



Analysis of the Effects of Salt Production, Salt Consumption, Per Capita Income, and Exchange Rate on Salt Imports in Indonesia

Muhammad Everest Ardiwinata*, Marseto, Anisa Fitria Utami

Universitas Pembangunan Nasional Veteran Jawa Timur, Indonesia

*Correspondence: Muhammad Everest Ardiwinata
Email: everestardiwinata@gmail.com

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Abstract: This study aims to analyze the effects of salt production, salt consumption, per capita income, and exchange rate on salt imports in Indonesia. Using a quantitative approach with multiple linear regression methods, data were analyzed over a 14-year period. The results show that salt production and exchange rate have a negative and significant effect on salt imports, while salt consumption has a positive and significant effect. Per capita income shows a positive but statistically insignificant effect. The coefficient of determination (R^2) of 71.60% indicates that the independent variables explain most of the variation in salt imports. These findings offer policy implications for the government and industry stakeholders to reduce dependency on salt imports through improved domestic production and adaptive strategies to macroeconomic changes.

Keywords: Salt Imports, Salt Production, Salt Consumption, Per Capita Income, Exchange Rate, Multiple Linear Regression

Introduction

Indonesia, as an archipelagic country with a long coastline, holds great potential in its natural resources—one of which is salt. Salt, or sodium chloride (NaCl), has been an integral part of human life since ancient times, making it one of the most essential commodities in daily life and playing a vital role across various sectors. Ironically, however, Indonesia remains one of the major salt-importing countries. This phenomenon raises concerns, as it contradicts the country's abundant natural resources. The country has long relied on salt imports from several key suppliers, with Australia consistently dominating as the largest exporter due to its high-quality salt that meets industrial needs and its relatively close geographic location. India also plays a significant role as a major salt supplier to Indonesia.

Between 2020 and 2023, salt production in Indonesia increased by 69.55%, driven by factors such as climate, technology, and government policies. Despite efforts in several regions to boost production, domestic output still often falls short of meeting the growing

national demand. High salt consumption especially in the food processing and manufacturing industries adds pressure to the domestic supply chain, forcing the government to import salt to fill the gap. This dependency affects the trade balance and price stability. Local production also faces challenges from climate change, including rising temperatures and shifting rainfall patterns, which disrupt traditional salt farming. Moreover, global competition and changing consumer preferences push domestic producers to innovate and improve product quality.

Consumption is an essential activity for households, as it sustains daily living (Afriani, 2021). Household consumption needs vary between basic and non-essential goods and are largely influenced by household income levels. Higher income typically results in increased consumption, and vice versa (Hijri Juliansyah, 2018). Globally, salt consumption continues to rise, driven by population growth and dietary changes, particularly the increased intake of processed and fast food. Excessive salt consumption, however, has been linked to serious health issues such as hypertension, heart disease, and stroke (Afif & Sasana, 2019).

Generally, a rise in per capita income reflects a country's economic growth and improved public welfare. This may influence the exchange rate; as income rises, purchasing power also increases, which can lead to greater demand for imported goods and services. If imports surpass exports, it may result in a trade deficit, putting pressure on the exchange rate and potentially causing depreciation. On the other hand, higher income levels can also attract foreign investment. It is essential to conduct an in-depth analysis of the effects of variables such as production, consumption, per capita income, and exchange rate on salt imports. Understanding these relationships is key to formulating effective strategies to reduce Indonesia's dependence on imported salt (Djangkung et al., n.d.). This study aims to provide clearer insights into the dynamics of the Indonesian salt market and offer policy recommendations to strengthen national salt self-sufficiency.

Research Method

The research adopts a quantitative approach, which is highly effective for testing hypotheses, identifying patterns, and making generalizations. In other words, this approach aims to objectively and measurably describe phenomena (Ghozali, 2018). The variables in this study are classified into two categories: the dependent variable, which is salt imports, and the independent variables, which include salt production, salt consumption, exchange rate, and per capita income. The population of the study comprises all data related to national salt production, consumption, per capita income, exchange rate, and salt imports in Indonesia over a 14-year period (Lucman et al., 2024).

Data sources include the Central Bureau of Statistics (BPS), the Ministry of Marine Affairs and Fisheries, the Ministry of Industry, the Ministry of Agriculture, and FAOSTAT. Along with scientific journals, articles, and government performance reports. The data analysis method used is multiple linear regression to estimate the influence of the independent variables on the dependent variable. based on the assumption that the coefficients in the equation are BLUE (Best Linear Unbiased Estimator). The analysis was conducted using IBM SPSS version 25.0, a statistical software tool for social science data processing.

Results and Discussion

A. Classical Assumption Tests

1. Normality Test

| One-Sample Kolmogorov-Smirnov Test | | |
|---|----------------|---------------------|
| | | Unstadeded Residual |
| N | | 15 |
| Normal Parameters ^{a,b} | | Mean |
| | | .0000000 |
| | Std. Deviation | 226765.463 |
| Most Extreme Differences | | Absolute |
| | | .130 |
| | | Positive |
| | | .130 |
| | | Negative |
| | | -.094 |
| Test Statistic | | .130 |
| Asymp. Sig. (2-tailed) | | .200 ^{c,d} |
| a) Test distribution is Normal | | |
| b) Calculated from data | | |
| c) Lilliefors Significance Correction | | |
| d) This is a lower bound of the true significance | | |

Source: SPSS, 2025

Referring to the table, it can be observed that the data in this study is normally distributed, as indicated by a probability value above 0.05, specifically 0.200, which satisfies the assumption of normality.

2. Muticollinearity Test

| Variable | Tolerance | rules | VIF | Rules | Statement |
|----------|-----------|--------|-------|-------|-------------------------------|
| (X1) | 0,360 | > 0,10 | 2,276 | <10 | There is no multicollinearity |
| (X2) | 0,297 | >0,10 | 3,372 | <10 | There is no multicollinearity |
| (X3) | 0,183 | >0,10 | 5,454 | <10 | There is no multicollinearity |
| (X4) | 0,130 | >0,10 | 7,637 | <10 | There is no multicollinearity |

Source: SPSS, 2025

The results obtained from the multiple linear regression analysis show that all four independent variables (salt production, salt consumption, per capita income, and exchange rate) in the model of salt import volume in Indonesia have tolerance values greater than 0.10 and VIF values less than 10. Therefore, it can be concluded that there is no multicollinearity in this regression model.

3. Heteroskedasticity Test

| Y | Sig (X1) | Sig (X2) | Sig (X3) | Sig (X4) | Rules | Statement |
|-------------|----------|----------|----------|----------|-------|--------------------------------|
| Salt Import | 0,521 | 0,979 | 0,194 | 0,671 | >0,05 | There is no heteroskedasticity |

Source: SPSS, 2025

Referring to the table, it is shown that the independent variables have significance values above 0.05, indicating that this study is free from heteroscedasticity.

4. Autocorelation Test

| RUN TEST | |
|-----------------------|------------------------|
| | Unstandarized Residual |
| Test value | -19979.37773 |
| Cases<Test Value | 7 |
| Cases=> Test Value | 8 |
| Total Cases | 15 |
| Number Of runs | 9 |
| Z | .018 |
| Asymp. Sig. (2tailed) | .986 |
| a. Median | |

Source: SPSS, 2025

Referring to the table, the autocorrelation test in this study was conducted using the Run Test method, which produced a 2-tailed significance value of 0.986—above the 0.05 threshold. This indicates that the regression model is free from autocorrelation issues.

B. Hypothesis Testing

| Coefficients | | | | | | |
|----------------------------------|-------------|---------------------------|------------|----------------------|--------|------|
| Model | | Unstadarized Coefficients | | Standard Coefficient | T | Sig |
| | | B | Std.Error | | | |
| 1 | (Constant) | 1349290,193 | 611971.212 | | 2.205 | .020 |
| 2 | X1_Produksi | -0,025 | .078 | -,069 | -,324 | .021 |
| 3 | X2_Konsumsi | .736 | .461 | 1484 | 2.595 | .014 |
| 4 | X3_PP | .713 | 393.416 | .108 | 3.170 | .869 |
| 5 | X4_Kurs | -1.075 | 80.433 | -,765 | -1.468 | .028 |
| a. Dependent Variable : Y_Import | | | | | | |

Source: SPSS, 2025

$$Y = 1349290,193 - 0,025 (X1) + 0,736 (X2) + 0,713 (x3) - 1,075 (x4)$$

Based on the regression equation output above, the following results are obtained:

- β_1 : The constant value is 1,349,290.193, indicating that if X_1 , X_2 , X_3 , and X_4 remain constant, then Y will increase by 1,349,290.193 tons.
- β_2 : The regression coefficient value of -0.025 indicates a negative relationship between salt production and salt imports. This means that a one-unit increase in salt production leads to a decrease in salt imports by 0.025 tons. This output is considered valid since the probability value is below 0.05, indicating that the relationship is statistically significant and negative.
- β_3 : The regression coefficient value of 0.736 indicates a positive relationship between salt consumption and salt imports. This means that a one-unit increase in salt consumption leads to an increase in salt imports by 0.736 tons. This result is considered valid as the probability value is below 0.05, indicating that the relationship is statistically significant and positive.
- β_4 : The regression coefficient value of 0.713 indicates a positive relationship between per capita income and salt imports. This implies that a one-unit increase in per capita income (1 USD) leads to an increase in salt imports by 0.713 tons. However, this result is considered not valid since the probability value is above 0.05, indicating that the relationship is statistically insignificant.
- β_5 : The regression coefficient value of -1.075 indicates a negative relationship between the exchange rate and salt imports. This means that a one-unit appreciation of the exchange rate (1 Rupiah) leads to a decrease in salt imports by 1.075 tons. This result is considered valid, as the probability value is below 0.05, indicating that the relationship is statistically significant and negative.

C. Coefficient of Determination

| Model Summary | | | | |
|---------------|-------|----------|-------------------|----------------------------|
| Model | R | R Square | Adjusted R Square | Std. Error of the estimate |
| 1 | .772a | .716 | .434 | 268312.530 |

Source: SPSS, 2025

Referring to the output shows a coefficient of determination (R^2) of 0.716 or 71.60%, indicating that the four independent variables are able to explain 71.60% of the variation in the dependent variable, namely salt imports. The remaining 21.40% is influenced by other variables not included in the model.

D. F Test

| ANOVA | | | | | | |
|---|------------|-------------------|----|-------------------|-------|-------|
| Model | | Sum of squares | df | Mean square | F | sig |
| 1. | Regression | 5494117486629.922 | 4 | 1373529371657.481 | 4.531 | .024b |
| | Residual | 3031508626213.677 | 10 | 303150862621.368 | | |
| | Total | 8525626112843.600 | 14 | | | |
| a. Dependent Variable: Y = Salt Import | | | | | | |
| b. Predictors: (Constant), X4 = Kurs, X1 = Salt Produce, X2 = Salt Consume, X3 = PP | | | | | | |

Source: SPSS, 2025

Based on the results from the F-test (ANOVA), the calculated F value is 4.531 with a significance level of 0.024. Since the significance value of 0.024 is less than the 5% significance level ($\alpha = 0.05$), and the F table value is 3.488 with degrees of freedom $df_1 = 4$ (number of independent variables) and $df_2 = 10$ ($n - k - 1$), it can be concluded that the calculated F value (4.531) is greater than the F table value (3.488). Therefore, it can be concluded that the independent variables—salt production, salt consumption, exchange rate, and per capita income—simultaneously have a significant effect on salt imports in Indonesia.

E. T test

| Variable | Calculated t value | T table | sig |
|----------|--------------------|---------|-------|
| X1 | -0,324 | 2,228 | 0,021 |
| X2 | 2,595 | 2,228 | 0,014 |
| X3 | 3,170 | 2,228 | 0,869 |
| X4 | -1,468 | 2,228 | 0,028 |

Source: SPSS, 2025

Based on the partial t-test results in Table 4.12, the production of salt (X1) has a negative and significant effect on salt imports, as the calculated t-value (-0.324) is less than the critical t-value (2.228) with a significance level of $0.019 < 0.05$. Salt consumption (X2) shows a positive and significant effect, with a t-value of 2.595 and significance of $0.019 < 0.05$. Per capita income (X3) has a positive but not significant effect, as indicated by a t-value of 3.170 and significance of $0.869 > 0.05$. The exchange rate (X4) has a negative and significant effect, although the t-value (-1.468) is lower than the critical value, the significance is $0.028 < 0.05$.

Discussion

The regression coefficient value of -0.025 indicates a negative relationship between salt production and salt imports, meaning that an increase in salt production by one unit will reduce salt imports by 0.025 tons. This result is considered valid, as the probability value is below 0.05 , implying a statistically significant and meaningful finding. This aligns with the theory of supply and demand—when salt production increases, the domestic supply rises, leading to reduced import needs due to sufficient local availability. From an economic perspective, this negative effect is explained by the law of supply: higher domestic production decreases dependence on imported salt. The increased local supply satisfies domestic demand, reducing the need for imports. These findings are consistent with previous studies, such as Yuniandini et al. (2024), which found that cotton production negatively and significantly affected Indonesia's cotton imports, and Basuki (2016), which also confirmed a negative and significant impact of production on imports in Indonesia.

The regression coefficient value of 0.713 with a probability below 0.05 indicates a positive and significant relationship between per capita income and salt imports. This implies that a 1 USD increase in per capita income leads to an increase in salt imports by 0.713 tons. This finding aligns with Keynes' consumption theory (Mankiw, 2010), which suggests that higher income levels drive greater consumption, thereby increasing demand. From an economic standpoint, rising demand due to improved purchasing power often leads to higher import volumes, especially when domestic production is insufficient or when local products lack the desired quality. This result is further supported by previous studies, such as Dewi & Sutrisna (2016), who found that shallot consumption positively and significantly affects shallot imports in Indonesia, and Zaeroni & Rustariyuni (2016), who found a similar effect of rice consumption on rice imports.

The regression coefficient of 0.713 indicates a positive relationship between per capita income and salt imports, meaning that a 1 USD increase in per capita income is associated with an increase of 0.713 tons in salt imports. However, this result is not considered valid, as the probability value exceeds 0.05 , indicating that the relationship is not statistically significant. Therefore, econometrically, the conclusion cannot be accepted, and there is insufficient evidence to state that per capita income significantly affects salt imports. Nonetheless, the finding aligns with Keynesian theory, particularly the concept of marginal propensity to consume (MPC), which suggests that as income increases, consumption tends to rise, potentially leading to increased imports. This interpretation is further supported by previous studies such as Ardi (2019), which found that per capita income positively influences rice imports in Indonesia, and Arga (2021), which found a similar effect on cotton imports.

The exchange rate has a regression coefficient of -1.075 , indicating a negative relationship between the exchange rate and salt imports. This means that an appreciation of the rupiah by 1 unit leads to a decrease in salt imports by 1.075 tons. The result is considered valid, as the probability value is below 0.05, indicating statistical significance. This finding aligns with the theory presented by Mankiw (2010), which explains that in the foreign exchange market mechanism, an increase in the exchange rate makes imported goods more expensive, thereby reducing import volumes. The credibility of this finding is further supported by previous studies, such as Rasyid and Andriyani (2020), who found that exchange rates have a negative and significant effect on raw material imports in Indonesia, and Putri and Santoso (2018), who demonstrated that rupiah depreciation leads to a decline in import volumes, especially for commodities highly dependent on foreign currency, such as industrial salt.

Conclusion

The regression analysis shows that salt production has a negative and significant effect on salt imports, with a coefficient of -0.025 , meaning that a one-unit increase in production reduces salt imports by 0.025 tons. Per capita income has a positive and significant influence, with a coefficient of 0.713 , indicating that a 1 USD increase in income leads to a 0.713-ton rise in salt imports. Salt consumption also shows a positive and significant effect, with a coefficient of 0.736 , implying that a one-unit increase in consumption raises imports by 0.736 tons. Lastly, the exchange rate has a negative and significant impact on salt imports, with a coefficient of -1.075 , meaning that a 1 rupiah appreciation results in a 1.075-ton decrease in salt imports. All variables are considered valid as their probability values are below 0.05, indicating statistically significant relationships.

This study is expected to serve as a reference for future research, particularly on commodity competitiveness, import substitution strategies, and the influence of macroeconomic variables on international trade, with suggestions to use econometric or regional panel data approaches. The findings can also guide the government in formulating policies to support national salt self-sufficiency through producer incentives, market protection, and infrastructure development. Additionally, salt industry players are encouraged to consider domestic consumption, production trends, and exchange rate fluctuations in developing more efficient and adaptive business strategies.

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