



Analysis of the Impact of Macroeconomic Inflation on the Profitability Performance of PT Vale Indonesia Tbk: An Empirical Regression Approach for the 2018-2023 Period

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Abstract: This study aims to examine and analyze the influence of macroeconomic inflation on the profitability performance of PT Vale Indonesia Tbk during the 2018–2023 period. Profitability is a key indicator of a company's financial health, and understanding how it responds to macroeconomic fluctuations is essential, particularly in the mining industry, which is highly sensitive to global and domestic economic conditions. This research employs a quantitative approach using simple linear regression analysis, supported by secondary data consisting of company financial statements and annual inflation data retrieved from the Central Statistics Agency (BPS) and Bank Indonesia. Several classical assumption tests were conducted, including normality, autocorrelation, and multicollinearity tests. The results show that the data are normally distributed and free from multicollinearity; however, the model exhibits positive autocorrelation, indicating that the residuals are not fully independent across time. The regression analysis reveals that inflation has a negative influence on the company's profitability, measured by Return on Assets (ROA). Nevertheless, this relationship is not statistically significant, as reflected by a significance value of 0.677 (> 0.05). Furthermore, the coefficient of determination (R^2) of 0.066 and an adjusted R^2 of -0.245 indicate that inflation explains only 6.6% of the variation in ROA, while the remaining 93.4% is influenced by other internal and external variables not included in this model. Overall, the findings suggest that inflation does not have a significant impact on the profitability of PT Vale Indonesia Tbk during the study period, implying that the company's financial performance may be more strongly affected by operational efficiency, commodity prices, production volume, and other macroeconomic indicators beyond inflation.

Keywords: Inflation, Profitability, ROA, Macroeconomics

INTRODUCTION

Inflation is a key macroeconomic indicator reflecting the stability of prices of goods and services in a country. In Indonesia, during the 2018-2023 period, the inflation rate experienced significant fluctuations influenced by various external and internal factors. According to data from the Central Statistics Agency (BPS, 2024), year-on-year inflation was recorded at 3.13% in 2018, declining to 2.72% in 2019, and reaching a low of 1.56% in 2021 due to the impact of the COVID-



19 pandemic, which suppressed aggregate demand. However, inflation surged again to 4.21% in 2022, triggered by rising global energy prices due to the Russia-Ukraine geopolitical conflict and the post-pandemic economic recovery. In 2023, inflation was successfully controlled at around 3.67%, thanks to Bank Indonesia's (BI) tight monetary policy, including an adjustment of the BI Rate to 6.00% (Bank Indonesia, 2023). These inflation fluctuations not only affect people's purchasing power, but also the performance of the real sector, particularly the mining industry, which is highly sensitive to input costs such as energy, labor, and raw materials.

In a corporate context, macroeconomic inflation can directly impact profitability by increasing production costs and eroding the value of monetary assets. Basic financial theory, proposed by Brigham and Houston (2019), states that unanticipated inflation tends to reduce return on assets (ROA) and return on equity (ROE) because companies face greater price uncertainty, resulting in shrinking profit margins. This is particularly relevant for companies in the mining sector, where operating costs include variable elements that are vulnerable to inflation, such as labor wages and logistics.

PT Vale Indonesia Tbk (PT Vale), one of Indonesia's largest nickel producers, is an interesting case study. Founded in 1968 and listed on the Indonesia Stock Exchange (IDX) under the code INCO, PT Vale operates a nickel mine in North Sulawesi and contributes significantly to national nickel exports, accounting for approximately 25% of Indonesia's total production in 2022 (Ministry of Energy and Mineral Resources, 2023). PT Vale's profitability during the 2018-2023 period exhibited volatility: ROA reached 8.5% in 2018, dropped drastically to 2.1% in 2020 due to the pandemic, and rebounded to 12.3% in 2022 in line with rising global nickel prices (PT Vale Indonesia Tbk Annual Report, 2023). However, this trend raises questions about whether inflation fluctuations contributed to this performance change.

Previous empirical studies have shown a negative relationship between inflation and corporate profitability. For example, research by Susanto and Wijaya (2020) on manufacturing companies listed on the Indonesia Stock Exchange (IDX) found that a 1% increase in inflation can reduce ROA by 0.3-0.5%, particularly in sectors dependent on imported raw materials. Globally, Ball and Brown (1968), within the semi-strong form efficient market hypothesis, emphasize that



macroeconomic factors such as inflation impact corporate financial statements through cost and revenue channels. However, in Indonesia, specific research on the nickel mining sector remains limited, even though nickel is a strategic commodity in the green energy transition, such as in electric vehicle batteries. PT Vale, with operations heavily dependent on global commodity prices and domestic costs, is vulnerable to inflationary shocks that could disrupt its supply chain and operational efficiency.

METHOD

The research strategy used in this study is an associative research strategy. According to Sugiyono (2014:92), an associative strategy is research that seeks relationships between two or more variables. The study population comprises all annual financial data of PT Vale Indonesia Tbk, listed on the Indonesia Stock Exchange (IDX) since its inception. The sample was purposively selected, using annual financial report data for the 2018-2023 period, resulting in six observations (one per year). This period was selected based on the availability of complete data and its relevance to inflation fluctuations following Indonesia's financial reforms. This small sample size is a common limitation of single-case time-series studies, but is sufficient for descriptive analysis and simple regression, as applied in Nugroho's (2022) study in a similar sector. There is no sampling error because the data cover the entire target period. Annual financial data includes profitability indicators such as Return on Assets (ROA), Return on Equity (ROE), and Net Profit Margin (NPM) for the periode 2018-2023. This data is obtained from the company's official financial reports published on the official website of PT Vale Indonesia Tbk and the Indonesia Exchange (IDX). Annual inflation rate data obtained from the Central Statistics Agency (BPS) and Bank Indonesia for the periode 2018-2023. Inflation is measured using the Consumer Price Index (CPI). This study uses quantitative analysis with a simple linear regression approach to determine the effect of inflation on the profitability performance of PT Vale Indonesia Tbk during the 2018–2023 period. The analysis was conducted by processing secondary data in the form of the company's financial reports and Indonesia's annual inflation data obtained from the Central Statistics Agency (BPS) or Bank Indonesia (BI).

1. Statistical analysis methods:

a. Normality Test



According to Gujarati (2012:124), the normality test aims to determine whether the residual distribution in a regression model is normally distributed. The normality assumption is important because the classical linear regression model requires that confounding variables have a normal distribution so that statistical tests such as the t-test and F-test can be used validly.

b. Autocorrelation Test

According to Nachrowi and Usman (2006:205), autocorrelation is the correlation between observation members arranged according to time or space, so that disturbances in a certain period are related to disturbances in other periods.

c. Partial Test (t)

According to Ghozali (2018:98) The t-test is used to determine how far the influence of one independent variable individually explains the variation in the dependent variable.

2. Simple Linear Regression Test

Used to determine the linear relationship between inflation and profitability. The analysis produces a constant value (α), a regression coefficient (β), and an R^2 value.

The regression equation used in this study is:

$$Y = \alpha + \beta X + \varepsilon$$

or specifically written as:

$$ROA_t = \alpha + \beta \cdot INF_t + \varepsilon_t$$

Information:

Y = Profitability (Return on Assets / ROA)

X = Inflation (INF)

α = Constant, namely the ROA value when inflation = 0

β = Regression coefficient, shows the direction and magnitude of the influence of inflation on ROA

ε_t = Error term, which is another factor that influences ROA but is not included in the model

3. Hypothesis Testing



Hypothesis testing in regression can be based on two things, the level of significance (α) and the level of confidence are used to determine the extent of the influence of the independent variable on the dependent variable partially. Testing criteria:

- a. If the Sig. value is < 0.05 , then there is a significant influence between inflation and profitability.
- b. If the Sig. value is > 0.05 , then there is no significant effect between inflation and profitability.

RESULT AND DISCUSSION

1. Company Description

PT Vale Indonesia Tbk (ticker code: INCO) is an integrated nickel mining company based in Sorowako, North Sulawesi. Founded in 1968 as a subsidiary of Vale SA (Brazil), the company focuses on mining and processing nickel ore into nickel matte for the stainless steel and EV battery industries. Listed on the IDX since 1990, PT Vale has a production capacity of approximately 70,000 tons of nickel matte per year and is committed to sustainable practices.

2. Research Result

a. Classical Assumption

1) Normality Test

This test was conducted with the primary goal of verifying whether the available data follows a normal distribution. The approach used involved the Kolmogorov-Smirnov test to assess the level of normality in the data for both independent and dependent variables. Based on these criteria, if the significance value is greater than the significance level (0.05), then the normality requirement is considered met. The findings from the normality test in this study are presented as follows:



		Unstandardized Residual
N		5
Normal Parameters ^{a,b}	Mean	.0000000
	Standard Deviation	.02726193
Most Extreme Differences	Absolute	.155
	Positive	.155
	Negative	-.126
Test Statistics		.155
Asymp. Sig. (2-tailed)		.200 ^{c,d}

Tabel 1. Normality Test

- a. Test distribution is Normal.
- b. Calculated from data.
- c. Lilliefors Significance Correction.
- d. This is a lower bound of the true significance.

Because the Asymp. Sig. (0.200) value > 0.05, the residual data is normally distributed. Thus, the normality assumption is met, so that the data is suitable for use in regression analysis or further parametric statistical tests.

2) Autocorrelation Test

This test aims to identify whether there is a correlation between the nuisance error at time period t and the nuisance error at the previous time period in a linear regression model. An optimal regression model is one that does not experience autocorrelation, thus free from dependencies between errors. The findings from the test conducted by the authors are presented as follows:

Model	R	R Square	Adjusted R Square	Standard Error of the Estimate	Durbin-Watson
1	.257 ^a	.066	-.245	.03147937	.502

Tabel 2. Autorrelaxion Test

- a. Predictors: (Constant), INFLATION
- b. Dependent Variable: ROA

Based on the results of the autocorrelation test using the Durbin–Watson test, the DW value was 0.502. This value is well below 2, thus concluding that the regression model experiences



positive autocorrelation. Therefore, the autocorrelation-free assumption in this regression model has not been met.

3) Multicollinearity Test

The multicollinearity test was conducted to determine whether the regression model in this study exhibits a correlation between the independent variables. An ideal regression model is one that is free from multicollinearity. To detect the presence of multicollinearity, a VIF (Variance Inflation Factor) value of less than 20 or a Tolerance value greater than 0.05 indicates the absence of multicollinearity. The test results from this study are as follows:

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	INFLATION	1,000	1,000

Tabel 3. Multicollinearity Test

a. Dependent Variable: ROA

Based on the results of the multicollinearity test, the Tolerance value was 1.000 (> 0.10) and the VIF value was 1.000 (< 10). This indicates that the regression model is free from multicollinearity symptoms, so the independent variables in this study do not have a high correlation with each other.

b. Simple Linear Regression Analysis

Simple linear regression analysis can be used to determine whether the independent variable, namely inflation (X), has an influence on the profitability performance of PT Vale Indonesia Tbk. The independent variable in this simple linear regression is inflation (X), while the dependent variable is Return on Assets (ROA) (Y).

Model	Unstandardized Coefficients	Standardized Coefficients	t	Sig.
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		B	Std. Error	Beta		
1	(Constant)	.079	.044		1,799	.170
	INFLATION	-.655	1,423	-.257	-.460	.677

Tabel 4. Simple Linear Regression

a. Dependent Variable: ROA

Based on the results of simple linear regression analysis, the following regression equation was obtained:

$$ROA_t = 0.079 - 0.655 \times \text{Inflation} + \varepsilon_t$$

This equation shows that if the inflation variable increases by 1 unit, the ROA value will decrease by 0.655 units, assuming other variables are constant.

The coefficient value is -0.655 → the effect of inflation on ROA is negative, but not significant (Sig. 0.677 > 0.05). This means that even though the direction of the effect is negative, the relationship is not statistically significant.

c. Coefficient of Determination (R²)

The coefficient of determination (adjusted R²) is used to determine the extent to which a regression model can explain variations in the dependent variable. The adjusted R² value ranges from 0 to 1. The smaller the adjusted R² value, the more limited the independent variable's ability to explain changes in the dependent variable. Conversely, if the value is close to 1, it means the independent variable is able to provide almost all the information needed to predict the dependent variable. The results of the coefficient of determination test in this study

Model	R	R Square	Adjusted R Square	Standard Error of the Estimate
1	.257a	.066	-.245	.03147937

Tabel 5. Coefficient of Determination

a. Predictors: (Constant), INFLATION

Based on the results of the coefficient of determination test, the R² value was 0.066. This indicates that the inflation variable is only able to explain 6.6% of the variation in ROA changes, while the remaining 93.4% is explained by other variables not included in this research model. Meanwhile, the adjusted R² value of -0.245 indicates that the regression model has very low ability to explain the dependent variable.



d. Hypothesis Testing

Based on the partial regression test (t-test), a significance value of 0.677 was obtained, which is greater than the 0.05 level of significance. Therefore, according to the test criteria, H_0 is accepted and H_1 is rejected, indicating that inflation does not significantly affect profitability (ROA). This indicates that changes in the inflation rate did not significantly impact the company's profitability during the study period.

CONCLUSION

Based on the research results, it can be concluded that inflation does not have a significant effect on the profitability of PT Vale Indonesia Tbk in the 2018–2023 period. This is indicated by a significance value of 0.677, which is greater than 0.05, and a negative regression coefficient of -0.655. Although the direction of the relationship is negative, it is not statistically significant. Furthermore, the low R^2 value (0.066) and negative adjusted R^2 (-0.245) indicate that the inflation variable's ability to explain variations in profitability is very limited. Most variations in ROA are influenced by factors other than the model, such as global commodity prices, company policies, or internal financial factors.

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