
**THE DETERMINATION OF EXCHANGE RATE, PRODUCTION VOLUME,
AVERAGE PRICE, AND GROSS DOMESTIC PRODUCT ON THE EXPORT
VALUE OF INDONESIAN NUTMEG SEEDS (HS-090811) TO CHINA**

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Abstract

Indonesia is one of the largest producers and exporters of nutmeg in the world. Nutmeg plays a very crucial role in improving the Indonesian economy. One of the destination countries for nutmeg exports is China. This study aims to determine the factors that influence the Export Value of Indonesian Nutmeg to China. The data in the study were analyzed using a quantitative approach using the Multiple Linear Regression Analysis method. The results of the study indicate that the Exchange Rate has a negative and significant effect on the Export Value of Indonesian Nutmeg Seeds to China, the Amount of Production and Average Price have no effect on the Export Value of Indonesian Nutmeg to China, and China's GDP has a significant positive effect on the Export Value of Indonesian Nutmeg to China.

Keywords: Nutmeg Export Value; Exchange Rate; Production Amount; Average Price; GDP

INTRODUCTION

Indonesia's spice commodities hold significant potential in the international market as one of the key products within the plantation sub-sector. According to data from Statistics Indonesia (Badan Pusat Statistik, 2023), the plantation sub-sector contributed the largest share to the GDP of the broader sector of agriculture, livestock, hunting, and agricultural services, averaging 42.23% over the period 2012–2023. Furthermore, this sub-sector plays a vital role in supporting national economic development by serving as a source of foreign exchange through exports, enhancing state revenue through export taxes and duties. Demand for plantation commodities, particularly spices, is projected to increase in line with population growth, economic expansion, health-related concerns, the rising costs of synthetic products, and growing environmental awareness (Ferry).

Based on data from the Ministry of Tourism and Creative Economy (Kemenparekraf, 2023) and Darmawan et al. (2022), global nutmeg production in 2023 revealed that Indonesia was the leading producer with a total output of 44,597 tons—significantly surpassing other countries such as Guatemala (3,200 tons) and India (2,800 tons). China imports nutmeg from Indonesia, which stands as both the largest producer and exporter of nutmeg globally. Indonesian nutmeg is widely recognized for its superior quality and global market competitiveness. In China, nutmeg is used in culinary applications, traditional medicine, the food processing industry, and cosmetics. The rising health awareness among Chinese consumers has further stimulated demand for Indonesian nutmeg. This increasing demand aligns with China's economic growth, which has led to greater consumption of spice-based products. Hence, an in-depth understanding of China's macroeconomic growth is essential to forecast the export prospects of Indonesian nutmeg. Despite having a comparative advantage, Indonesia's nutmeg exports face several challenges, including volatile exchange rates that create price uncertainty for exporters. Additionally, competition has intensified, particularly with Vietnam, which has begun expanding its nutmeg production and exports to China at more competitive prices. Trade regulations and evolving import standards in China, such as stricter quality requirements, also pose considerable challenges for Indonesian exporters.

According to Trade Map (2023), Indonesia ranks as the top exporter of nutmeg in the global market. The spice trade involving nutmeg exports to Europe has been ongoing since the 12th century. Nutmeg products exported from Indonesia are classified under the Harmonized System (HS) codes according to the Indonesian Customs Tariff Book (BTKI, 2017) (Dekanawati et al., 2023), including: HS 090811 (whole nutmeg), HS 090812 (ground nutmeg), HS 090821 (whole mace), and HS 090822 (crushed or ground mace). Data from the International Trade Center UNCTAD/WTO (ITC, 2021) indicates that the most exported nutmeg product by Indonesia is HS 090811, representing whole nutmeg (not crushed or ground). Indonesian nutmeg is in high demand across many countries, including members of the European Union.

According to Salvatore (as cited in Yang Febriana, N., 2020), the exchange rate is the result of interactions between demand and supply in the foreign exchange market. Trade requirements are fulfilled through rapid and substantial foreign exchange flows; speculation and investment from surplus regions to deficit regions can occur due to various differential factors, thus influencing the exchange rate in each region accordingly.

Fahmi (as cited in Mentari Kurniasih, 2021) defines production as a process that yields goods or services which can generate value-added for a company over time. Prices are influenced by external factors such as government policy, macroeconomic conditions, and social dynamics. Taxes and subsidies can affect market prices, thereby influencing both consumer and producer decisions. Moreover, markets are not always in equilibrium; price fluctuations may arise due to shifts in supply and demand.

REVIEW OF LITERATURE

According to Mankiw (2021), price theory emphasizes the interaction between supply and demand as the foundational mechanism in determining the prices of goods and services in the market. The law of supply and demand states that when the price of a good rises, the quantity demanded will decrease, while the quantity supplied will increase. This interaction creates an equilibrium point where the quantity demanded equals the quantity supplied, thereby establishing the market price. Mankiw also highlights the role of price as a critical signal in the economy: when the price of a good increases, it signals producers to raise production, and vice versa. Additionally, the concept of price elasticity discussed by Mankiw explains how responsive demand or supply is to changes in price, which varies depending on the type of good. Necessities tend to have low price elasticity of demand, while luxury goods are more sensitive to price fluctuations.

According to Sukirno (as cited in Nasrudin et al., 2023), the exchange rate is defined as the price of one currency in relation to another. The exchange rate is one of the most significant prices in an open economy, given its substantial influence on the current account balance and other macroeconomic variables. The exchange rate is generally described as the relative value between currencies of different countries. It serves as a standard reference and a determinant of consumer purchasing power for goods traded internationally. International trade requires that each country possess its own currency, which has a certain value or comparison—commonly referred to as the foreign exchange rate.

Fahmi (as cited in Mentari Kurniasih, 2021) defines production as the result acquired by a company in the form of goods or services, which is expected to generate added value over time. Meanwhile, Damayanti (as cited in Indah Octavia, 2023) views production as the output of a process that requires various inputs and resources, resulting in a final product. The factors that drive production are inputs, while the resulting quantity is referred to as output. Thus, in general terms, production can be summarized as an activity that creates goods and services.

According to Arsyad (as cited in Romadhon & Nawawi, 2024), Gross Domestic Product (GDP) is defined as the total value of final goods and services produced by all productive sectors within a country during a specific period. GDP differs from Gross National Product (GNP), in that GNP uses the term "national" because it is based on the citizenship of the producers. This means that goods and services produced by nationals both domestically and abroad are included in GNP. In contrast, the term "domestic" in GDP refers to production within a country's territorial boundaries, including that carried out by foreign nationals and multinational corporations.

RESEARCH METHOD

This study employs a quantitative research approach aimed at examining the causal relationship between independent variables—namely exchange rate, production volume, average price, and Gross Domestic Product (GDP)—and the dependent variable, which is the export value of Indonesian nutmeg to China. Data were collected from official sources including the Directorate General of Estate Crops (Ditjenbun), Statistics Indonesia (Badan Pusat Statistik/BPS), the Ministry of Agriculture, and the World Bank, covering the period from 2012 to 2023.

The dependent variable in this study is the export value of Indonesian nutmeg to China, measured in millions of U.S. dollars. The independent variables include the exchange rate (IDR/USD), production volume (in tons), average nutmeg price, and China's GDP (in USD). The sampling technique applied is purposive sampling, in which the researcher deliberately selected annual data spanning from 2012 to 2023, resulting in a total of 12 observations. These include annual data on Indonesia's nutmeg export value to China, exchange rates, nutmeg production volumes, average prices, and China's GDP. The collected data were analyzed using multiple linear regression analysis to determine the influence of each independent variable on the dependent variable.

RESULTS AND DISCUSSION

Normality Test

Table 1.
One-Sample Kolmogorov-Smirnov Test

One-Sample Kolmogorov-Smirnov Test	
	Unstandardized Residual
Asymp. Sig. (2-tailed)	.200 ^{c,d}

Source: Processed Data

Based on Table 1, the Asymp. Sig. (2-tailed) value of the Kolmogorov-Smirnov test is 0.200, which is greater than 0.05. According to the decision rule for the Kolmogorov-Smirnov normality test, it can be concluded that the residuals are normally distributed.

Multicollinearity Test

Table 2.
Multicollinearity Statistics

Variable	Tolerance	VIF
Exchange Rate (X1)	0.143	6.994
Production Volume (X2)	0.132	7.571
Average Price (X3)	0.566	1.768
China's GDP (X4)	0.221	4.526

Source: Processed Data

Table 2 shows that all independent variables have VIF values below 10 and tolerance values above 0.1. Therefore, it can be concluded that there are no multicollinearity issues among the independent variables in this regression model.

Heteroscedasticity Test

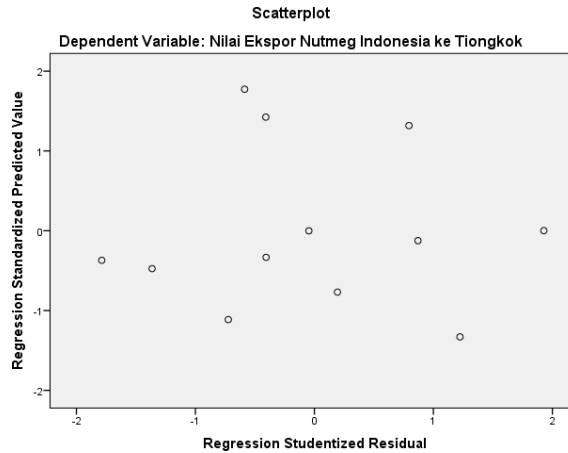


Figure 1.
Scatter Plot

Source: Processed Data

The scatter plot in Figure 1 shows that the distribution of residuals appears random and does not form a clear or patterned shape. This indicates the absence of heteroscedasticity symptoms in the regression model.

Autocorrelation Test

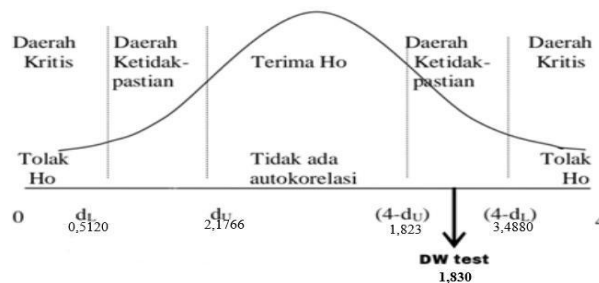


Figure 2.

Durbin-Watson Test

Source: Processed Data

The Durbin-Watson test value is 1.830, which falls within the acceptable range (between 1.5 and 2.5). Therefore, it can be inferred that there is no indication of autocorrelation in the regression residuals.

Multiple Linear Regression Analysis

Table 3.
Regression Coefficients

Variable	Beta
Constant	207.728

Variable	Beta
Exchange Rate (X1)	-21.278
Production Volume (X2)	-0.763
Average Price (X3)	-1.719
China's GDP (X4)	19.647

Source: Processed Data

The estimated regression equation is:

$$Y = 207.728 - 21.278X_1 - 0.763X_2 - 1.719X_3 + 19.647X_4 + \varepsilon$$

Interpretation:

- The constant value of 207.728 indicates the predicted export value when all independent variables are zero.
- The coefficient for exchange rate (X1) is -21.278, suggesting that a 1 USD increase in the exchange rate will reduce the export value of Indonesian nutmeg to China by 21.278 million USD, assuming other variables are constant.
- The coefficient for production volume (X2) is -0.763, meaning that an increase of 1 ton in nutmeg production will reduce the export value by 0.763 million USD, ceteris paribus.
- The coefficient for average price (X3) is -1.719, suggesting a negative influence on export value.
- The coefficient for China's GDP (X4) is 19.647, indicating that a 1 USD increase in China's GDP contributes positively to the increase of Indonesia's nutmeg export value by 19.647 million USD.

Coefficient of Determination (R²)

Table 4.
Model Summary

R	R Square	Adjusted R Square
0.967	0.934	0.897

Source: Processed Data

The R Square value of 0.934 indicates that 93.4% of the variation in the export value of Indonesian nutmeg to China can be explained by the independent variables: exchange rate, production volume, average price, and China's GDP. The remaining 6.6% is influenced by other variables not included in the model.

F-Test (Simultaneous Significance Test)

Table 5.
ANOVA Results

Model	F	Sig.
Regression	24.869	0.000

Source: Processed Data

The F-test result shows a significance value of 0.000, which is below the threshold of 0.05. This indicates that all independent variables jointly have a significant effect on the dependent variable. Moreover, the F-value of 24.869 is greater than the F-table value of 4.07, further confirming the significance of the model.

T-Test (Partial Significance Test)

Table 6.
T-Test Results

Variable	t	Sig.
Exchange Rate	-3.901	0.006
Production Volume	-0.466	0.656
Average Price	0.657	0.532
China's GDP	8.297	0.000

Source: Processed Data

From Table 6, it can be seen that:

- **Exchange rate (X1)** significantly affects the export value ($p = 0.006 < 0.05$).
- **Production volume (X2)** and **average price (X3)** do not significantly influence the export value ($p > 0.05$).
- **China's GDP (X4)** has a strong and significant positive effect ($p = 0.000 < 0.05$).

Exchange Rate

The regression results indicate that the Exchange Rate variable is statistically significant with a p-value of 0.006, which is lower than the 0.05 threshold. This suggests that the first hypothesis (H1) is accepted, indicating that the Exchange Rate (X1) significantly influences Indonesia's Nutmeg Export Value to China (Y). Furthermore, the t-statistic for the Exchange Rate variable is -3.901, which is greater in absolute value than the t-table value of 2.306, reinforcing the acceptance of H1. The regression coefficient of -21.278 implies that a one-dollar increase in the exchange rate would lead to a decrease in Indonesia's nutmeg export volume to China by 21.278 tons.

This finding aligns with the Theory of Elasticity of Demand, which posits that export demand is sensitive to price fluctuations caused by exchange rate movements. If the demand for nutmeg in China is elastic, a depreciation of the Indonesian Rupiah would render nutmeg cheaper for Chinese consumers, thereby boosting demand and export volume. This study demonstrates that a weaker Rupiah against the US Dollar makes Indonesian nutmeg more competitively priced in international markets, including China. As a result, Chinese buyers can purchase a larger quantity of nutmeg using the same amount of their currency. Thus, a depreciation of the Rupiah enhances export performance by making Indonesian products more affordable to foreign consumers.

Production Volume

The regression analysis reveals that the Production Volume variable is not statistically significant, with a p-value of 0.656, which exceeds the 0.05 level of significance. Therefore, the second hypothesis (H2) is rejected, indicating that Production Volume (X2) does not significantly affect Indonesia's Nutmeg Export Value to China (Y). The t-statistic for this variable is -0.466, which is lower than the t-table value of 2.306, leading to the

rejection of H2. The regression coefficient of -0.763 suggests that for every additional ton of nutmeg produced, the export volume to China would decrease by 0.763 tons.

This outcome is consistent with the Theory of Demand and Supply, which holds that export value is determined by the interaction between supply (production) and demand in the target market. Even if Indonesia's nutmeg production increases, it does not automatically translate into higher export values due to several factors. In this case, the export value is not solely driven by production volume but rather by structural factors and global market dynamics. These include comparative competitiveness, product quality, trade regulations, and demand elasticity in China. Although Indonesia is the primary nutmeg exporter to China, it faces challenges in maintaining export value due to post-harvest quality issues, such as high aflatoxin content. The inconsistency in nutmeg quality often fails to meet international standards, leading to reduced Chinese imports. Consequently, Indonesia's nutmeg export value to China is not significantly influenced by production volume.

Average Price

The regression output shows that the Average Price variable is not statistically significant, with a p-value of 0.532, which is higher than the 0.05 threshold. Accordingly, the third hypothesis (H3) is rejected, implying that the Average Price (X3) does not significantly affect the Export Value of Indonesian Nutmeg to China (Y). The t-statistic for this variable is 0.657, which is less than the t-table value of 2.306, confirming the rejection of H3. The regression coefficient is -1.719, indicating that a one-dollar increase in the average price would reduce the export volume by 1.719 tons.

This finding is in line with the Theory of Inelastic Demand, which posits that price changes may not significantly impact the quantity demanded under certain conditions. In this context, although the average price of nutmeg increases, the demand from Chinese consumers remains relatively stable or does not rise proportionately. The study finds that Average Price does not significantly affect Indonesia's nutmeg export value to China. Price is not the primary concern for Chinese importers; instead, critical factors include consistent availability and recognized quality. While a slightly higher price may signal better quality, Chinese consumers prioritize reliability and product standards. Additionally, nutmeg purchases are often driven by seasonal or health-related factors, making price fluctuations less impactful. Buyers typically have established preferences for specific quality levels, and thus price variations do not alter their purchasing intentions. The strong trade relations between Indonesia and China suggest that price is not a major constraint. Consequently, despite potential price volatility, Indonesia's nutmeg exports are more influenced by factors such as marketing approach and product quality than by price alone.

Gross Domestic Product

The regression results indicate that China's Gross Domestic Product (GDP) has a significance value of 0.000, which is lower than the standard probability level of 0.05. This finding leads to the conclusion that the fourth hypothesis (H4) is accepted, suggesting that China's GDP (X4) has a significant effect on the export value of Indonesian nutmeg to China (Y). Furthermore, the t-statistic for the GDP variable is 8.297, which exceeds the critical t-table value of 2.306, thus confirming the acceptance of H4. The regression coefficient for China's GDP is 19.647, meaning that for every 1-dollar increase in China's GDP, the export value of Indonesian nutmeg to China is projected to rise by 19.647 tons.

This finding is consistent with economic growth theory, which posits that a country's economic expansion—measured by an increase in GDP—stimulates greater demand for goods and services. A rising GDP in China signifies a robust economic performance, typically accompanied by increased consumer spending and demand for various products.

In this study, China's GDP demonstrates a significant positive influence on Indonesia's nutmeg export value to China. This is attributed to the enhanced purchasing power of Chinese consumers resulting from GDP growth. A higher GDP implies rising income levels among the population, which in turn drives increased demand for Indonesian nutmeg. As the Chinese economy expands, consumers and enterprises are more inclined to engage in international trade and import goods, including nutmeg from Indonesia. Moreover, a strong Chinese economy often triggers higher demand for nutmeg as a staple ingredient, driven by intensified industrial and culinary activities

CONCLUSION

Based on the research findings, the export value of Indonesian nutmeg to China is influenced by various factors beyond production volume, such as the Rupiah–US Dollar exchange rate, product quality, and China's economic conditions. The depreciation of the Rupiah makes Indonesian nutmeg relatively more expensive for Chinese consumers, thereby reducing demand and encouraging the search for alternative sources from other countries. Although Indonesia remains a leading exporter, the competitiveness of its nutmeg in the Chinese market is hindered by poor post-harvest quality and high aflatoxin content. The average price of nutmeg does not have a significant impact, as consumers tend to prioritize quality, availability, and brand reputation over price. In contrast, China's GDP growth positively affects purchasing power and increases demand for Indonesian nutmeg. Therefore, the export value of nutmeg is more strongly influenced by product quality and market conditions than by production volume alone.

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