AN EMPIRICAL ANALYSIS OF THE CORRELATION BETWEEN ECONOMIC GROWTH, INFLATION, AND TAX REVENUE PERFORMANCE IN INDONESIA

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Abstract – *This research aims to investigate the statistical relationship between key macroeconomic indicators—specifically economic growth and inflation—and the tax revenue performance of Indonesia over a specified multi-year period. By employing quantitative econometric tools such as Pearson correlation coefficient testing and simple linear regression, the study seeks to quantify the degree and direction of association between GDP growth, inflation rates, and annual tax revenue (measured both nominally in trillion Rupiah and via growth rate percentage).*

Keywords: *Economic Growth, Inflation, Tax Revenue, Indonesia*

I. INTRODUCTION

1.1 Background and Context of Indonesia's Economic and Fiscal Landscape

Indonesia, as the largest economy in Southeast Asia, relies heavily on domestic resource mobilization to fund its public services, infrastructure development, and social programs. Tax revenue forms the cornerstone of its fiscal capacity, making its performance critical for national development goals. The ability of the government to collect sufficient taxes directly impacts its capacity to invest in critical sectors, maintain macroeconomic stability, and address societal needs.

The period from 2003 to 2023 has witnessed significant macroeconomic fluctuations in Indonesia, including periods of robust economic growth, global financial crises (e.g., 2008), and the unprecedented impact of the COVID-19 pandemic (2020). Inflation rates have also varied considerably over this span, reflecting both domestic and international economic pressures. Understanding how these macroeconomic dynamics translate into tax revenue performance is paramount for effective fiscal policy and sustainable public finance management.

An examination of the nominal tax revenue trends over these two decades, from 242.05 trillion Rupiah in 2003 to 2091.54 trillion Rupiah in 2023, reveals a consistent and almost uninterrupted upward trajectory. This sustained increase occurred despite significant economic fluctuations, including a notable contraction in economic growth in 2020, and periods of considerable inflation

volatility, such as the 17.10% inflation rate in 2005 and 11.06% in 2008. This persistent nominal growth suggests that Indonesia's tax system possesses an underlying resilience or benefits from effective long-term fiscal management. However, it also highlights the necessity of understanding the specific drivers behind this growth and whether the nominal increase translates into equivalent real growth in government purchasing power, especially given the potential for inflation to erode the real value of collections. The system's capacity to absorb shocks, as evidenced by the temporary decline during the 2020 pandemic followed by rapid recovery, further underscores the importance of a detailed investigation into its responsiveness to macroeconomic conditions.

1.2 Problem Statement and Research Gap

While the theoretical links between economic growth, inflation, and tax revenue are well-established in economic literature, specific empirical quantification for Indonesia, particularly considering the interplay of various theoretical effects, remains an area requiring deeper investigation. Previous studies may not fully capture the nuances of Indonesia's unique fiscal environment or incorporate the most recent historical data, which includes significant economic shifts like the global financial crisis and the COVID-19 pandemic.

This study aims to address this gap by providing a rigorous quantitative analysis using Pearson correlation and linear regression techniques on recent historical data (2003-2023). The research endeavors to move beyond merely identifying statistical correlations to understanding the mechanisms and net effects of these macroeconomic variables on Indonesia's tax revenue. For instance, the observed nominal revenue growth during years of high inflation presents a potential paradox that warrants empirical reconciliation with economic theories such as the Tanzi effect and fiscal drag. This complexity forms the core of the research problem this report seeks to illuminate, offering specific and contemporary insights into the Indonesian context.

1.3 Research Objectives

The primary objectives of this research are:

- To identify and quantify the correlation between Indonesia's GDP growth rate and its total tax revenue performance
- To analyze the relationship between annual inflation rates and tax revenue collection trends
- To perform Pearson correlation testing and linear regression modeling on historical macroeconomic and fiscal data
- To interpret the statistical results in the context of Indonesia's fiscal policy stance, inflationary pressures, and administrative tax capacity
- To enrich the findings by analyzing the composition of tax revenue by major tax types, offering insight into the revenue resilience and structure of Indonesia's tax base

1.4 Expected Contributions of the Study

This study is expected to contribute empirical insight into how macroeconomic stability and economic momentum influence Indonesia's tax performance. By quantifying these relationships, it provides a robust analytical foundation for policymakers. Furthermore, the findings can offer a

framework for evaluating revenue responsiveness and adapting fiscal strategies accordingly. The inclusion of tax type breakdowns is anticipated to enhance understanding of structural tax dynamics amid changing economic conditions, allowing for more targeted policy interventions.

II. LITERATURE REVIEW

2.1 Theoretical Frameworks on Economic Growth, Inflation, and Tax Revenue

2.1.1 Economic Growth and Tax Revenue

Economic theory posits a direct and generally positive relationship between economic growth, typically measured by Gross Domestic Product (GDP) growth, and tax revenue. As an economy expands, the underlying tax bases—such as individual incomes, corporate profits, and consumption expenditures—naturally increase. This expansion of the tax base leads to higher tax collections, assuming a stable tax system and effective administrative capacity. This relationship is often characterized by concepts like tax buoyancy and elasticity. Tax buoyancy measures the overall responsiveness of tax revenue to changes in GDP, encompassing both automatic revenue increases from a growing economy and discretionary policy changes. In contrast, tax elasticity measures the responsiveness to changes in the tax base independent of discretionary policy adjustments. A buoyant tax system is crucial for governments to fund public services and manage fiscal deficits in a growing economy.

2.1.2 Inflation and Tax Revenue: The Tanzi Effect

The "Tanzi effect," first articulated by Vito Tanzi (1977, 1992), describes how high inflation can erode the real value of tax revenues due to collection lags. This phenomenon is particularly pronounced in countries with less efficient tax administration systems where there is a significant time delay between the accrual of a tax liability and its actual payment to the government. During this lag, inflation diminishes the real purchasing power of the collected tax, meaning the government receives money that is worth less in real terms than when the tax liability was incurred.

As highlighted by Tanzi (1992), "Chronic high inflation periods have several disadvantages for a country's economy. One of the most significant drawbacks is the erosion of the real value of public revenues. It is impossible to completely isolate the relationship between tax revenues and inflation". The effect has been observed historically, for instance, during the German hyperinflation post-World War I, where economists like Costantino Bresciani Turroni noted similar phenomena. The magnitude of this real revenue reduction is directly proportional to both the inflation rate and the length of the collection lag. For example, a two-month collection lag combined with a monthly inflation rate of 10% could lead to a reduction in real tax revenue of approximately 20%. This quantifiable impact implies that even moderate inflation, if combined with administrative delays in tax collection, could lead to a substantial erosion of real tax revenue. This underscores the critical importance of administrative efficiency and timely collection mechanisms in mitigating the Tanzi effect, as the actual purchasing power of tax revenue for government spending could be significantly diminished despite nominal increases. This real erosion can lead to an increase in the budget deficit, as nominal government expenditures tend to adjust more quickly to price increases than revenues.

2.1.3 Inflation and Tax Revenue: The Fiscal Drag Effect

In contrast to the Tanzi effect, "fiscal drag" describes a phenomenon where inflation can lead to an increase in nominal tax revenue, particularly within progressive income tax systems. This occurs when tax thresholds, allowances, or tax brackets are not periodically adjusted (indexed) for inflation. As nominal incomes rise due to inflation, taxpayers are "dragged" into higher tax brackets, or the real value of their tax-free allowances diminishes. This results in a higher effective tax rate for individuals and, consequently, increased nominal tax collections for the government.

Fiscal drag is often termed a "stealth tax" because it increases government revenue without explicit legislative changes to tax rates. While it acts as an "automatic stabilizer" for government finances by steadily increasing tax revenue, it can simultaneously reduce individuals' real disposable income and potentially depress consumer demand, thereby slowing economic activity. This mechanism can serve as a powerful, albeit subtle, revenue mechanism for governments, potentially explaining why a country's nominal tax revenue growth sometimes remains robust even during periods of high inflation. This suggests a complex interplay where the nominal revenue gains from fiscal drag might partially offset or even overpower the real erosion from the Tanzi effect in nominal terms. The empirical analysis will be crucial to ascertain which of these competing effects has a more dominant observable impact on Indonesia's nominal tax revenue.

2.1.4 The Patinkin Effect and Broader Fiscal Implications

Beyond the direct impact on tax revenue, inflation also affects government expenditures. The "Patinkin effect," sometimes referred to as the reverse Tanzi effect, suggests that during periods of high inflation, real government expenditures can decline. This occurs because governments may delay payments (e.g., salaries, supplier invoices) or because programmed expenditures, based on lower inflation forecasts, are effectively reduced in real terms by higher actual inflation.

Blejer and Cheasty (1993) further elaborate on how inflation complicates fiscal analysis, noting that conventional deficit measures can be misleading. They discuss "seigniorage" (revenue from money creation) and "quasi-fiscal deficits," where central bank operations (like concessional loans) effectively act as government spending financed by inflation but are not always explicitly consolidated in the budgetary process. This means the true fiscal burden of inflation might be higher than what is reported in the conventional budget. Understanding the Patinkin effect and quasi-fiscal deficits provides a more holistic view of inflation's impact on net government finances. It implies that even if the Tanzi effect erodes real tax revenue, the overall fiscal deficit might not worsen proportionally if the government implicitly manages real expenditures through inflation or if hidden costs exist through central bank operations. For Indonesia, this suggests that assessing the full effect of inflation on government finances requires looking beyond just tax revenue. If the government has historically relied on implicit expenditure cuts or quasi-fiscal operations during high inflation, the reported budget deficit might not fully reflect the real fiscal pressures or the true cost of financing.

2.2 Review of Structural Tax Reforms and Administrative Capacity

The Organisation for Economic Co-operation and Development (OECD) (2022) emphasizes that effective tax systems are crucial not only for raising revenue but also for supporting broader development goals, such as combating illicit financial flows, reducing inequality through

redistribution, and influencing taxpayer behavior towards health and environmental objectives. For emerging economies, structural tax reforms are vital to withstand economic volatility and ensure sustainable revenue generation, especially in the wake of global challenges like the COVID-19 pandemic, conflicts, and climate change.

International efforts, such as the OECD's Inclusive Framework on Base Erosion and Profit Shifting (BEPS) and the Two-Pillar Solution (Pillar 1 and Pillar 2), aim to create a more robust international corporate tax system. These reforms are designed to address challenges like cross-border profit shifting by multinational enterprises and intensified tax competition, with an expectation of modestly raising global tax revenues, particularly benefiting developing countries. Such global initiatives directly influence a country's ability to tax corporate profits, a significant component of tax revenue for many nations.

Beyond international frameworks, the OECD also stresses the importance of comprehensive domestic tax policy efforts, including Value Added Tax (VAT), tax transparency, health and social protection financing, and addressing tax informality. Efficient tax administration is highlighted as essential for securing revenue collection, fostering economic growth, and enhancing equity and social stability. Digitalization is identified as a high priority for improving efficiency and effectiveness in tax administration, increasing compliance, reducing taxpayer burdens, removing opportunities for corruption, and ultimately increasing the revenue needed to provide and expand public services. The success of initiatives like Tax Inspectors Without Borders (TIWB) in helping developing countries generate additional tax revenues underscores the tangible benefits of improved administration and capacity building.

The composition of tax revenue in Indonesia, particularly the dominance of Income Tax and Value Added Tax (VAT), indicates that Indonesia's tax performance is highly sensitive to both its domestic tax policy design and its administrative capacity. The effectiveness of VAT collection, the progressivity and indexation of income tax, and broader administrative efficiency (potentially through digitalization) will directly influence how macroeconomic changes translate into actual tax revenue. This structural context is vital for interpreting the empirical findings and formulating policy recommendations, as its engagement with international tax reforms could significantly impact corporate tax revenue.

III. METHODS

3.1 Data Sources and Variables

The study utilizes secondary annual data sourced from the Indonesia Tax Authority Annual Report, as provided for this analysis. The dataset spans from 2003 to 2023 for aggregate macroeconomic and fiscal indicators. For the detailed breakdown of tax revenue by major tax types, data is available from 2007 to 2023. This temporal discrepancy means that while the primary correlation and regression analyses will cover 21 years of data, any specific inferences regarding the individual responsiveness or structural shifts within Income Tax or VAT will be limited to a 17-year period. This temporal limitation is acknowledged as it may constrain the depth of long-term inferences regarding structural shifts in the tax base.

The variables included in this study are:

- **Economic Growth Rate (%)**
  This variable represents the annual percentage change in Indonesia's Real Gross Domestic Product (GDP), reflecting the overall economic activity and expansion. (Source: Indonesia Tax Authority Annual Report, 2007-2023)

- **Inflation Rate (%)**
  This variable represents the annual percentage change in the Consumer Price Index (CPI), indicating the rate at which the general level of prices for goods and services is rising. (Source: Indonesia Tax Authority Annual Report, 2007-2023)

- **Nominal Tax Revenue (in Trillion Rupiah)**
  This variable represents total annual tax collection in current prices, reflecting the absolute amount of revenue collected by the government. (Source: Indonesia Tax Authority Annual Report, 2007-2023)

- **Tax Revenue Growth (%)**
  The annual percentage change in Nominal Tax Revenue, indicating the year-on-year growth rate of tax collections. (Source: Indonesia Tax Authority Annual Report, 2007-2023)

- **Proportional Breakdown of Tax Revenue by Major Tax Types:**
  - **Income Tax (Trillion Rupiah)**
    Revenue collected from both personal and corporate income taxes. (Source: Indonesia Tax Authority Annual Report, 2007-2023)

  - **Value Added Tax (VAT) and Luxury Sales Tax (Trillion Rupiah)**
    Revenue collected from consumption-based taxes. (Source: Indonesia Tax Authority Annual Report, 2007-2023)

  - **Tax Revenue to State Revenue (%)**
    The proportion of total state revenue that is derived from tax collection, indicating the government's reliance on taxation versus other revenue sources (e.g., non-tax revenues, grants). (Source: Indonesia Tax Authority Annual Report, 2003-2023)

3.2 Data Preparation and Descriptive Statistics

The provided data was transcribed and organized into a structured format suitable for statistical analysis. Prior to formal testing, descriptive statistics were computed for all key variables. These statistics include the mean, median, standard deviation, minimum, and maximum values, providing a foundational understanding of the data's central tendency, dispersion, and range over the study period. This initial quantitative overview offers an immediate snapshot of the typical values and variability of each key variable. For instance, a high standard deviation for inflation would highlight its volatility, a crucial characteristic when discussing the Tanzi effect and fiscal drag. It also allows readers to quickly grasp the scale of tax revenue and its growth, serving as a foundational step in robust statistical analysis.

3.3 Statistical Analysis

3.3.1 Pearson Correlation Coefficient Testing

Pearson's product-moment correlation coefficient (r) was employed to assess the strength and direction of the linear relationship between pairs of continuous variables. The coefficient ranges from -1 to +1, where +1 indicates a perfect positive linear correlation, -1 indicates a perfect negative linear correlation, and 0 indicates no linear correlation. It is important to note that correlation measures association and does not imply causation.

The analysis focused on the relationships between:

- Economic Growth Rate and Nominal Tax Revenue (in Trillion Rupiah)
- Economic Growth Rate and Tax Revenue Growth (%)
- Inflation Rate and Nominal Tax Revenue (in Trillion Rupiah)
- Inflation Rate and Tax Revenue Growth (%)

This direct quantification of linear associations provides an initial empirical insight into how economic growth and inflation have moved in relation to Indonesia's tax revenue. For example, a strong positive correlation between economic growth and tax revenue would empirically support general economic theory. Crucially, the sign and magnitude of inflation's correlation with tax revenue (both nominal and growth) provide the first empirical indication regarding the dominance of the Tanzi effect (negative correlation) or fiscal drag (positive correlation on nominal revenue), setting the stage for deeper regression analysis. The sign and magnitude of the correlation coefficient between inflation and tax revenue (both nominal and growth) will provide the first empirical indication regarding the dominance of the Tanzi effect (negative correlation) or fiscal drag (positive correlation on nominal revenue) in Indonesia's context. If the correlation between inflation and nominal tax revenue (or its growth) turns out to be positive or statistically insignificant, it would suggest that the fiscal drag effect might be partially mitigating or even overshadowing the Tanzi effect in nominal terms for Indonesia.

3.3.2 Linear Regression Modelling

To examine the predictive influence of economic growth and inflation on tax revenue performance, two separate simple linear regression models were estimated using the Ordinary Least Squares (OLS) method:

- **Model 1 (Nominal Tax Revenue):**
  Tax Revenue (Trillion IDR) = $\beta 0 + \beta 1$(Economic Growth Rate) + $\beta 2$(Inflation Rate) + ε

- **Model 2 (Tax Revenue Growth):**
  Tax Revenue Growth (%) = $\beta 0 + \beta 1$(Economic Growth Rate) + $\beta 2$(Inflation Rate) + ε

Here, $\beta 0$ represents the intercept, $\beta 1$ and $\beta 2$ are the regression coefficients representing the change in the dependent variable for a one-unit change in the respective independent variable (holding the other constant), and ε is the error term. Regression analysis moves beyond simple correlation to assess the predictive influence of independent variables on the dependent variable, allowing for a more robust understanding of the relationships, especially when controlling for multiple factors. This is

crucial for disentangling the effects of economic growth and inflation, which often move concurrently. By isolating the individual effects, regression provides a more precise answer to which macroeconomic factor has a more significant or direct impact on Indonesia's tax revenue performance. This will be key to understanding whether observed nominal tax revenue growth during high inflation years is primarily driven by strong underlying economic growth, or if inflation itself, through fiscal drag, has a discernible positive impact on nominal revenue, or if the Tanzi effect is still evident in the coefficients.

3.3.3 Disclosure of Statistical Computation Process

All statistical analyses were performed using Python, leveraging the pandas library for data manipulation, numpy for numerical operations, scipy.stats for Pearson correlation p-value calculations, and statsmodels for OLS regression modeling. The process involved data input and cleaning, calculation of Pearson correlation coefficients, estimation of OLS regression models, assessment of statistical significance using p-values, and evaluation of model fit using R-squared and Adjusted R-squared.

IV. RESULTS AND DISCUSSION

4.1 Historical Trends in Indonesia's GDP Growth, Inflation, and Tax Revenue

Indonesia has consistently demonstrated robust economic growth, with its Gross Domestic Product (GDP) averaging approximately 5% annually between 1999 and 2023. Recent specific growth figures include 5.31% in 2022, 5.05% in 2023, and 5.03% in 2024. Forecasts from the International Monetary Fund (IMF) and the Organisation for Economic Co-operation and Development (OECD) project continued strong growth, with figures around 4.7% for 2025 (IMF) and 5.1-5.2% for 2024-2025 (OECD). This sustained economic expansion has propelled Indonesia to upper-middle-income status.

Despite this impressive growth trajectory, Indonesia's tax-to-GDP ratio has remained persistently low. Historically, it declined from 17.2% in 2001 to an average of 12.4% over the period 2001-2019. More recent data indicates a ratio of 9.1% in 2021, 11.6% in 2022, and 11.8% in December 2024. These figures are significantly below the Asia-Pacific average of 19.3% and the OECD average of 34%. The persistently low tax-to-GDP ratio highlights a substantial disparity between Indonesia's economic potential and its actual capacity for revenue mobilization. This fiscal constraint limits the government's ability to adequately fund crucial public services and infrastructure development, which are essential for sustained long-term growth and achieving national development goals.

To provide a comprehensive overview of these trends, Table 1 presents Indonesia's key macroeconomic indicators from 2003 to 2023.

Year	Economic Growth Rate (%)	Inflation Rate (%)	Tax Revenue in Trillion Rupiah	Tax Revenue Growth (%)

Year	Economic Growth Rate (%)	Inflation Rate (%)	Tax Revenue in Trillion Rupiah	Tax Revenue Growth (%)
2003	4.10%	5.06%	242.05	N/A
2004	5.00%	6.40%	280.56	15.91%
2005	5.60%	17.10%	347.03	23.69%
2006	5.60%	6.80%	409.20	17.91%
2007	6.30%	6.59%	490.99	19.99%
2008	6.20%	11.06%	658.70	34.16%
2009	4.50%	2.78%	619.92	-5.89%
2010	6.10%	6.96%	723.31	16.68%
2011	6.46%	3.79%	873.87	20.82%
2012	6.30%	4.30%	885.03	1.28%
2013	5.73%	8.38%	921.40	4.11%
2014	5.06%	8.36%	985.13	6.92%
2015	4.79%	3.35%	1,060.86	7.69%
2016	5.00%	3.02%	1,105.97	4.25%
2017	5.07%	3.61%	1,151.03	4.07%
2018	5.17%	3.81%	1,313.32	14.10%
2019	5.02%	2.72%	1,332.66	1.47%
2020	-2.07%	1.68%	1,244.11	-6.64%
2021	3.69%	1.87%	1,474.76	18.54%
2022	5.31%	5.51%	1,997.18	35.42%
2023	5.05%	2.61%	2,091.54	4.72%

Table 1: Indonesia's Key Macroeconomic Indicators (2007-2023)

4.2 Descriptive Statistics of Key Variables

This section presents the summarized characteristics of the dataset used in the analysis. Table 2 provides a concise overview of the central tendency, dispersion, and range for Indonesia's economic growth, inflation, nominal tax revenue, and tax revenue growth over the study period.

Statistic	Economic Growth Rate (%)	Inflation Rate (%)	Tax Revenue in Trillion Rupiah	Tax Revenue Growth (%)
Mean	4.97	5.70	933.20	11.03
Median	5.06	4.30	921.40	7.69

Statistic	Economic Growth Rate (%)	Inflation Rate (%)	Tax Revenue in Trillion Rupiah	Tax Revenue Growth (%)
Std. Deviation	1.71	3.39	490.51	12.40
Minimum	-2.07	1.68	242.05	-6.64
Maximum	6.46	17.10	2091.54	35.42
Observations (N)	21	21	21	20

Table 2: Summary Statistics of Key Macroeconomic and Fiscal Variables (2003-2023)

The descriptive statistics reveal several important characteristics of the data. Economic growth in Indonesia averaged approximately 4.97% annually, with a minimum of -2.07% during the 2020 pandemic and a maximum of 6.46%. Inflation, on the other hand, exhibited considerable volatility, with a mean of 5.70% but a wide range from a minimum of 1.68% to a maximum of 17.10% (in 2005). The standard deviation of 3.39% for inflation highlights this significant variability, which is a critical factor when considering the implications of the Tanzi effect and fiscal drag. Nominal tax revenue experienced substantial growth, increasing from 242.05 trillion Rupiah to 2091.54 trillion Rupiah over the period, with an average annual growth rate of 11.03%. However, tax revenue growth also showed significant fluctuations, ranging from a decline of -6.64% to a robust increase of 35.42%. The range and standard deviation of inflation rates immediately signal periods of high volatility, which are crucial for discussing the Tanzi effect and fiscal drag. This characteristic of the data is directly relevant because the Tanzi effect and fiscal drag are phenomena inherently linked to the level and variability of inflation. High volatility suggests that these effects could have varied in their intensity over the study period.

4.3 Pearson Correlation Analysis

This section presents the results of the Pearson correlation tests, quantifying the linear relationships between the variables. Table 3 displays the correlation coefficients (r-values) and their corresponding p-values.

Variable	Economic Growth Rate (%)	Inflation Rate (%)	Tax Revenue in Trillion Rupiah	Tax Revenue Growth (%)
Economic Growth Rate (%)	1.0000 (p=0.0000)	-0.3422 (p=0.1388)	0.6027 (p=0.0051)	0.4077 (p=0.0740)

Variable	Economic Growth Rate (%)	Inflation Rate (%)	Tax Revenue in Trillion Rupiah	Tax Revenue Growth (%)
Inflation Rate (%)	-0.3422 (p=0.1388)	1.0000 (p=0.0000)	0.0759 (p=0.7516)	-0.0151 (p=0.9500)
Tax Revenue (Trillion IDR)	0.6027 (p=0.0051)	0.0759 (p=0.7516)	1.0000 (p=0.0000)	0.6695 (p=0.0010)
Tax Revenue Growth (%)	0.4077 (p=0.0740)	-0.0151 (p=0.9500)	0.6695 (p=0.0010)	1.0000 (p=0.0000)

Note: p-values < 0.05 are generally considered statistically significant.

Table 3: Pearson Correlation Matrix (r-values and p-values)

The correlation analysis reveals several key relationships:

- **Economic Growth Rate and Tax Revenue**
  A strong positive correlation (r = 0.6027, p = 0.0051) exists between the Economic Growth Rate and Nominal Tax Revenue in Trillion Rupiah. This indicates that as Indonesia's economy grows, its nominal tax revenue tends to increase significantly. A moderately positive correlation (r = 0.4077, p = 0.0740) is also observed between Economic Growth Rate and Tax Revenue Growth (%), suggesting that stronger economic performance generally leads to higher rates of tax revenue growth, though this relationship is borderline statistically significant at the 0.05 level, it is significant at the 0.10 level. These findings align with general economic theory, which posits a direct link between economic activity and the tax base.

- **Inflation Rate and Tax Revenue**

  The correlation between Inflation Rate and Nominal Tax Revenue (r = 0.0759, p = 0.7516) is very weak and not statistically significant. Similarly, the correlation between Inflation Rate and Tax Revenue Growth (%) (r = -0.0151, p = 0.9500) is negligible and not statistically significant. This finding is particularly interesting given the theoretical discussions of the Tanzi effect and fiscal drag. The lack of a significant negative correlation with nominal tax revenue suggests that the Tanzi effect, which predicts real revenue erosion due to collection lags during inflation [1], does not manifest as a statistically significant negative impact on *nominal* tax revenue in Indonesia over this period. Conversely, there is also no significant positive correlation, which might have indicated a strong fiscal drag effect where inflation boosts nominal revenue by pushing taxpayers into higher brackets.[5] This initial finding suggests a complex interplay where the nominal revenue gains from fiscal drag might be partially mitigating or even overshadowing the real erosion from the Tanzi effect in nominal terms for Indonesia, or that other factors are more dominant.

4.4 Linear Regression Analysis

This section presents the results from the estimated linear regression models, providing insights into the predictive influence of economic growth and inflation on Indonesia's tax revenue.

4.4.1 Model 1: Dependent Variable: Tax Revenue in Trillion Rupiah (N=21)

Variable	Coefficient (β)	Std. Error	t-statistic	p-value
Constant	513.7544	175.760	2.923	0.009
Economic Growth Rate (%)	119.8665	36.002	3.329	0.004
Inflation Rate (%)	2.9730	10.606	0.280	0.783
R-squared	**0.369**			
Adjusted R-squared	**0.298**			
F-statistic	**5.250**			
Prob (F-statistic)	**0.0155**			

Table 4: Linear Regression Results

Interpretation of Model 1 (Nominal Tax Revenue):

Model 1, which examines the impact on Nominal Tax Revenue, indicates that the Economic Growth Rate is a statistically significant positive predictor (β = 119.8665, p = 0.004). This suggests that, holding inflation constant, a one percentage point increase in economic growth is associated with an increase of approximately 119.87 trillion Rupiah in annual nominal tax revenue. This finding strongly supports the theoretical expectation that a growing economy expands the tax base, leading to higher tax collections.

Conversely, the Inflation Rate shows a positive but statistically insignificant coefficient (β = 2.9730, p = 0.783). This result is crucial as it empirically resolves the tension between the Tanzi effect and fiscal drag in Indonesia for nominal tax revenue. While the Tanzi effect predicts a negative impact on real tax revenue due to collection lags, and fiscal drag predicts a positive impact on nominal tax revenue due to bracket creep, the regression analysis indicates that neither effect has a dominant, statistically significant influence on nominal tax revenue when controlling for economic growth. The positive sign, albeit insignificant, hints that if any effect of inflation is present on nominal tax revenue, it leans towards fiscal drag, but it is not strong enough to be statistically distinguishable from zero.

This suggests that other factors, or the dynamic balance between these two opposing effects, might be at play.

The model's R-squared value of 0.369 indicates that approximately 36.9% of the variance in Nominal Tax Revenue can be explained by Economic Growth Rate and Inflation Rate. The overall model is statistically significant (F-statistic = 5.250, p = 0.0155), confirming that these macroeconomic variables collectively explain a meaningful portion of the variation in nominal tax revenue.

4.4.2 Model 2: Dependent Variable: Tax Revenue Growth (%) (N=20)

Variable	Coefficient (β)	Std. Error	t-statistic	p-value
Constant	0.3708	9.529	0.039	0.969
Economic Growth Rate (%)	2.4168	1.884	1.283	0.217
Inflation Rate (%)	-0.4578	0.559	-0.819	0.424
R-squared	**0.170**			
Adjusted R-squared	**0.066**			
F-statistic	**1.737**			
Prob (F-statistic)	**0.206**			

Interpretation of Model 2 (Tax Revenue Growth)

Model 2, which analyzes the impact on Tax Revenue Growth (%), shows that neither Economic Growth Rate (β = 2.4168, p = 0.217) nor Inflation Rate (β = -0.4578, p = 0.424) are statistically significant predictors of the annual growth rate of tax revenue. The R-squared value of 0.170 indicates that only 17.0% of the variance in Tax Revenue Growth can be explained by these two macroeconomic variables, and the overall model is not statistically significant (F-statistic = 1.737, p = 0.206).

This suggests that while economic growth significantly impacts the *level* of nominal tax revenue, its direct year-on-year *growth rate* is influenced by a broader set of factors not captured in this model. Similarly, inflation does not appear to have a statistically significant effect on the annual percentage change in tax revenue. The negative sign for inflation, though insignificant, aligns with the direction of the Tanzi effect, but its lack of statistical significance means it cannot be definitively concluded to be a driving factor.

4.5 Trends in Tax Revenue Composition

This section presents the breakdown of tax revenue by major tax types, providing structural context to the aggregate findings. Table 5 details the composition of Indonesia's state revenue and tax revenue, highlighting the contributions of Income Tax and Value Added Tax (VAT) and Luxury Sales Tax.

Year	Total State Revenue (Trillion IDR)	Tax Revenue (Trillion IDR)	Income Tax (Trillion IDR)	VAT & Luxury Sales Tax (Trillion IDR)	Tax Revenue to State Revenue (%)
2003	340.93	242.05	N/A	N/A	71.00
2004	403.10	280.56	N/A	N/A	69.60
2005	493.92	347.03	N/A	N/A	70.26
2006	636.15	409.20	N/A	N/A	64.32
2007	706.11	490.99	238.74	155.19	69.53
2008	979.30	658.70	327.49	209.64	67.26
2009	847.10	619.92	344.59	193.07	73.18
2010	992.25	723.31	356.73	230.58	72.90
2011	1,205.35	873.87	431.13	277.80	72.50
2012	1,332.32	885.03	513.60	337.58	66.43
2013	1,432.05	921.40	506.44	384.72	64.34
2014	1,549.45	985.13	546.53	408.83	63.74
2015	1,496.04	1060.86	602.33	423.71	70.91

Year	Total State Revenue (Trillion IDR)	Tax Revenue (Trillion IDR)	Income Tax (Trillion IDR)	VAT & Luxury Sales Tax (Trillion IDR)	Tax Revenue to State Revenue (%)
2016	1,546.94	1105.97	666.21	412.21	71.49
2017	1,654.74	1151.03	646.79	480.72	69.56
2018	1,928.11	1313.32	749.99	537.26	68.11
2019	1,955.13	1332.66	772.27	531.56	68.16
2020	1,628.95	1244.11	594.04	450.33	76.37
2021	2,006.33	1474.76	759.74	684.04	73.51
2022	2,630.14	1997.18	1052.99	911.66	75.93
2023	2,634.14	2091.54	1100.64	947.55	79.40

Note: Data for Income Tax and VAT & Luxury Sales Tax is available from 2007 onwards.

Table 5: Tax Revenue Composition by Major Tax Type (2003-2023)

Table 5 provides a detailed structural understanding of Indonesia's tax base and its evolution over time. Over the period for which detailed data is available (2007-2023), Income Tax and Value Added Tax (VAT) and Luxury Sales Tax consistently represent the largest components of Indonesia's total tax revenue. In 2023, Income Tax reached 1100.64 trillion Rupiah, while VAT and Luxury Sales Tax amounted to 947.55 trillion Rupiah. These two categories together constitute the vast majority of tax collections.

The proportion of Tax Revenue to Total State Revenue generally remained high, fluctuating between approximately 63% and 79% over the entire period, indicating Indonesia's strong reliance on taxation for public finance. The slight dip in 2013-2014 and the increase in 2020 (during the pandemic) and 2023 highlight shifts in the composition of state revenue or the relative performance of tax collections compared to non-tax revenues.

Observing the trends in Income Tax and VAT allows for a more nuanced discussion of revenue resilience and responsiveness. The consistent growth in both categories, despite economic fluctuations, suggests a broadening tax base and potentially improved collection efficiency over time. If VAT constitutes a large and growing share, its performance will be highly sensitive to consumption trends driven by economic growth. If Income Tax is dominant, its performance will be sensitive to wage and profit growth, and its non-indexation would directly contribute to fiscal drag. This structural context is vital for interpreting the aggregate correlation and regression findings, allowing for more specific policy implications related to tax structure and administration, as advocated by the OECD.[9] The

dominance of these tax types means that Indonesia's tax performance is critically dependent on the specific design and administration of its major tax types. The effectiveness of VAT collection, the progressivity and indexation of income tax, and the broader administrative efficiency (potentially through digitalization) will directly influence how macroeconomic changes translate into actual tax revenue.

4.6 Interpretation of Correlation Coefficients and their Implications

The Pearson correlation analysis provided initial insights into the linear relationships between the variables. The strong positive correlation observed between economic growth and nominal tax revenue ($r = 0.6027$) aligns with fundamental economic principles, affirming that a robust and expanding economy naturally leads to higher tax collections. This suggests that the underlying tax bases, such as incomes, consumption, and corporate profits, grow in tandem with GDP, providing a larger pool from which taxes can be collected. The moderately positive correlation with tax revenue growth ($r = 0.4077$) further reinforces this, indicating that periods of higher economic growth generally correspond to faster increases in tax revenue.

A particularly noteworthy finding from the correlation analysis is the absence of a statistically significant linear relationship between inflation and both nominal tax revenue ($r = 0.0759$) and tax revenue growth ($r = -0.0151$). This finding is significant because economic theory presents two opposing effects of inflation on tax revenue: the Tanzi effect and fiscal drag. The Tanzi effect posits that high inflation erodes the real value of tax revenues due to collection lags.[1] Conversely, fiscal drag suggests that inflation can increase nominal tax revenue in progressive tax systems if tax thresholds are not indexed to inflation, effectively pushing taxpayers into higher brackets.[5] The lack of a strong positive or negative correlation in Indonesia suggests a complex dynamic where these two effects might be largely offsetting each other in terms of their aggregate impact on nominal tax revenue. It is also possible that other factors, not captured in this bivariate analysis, exert a more dominant influence on the nominal tax revenue performance. This initial finding underscores the need for the more nuanced insights provided by the regression analysis.

4.7 Interpretation of Linear Regression Results

The linear regression analysis provides a more robust understanding of the predictive influence of economic growth and inflation on tax revenue, controlling for the simultaneous effects of both macroeconomic variables.

4.7.1 Nominal Tax Revenue (Model 1)

The results indicate that economic growth is a highly significant positive predictor. The coefficient of 119.87 suggests that, on average, a one percentage point increase in Indonesia's economic growth rate is associated with an increase of approximately 119.87 trillion Rupiah in nominal tax revenue. This strong empirical evidence confirms that economic expansion is a primary driver of tax revenue generation in Indonesia. The tax system appears to be highly responsive to changes in the overall level of economic activity.

In contrast, the inflation rate's coefficient in Model 1 ($\beta = 2.9730$) is not statistically significant. This outcome is a critical empirical finding for Indonesia, as it helps to resolve the theoretical tension between the Tanzi effect and fiscal drag. If the inflation coefficient had been significantly negative, it

would have provided strong evidence for the dominance of the Tanzi effect, indicating that inflation substantially erodes nominal tax revenue. If it had been significantly positive, it would have strongly supported the fiscal drag hypothesis, implying that inflation effectively boosts nominal tax revenue. The observed insignificant positive coefficient suggests that, on average, the nominal revenue gains from fiscal drag (e.g., from non-indexed tax brackets pushing taxpayers into higher nominal income tax rates) are largely balanced by the nominal losses from the Tanzi effect (e.g., real value erosion due to collection lags). This implies that while these effects are theoretically at play, their net impact on nominal tax revenue in Indonesia, when controlling for economic growth, is not statistically discernible over the study period. This does not mean these effects are absent, but rather that their combined influence on nominal revenue is either negligible or highly variable, or that their individual impacts cancel each other out. This finding highlights the importance of considering both effects when evaluating the impact of inflation on fiscal performance.

The R-squared value of 0.369 for Model 1 indicates that economic growth and inflation collectively explain about 36.9% of the variation in nominal tax revenue. While statistically significant, this also means that a substantial portion of the variation (over 63%) remains unexplained by these two macroeconomic variables. This suggests that other factors, such as discretionary tax policy changes (e.g., changes in tax rates, new tax laws, exemptions), improvements in tax administration, digitalization efforts, or global commodity price fluctuations (especially relevant for resource-rich economies like Indonesia), play a significant role in determining the overall nominal tax revenue performance.

4.7.2 Tax Revenue Growth (%) (Model 2)

Neither economic growth nor inflation emerged as statistically significant predictors. The model's low R-squared (0.170) and insignificant F-statistic indicate that these two variables do not reliably explain the year-on-year percentage change in tax revenue. This suggests that the annual growth rate of tax revenue is a more volatile metric, potentially influenced by short-term policy adjustments, one-off revenue windfalls, or specific sectoral performances that are not fully captured by aggregate economic growth or inflation rates. This also implies that while economic growth is crucial for the absolute level of tax revenue, the *rate of change* in tax revenue is subject to a wider array of influences.

4.8 Insights from Tax Revenue Composition

The analysis of tax revenue composition, particularly the dominance of Income Tax and Value Added Tax (VAT) and Luxury Sales Tax, provides crucial structural context for the aggregate findings. The consistent and substantial contribution of these two major tax types to Indonesia's total tax revenue indicates that the performance of the tax system is highly sensitive to the dynamics of personal and corporate incomes, as well as consumption patterns.

The continued growth in both Income Tax and VAT collections over the years, even during periods of economic slowdown (like 2020), suggests a broadening of the tax base and potentially ongoing improvements in tax administration and compliance. For instance, the significant increase in tax revenue in 2022 and 2023, with Income Tax reaching 1052.99 trillion Rupiah and VAT & Luxury Sales Tax reaching 911.66 trillion Rupiah in 2022, demonstrates the system's capacity to rebound strongly from shocks.

The reliance on Income Tax means that the effectiveness of its collection is sensitive to wage and profit growth, and crucially, to the indexation of its thresholds. If tax brackets and allowances for income tax are not periodically adjusted for inflation, fiscal drag would be a continuous process, effectively increasing the real tax burden on individuals and corporations as their nominal incomes rise. This mechanism could explain why the overall nominal tax revenue has shown resilience even during inflationary periods, as the automatic revenue generation from fiscal drag might offset the erosion from the Tanzi effect. This highlights a de facto revenue booster for the government, albeit one that can reduce individual spending power and raise questions about tax fairness if not managed through periodic adjustments.

Similarly, the large share of VAT and Luxury Sales Tax implies that consumption trends, which are closely tied to economic growth and consumer confidence, directly influence a significant portion of tax revenue. An expanding economy with rising consumption would naturally lead to higher VAT collections. The OECD's emphasis on broad tax policy efforts, including VAT and efficient tax administration, resonates strongly with Indonesia's tax structure. The observed trends underscore that Indonesia's tax performance is not solely a function of macroeconomic factors but is also critically dependent on the specific design and administration of its major tax types. Improvements in administrative efficiency, potentially through digitalization, and strategic policy decisions regarding tax rates and exemptions for these dominant tax types, will continue to play a pivotal role in shaping Indonesia's fiscal capacity.

V. CONCLUSION

5.1. Conclusion

This empirical study investigated the statistical relationship between economic growth, inflation, and tax revenue performance in Indonesia from 2003 to 2023, employing Pearson correlation and linear regression techniques. The findings provide nuanced insights into the drivers of Indonesia's fiscal health.

The analysis robustly confirms a strong and statistically significant positive relationship between **economic growth** and **nominal tax revenue**. A higher rate of GDP growth is consistently associated with a substantial increase in the absolute amount of tax collected, affirming the fundamental link between economic activity and fiscal capacity. This suggests that policies aimed at fostering sustainable economic growth are paramount for enhancing Indonesia's tax revenue base.

Regarding **inflation**, the study found no statistically significant linear correlation or predictive influence on either nominal tax revenue or its growth rate. This outcome is particularly insightful as it implies that the opposing forces of the Tanzi effect (inflation eroding real tax value due to collection lags) and fiscal drag (inflation increasing nominal tax revenue by pushing taxpayers into higher tax brackets) appear to largely offset each other in the Indonesian context, resulting in no discernible net impact on nominal tax revenue over the study period. While these theoretical effects are likely present, their aggregate observable effect on nominal revenue is not statistically significant. This highlights a complex dynamic where the tax system's inherent design and administrative practices lead to a balance between these inflationary impacts.

The analysis of tax revenue composition revealed that **Income Tax** and **Value Added Tax (VAT) and Luxury Sales Tax** are the predominant contributors to Indonesia's total tax revenue. The consistent growth in these categories underscores their importance to fiscal stability and indicates that the tax base is expanding in line with economic development. This structural reliance means that the performance of the overall tax system is highly sensitive to the specific design and administration of these key tax types.

Overall, while economic growth is a clear and significant driver of Indonesia's nominal tax revenue, the impact of inflation on nominal tax collections appears to be neutralized by the interplay of various effects. A significant portion of the variation in tax revenue remains unexplained by these macroeconomic variables, suggesting that other factors, such as specific tax policy reforms, administrative efficiency, and global economic conditions, also play crucial roles.

5.2. Recommendations

Based on the empirical findings, the following recommendations are put forth for Indonesian policymakers:

1. **Prioritize Sustainable Economic Growth**
   Given the strong positive relationship between economic growth and nominal tax revenue, policies that foster a stable and expanding economy should remain a central focus. This includes maintaining a conducive investment climate, promoting productivity, and ensuring macroeconomic stability.

2. **Monitor Real Tax Revenue Performance**
   While nominal tax revenue has shown resilience, the absence of a significant impact from inflation on nominal revenue does not negate the potential for the Tanzi effect to erode the *real* value of tax collections. Policymakers should conduct regular analyses of real tax revenue, adjusted for inflation, to assess the true purchasing power of government funds. This is crucial for accurate budget planning and ensuring that public services are not inadvertently curtailed by inflationary pressures.

3. **Evaluate Tax System Indexation**
   The empirical findings suggest that fiscal drag might be offsetting the Tanzi effect on nominal revenue. Policymakers should thoroughly evaluate the extent to which tax thresholds, allowances, and brackets are indexed to inflation, particularly for Income Tax and VAT. While fiscal drag can provide a "stealth" revenue boost, over-reliance on it can lead to a higher effective tax burden on citizens without explicit policy changes, potentially affecting disposable income and consumer demand. Regular review and potential indexation adjustments could enhance tax fairness and transparency.

4. **Strengthen Tax Administration and Digitalization**
   The unexplained variance in tax revenue performance indicates the importance of administrative factors. Continued investment in modernizing tax administration, including digitalization efforts, is crucial. Improved efficiency in collection, reduced lags, and enhanced compliance mechanisms can mitigate the Tanzi effect and bolster revenue collection regardless of inflation levels. Initiatives to combat illicit financial flows and improve tax transparency are also vital for

securing and expanding the tax base.

5. **Diversify Revenue Streams and Enhance Structural Reforms**
   While Income Tax and VAT are dominant, exploring opportunities to broaden the tax base and diversify revenue streams can enhance fiscal resilience against specific economic shocks. Continued engagement with international tax reforms, such as those promoted by the OECD (e.g., BEPS and Pillar 1 & 2 solutions), is important for securing corporate tax revenues in an increasingly globalized and digitalized economy.

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