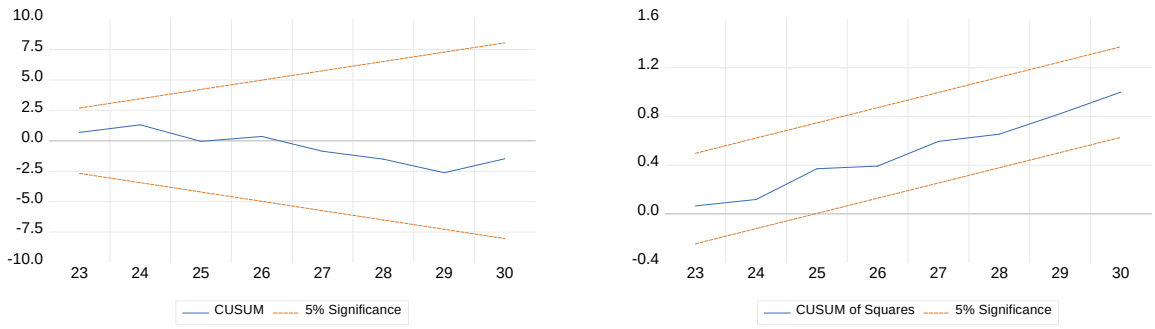
specification model error and normality distribution should be greater than 5% or 0.05. Based on Table 6, the probability (p-value) values of the hypothetical diagnostic statistics seem to meet the necessary condition. In other words, it is seen that the model does not have serial correlation, changing variance problem, has no model error and has a normal distribution.

Table 6. Residual diagnostic test results

Test series	P-value
Breusch-Godfrey LM	0.2177
Breusch-Pagan-Godfrey	0.1468
Ramsey RESET Test	0.5016
Jarque-Bera Test	0.9254

The estimated ARDL model's serial correlation is evaluated utilizing the Breusch-Godfrey test. The test yields a P-value of 0,2177, indicating that at all levels of significance, the null hypothesis of no serial correlation is not rejected. The Jarque–Bera statistic confirms the estimated residuals' normality behaviour. The Breusch-Pagan-Godfrey Test yielded a P-value of 0.9254 when used to test the heteroskedasticity assumption. Given that Breusch-Pagan-Godfrey and Ramsey RESET test with the p-value of 0.1468 and 0.5016 respectively demonstrated these p-values are greater than the 95% confidence level that means concluded that homoskedasticity is valid in the model and verified the correct functional form of the equations.

The variable stability test plots are shown in Figure 3: Cumulative Sum (CUSUM) and Cumulative Sum of Squares (CUSUMSQ). When the CUSUM plot is well within the 5% critical bound, the null hypothesis of parameter stability cannot be rejected. The CUSUMQ plot also falls within the 5% critical bound. It indicates that the estimated parameters are consistent or steady within the sample considered because they do not exhibit structural instability throughout the investigation.



(a) (b)

Figure 3. The plot of (a) CUSUM) and (b) CUSUMQ

Overall, the diagnostic tests indicate that the estimated equation possesses suitable statistical characteristics.

CONCLUSION

According to the findings, the currency value of the US dollar against the Indonesian rupee and Indonesia's annual inflation rate has no statistically significant effect on the value of coffee exports in both the short and long run. Thus, there is a statistically significant association between global coffee prices, US coffee consumption, global tea prices, Indonesian coffee export prices to the US, trade terms, trade openness, and Indonesian coffee planting area. Meanwhile, U.S. coffee consumption and Indonesia's coffee export price to the U.S. have a positive effect in the short run but negatively affect them in the long run. Among all the independent variables, the Indonesian coffee planting area has the greatest influence.

In the long run, US coffee consumption and the price of coffee exports to the US are the main reasons for the decline in the value of Indonesian coffee exports. It shows that although Indonesian coffee production has increased, the level of competition in the export market of Indonesian coffee is still lower than in other coffee exporting countries. Indonesia is not a price-setting country, but rather a follower of market price-setters. This is of great importance in determining the proposals to be put forward.

Policymakers should be careful not to overly focus on exchange rate fixing or inflation targeting as they have no impact on Indonesia's coffee export value. More attention should be paid to how to increase and optimize coffee planting areas to improve Indonesia's coffee exports. Given the importance of Indonesia's coffee planting area, the government's role in promoting the diffusion of good agricultural practices in the coffee farming sector and encouraging greater farmer cooperation is required to increase productivity.

By adding value to the export product, the Indonesian coffee production process can improve its competitiveness. Coffee from Indonesia may be roasted or processed, such as soluble coffee. Several importer countries, however, continue to levy high tariffs and non-tariff impediments on instant coffee. This necessitates the full involvement of negotiating team to reduce import duties or other laws, allowing for easier connectivity to the Indonesian value-added coffee market.

Successful product development adds value (for example, improved quality of the product, brand image, food standards, easiness and sustainability, and geographic features), allowing exporters to charge higher prices. This method of product enhancement has proved especially effective in the case of roasted coffee. While there was a positive trend in the unit value of exported green coffee (particularly by arabica growers), the unit value increase in roasted coffee was much greater than in green coffee. The evolution of unit values in the particular instance of instant coffee exports was generally negative.

Finally, unlike the data set used in this study, other studies can be conducted by using monthly data and including additional variables such as domestic coffee prices in the United States and per capita coffee consumption in addition to the variables used in the study. In addition, for other variables such as exchange rate and inflation, although the two variables do not have a significant effect, studies in which both are included in order not to interfere with the value of coffee exports from Indonesia to the USA can be done by researchers in the future.

Conflict of Interest

The article authors declare that there is no conflict of interest between them**.**

Author's Contributions

The authors declare that they have contributed equally to the article.

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