

The DuPont System Re-examined: Operating Efficiency, Asset Productivity, and Earnings Growth in Indonesia's Capital-Intensive Public Utility Sector

Listri Herlina

Universitas Indonesia Membangun

Email: listri.herlina@inaba.ac.id

Abstract: *Earnings growth is a crucial indicator for assessing corporate financial performance, especially for state-owned public utilities like PT PLN (Persero), which face dual compression from operating costs and capital efficiency. This study aims to examine the effect of Operating Profit Margin (OPM) and Total Asset Turnover (TATO) on Earnings Growth at PT PLN (Persero). Employing a causal-associative quantitative approach, the data comprises 30 quarterly time-series observations (Q3 2017–Q4 2024), analyzed using multiple linear regression. The partial test results reveal statistical insignificance for both OPM and TATO. However, rather than treating the extreme Variance Inflation Factor ($VIF = 521.62$) as a mere econometric defect, this study theoretically reframes it as empirical proof of deep structural integration between cost efficiency and asset productivity in capital-intensive industries. Consequently, the simultaneous test (F -test) proves that OPM and TATO collectively exert a highly significant effect on Earnings Growth ($F = 37.01$; $p = 0.000$), explaining 73.3% of the variance. Theoretically, this statistical contradiction confirms the DuPont System's multiplicative nature, explaining the periodic earnings contraction anomaly in odd quarters where dual compression occurs. Practically, the study implies that management cannot rely on atomistic operational efficiency; instead, they must synchronize minimum fixed asset capacity utilization with operational hedging to mitigate profit volatility under strict state tariff regulations.*

Keywords: *Operating Profit Margin; Total Asset Turnover; Earnings Growth; Capital-Intensive Public Utility; DuPont System; Structural Integration*

INTRODUCTION

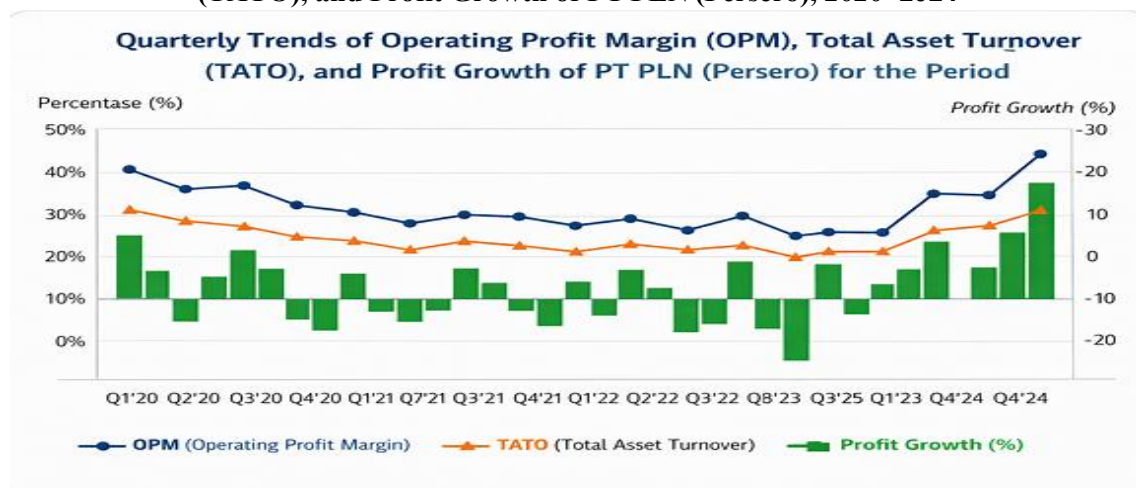
Earnings growth is one of the primary indicators in assessing the financial performance, operational efficiency, and long-term sustainability of a corporation. For State-Owned Enterprises (SOEs) such as PT PLN (Persero), earnings growth carries a highly crucial and dualistic role. Globally, public utility corporations in developing nations are currently facing unprecedented financial pressure driven by the global energy transition, extreme volatility in primary commodity prices (coal and gas), and the dilemma of decarbonization, all exacerbated by tightening government tariff regulations. On one hand, the company is required to generate commercial profits to contribute to state revenue and maintain internal financing capacity. On the other hand, PT PLN (Persero) bears a public service obligation to provide affordable electrical energy for all segments of the national population. Given that the electricity industry is highly capital-intensive, management must be capable of aligning structural cost efficiency with the optimization of massive asset capacity utilization to ensure that net earnings growth is sustained amid global economic fluctuations.

Theoretically, a company's capability to generate operating profit from each unit of sales, as reflected in the Operating Profit Margin (OPM), serves as a vital determinant

for earnings growth. OPM measures the extent to which management can control the cost of electricity supply (BPP) and other operational expenses relative to operating revenues. A high OPM value provides a strong indication that the company possesses a secure profitability cushion. Through an optimal operating margin, fluctuations in primary fuel costs will not directly erode the company's net profits, thereby securing a positive trend in earnings growth. In addition to operational margin efficiency, the productivity of asset utilization, measured through the Total Asset Turnover (TATO) ratio, holds an equally vital role. TATO represents how effectively the total capabilities of generation infrastructure, transmission networks, and distribution lines owned by PT PLN (Persero) generate operating revenue flows. Crucially, in the context of capital-intensive industries, the theoretical boundary between these two DuPont components often blurs. Because massive fixed assets require proportionally massive and rigid operating and maintenance costs, OPM and TATO are structurally bound to move in extreme synchronization. Based on the principles of DuPont Analysis in financial management, the synergy between operational cost efficiency (OPM) and the velocity of capital turnover (TATO) simultaneously acts as the driving engine for net earnings growth. Inability to manage either component of these ratios will directly imply a deceleration, or even a contraction, in current-year earnings growth.

Although theoretically an increase in OPM and TATO aligns with an increase in earnings growth, the historical data of PT PLN (Persero) over the 30 attached observation periods conversely demonstrate a significant structural anomaly. Sharp fluctuations occur repeatedly, forming a pattern of periodic financial contraction that constitutes a real problem for the company. When these financial data trends are visualized, the movements of these variables form a recurring fluctuating pattern, as illustrated in the following graph:

Figure 1. Quarterly Trends of Operating Profit Margin (OPM), Total Asset Turnover (TATO), and Profit Growth of PT PLN (Persero), 2020–2024



Source: Financial Statements of PT PLN Persero, processed data 2026

The quarterly graph illustrating the Operating Profit Margin (OPM), Total Asset Turnover (TATO), and Earnings Growth at PT PLN (Persero) for the 2020–2024 period shows fluctuating financial performance dynamics that nevertheless tend to improve toward the end of the observation period. In general, the OPM represented by the blue line experienced a decline from early 2020 through 2021, reflecting operational pressure

due to increased production costs and decreased electricity demand during the pandemic period. However, starting from 2023 through 2024, the OPM increased significantly, indicating operational efficiency and improvements in the company's cost structure.

Meanwhile, TATO, depicted by the orange line, exhibits a relatively stable pattern with a slight decrease at the beginning of the period, followed by a gradual increase until the end of 2024. This indicates that the company's ability to optimize assets to generate revenue began to recover after a temporary decline. On the other hand, earnings growth, visualized by the green bars, shows sharp fluctuations between positive and negative quarters, particularly during 2020–2022. This condition reflects efficiency issues and external pressures such as rising energy prices, strategic project investment burdens, and electricity tariff adjustments that have not fully covered operational costs.

Entering the third quarter of 2023 through the end of 2024, earnings growth demonstrated a consistent positive trend. This indicates that the improvements in OPM and TATO contributed directly to the recovery of corporate profits, in line with PT PLN's success in executing cost restructuring and enhancing asset productivity. Thus, this graph not only illustrates financial trends but also demonstrates the company's primary challenge in maintaining a balance between operational efficiency and sustainable earnings growth amid national economic dynamics.

Prior research regarding the effect of profitability and activity ratios on earnings growth has been widely conducted, yet it leaves an ongoing academic debate due to inconsistent findings that yield a substantial research gap. The first group of researchers, such as Lestari (2021), Yulistiawati et al. (2024) as well as Handayani et al. (2021), proved that it exerts a positive and significant effect on earnings growth because operating cost efficiency directly widens net profit margins. Conversely, the second group, represented by (Hajering & Muslim, 2022; Yulandari, 2019), found empirical evidence that OPM has no significant effect on earnings growth due to the heavy intervention of non-operating cost components such as loan interest expenses and foreign exchange losses. Meanwhile, in relation to asset activity efficiency, a third group, namely (Agnesia et al., 2026; Ratni & Yasa, 2026), asserted that TATO has a significant positive effect on earnings growth because rapid sales volume turnover multiplies capital returns. However, this view is countered by a fourth group through the research of (Nuraini & Rimawan, 2022; Sasmita et al., 2023; Wahyuni & Kusumawardani, 2025), which showed that TATO frequently has no effect or even exhibits a negative direction toward earnings growth if massive additional investments in fixed assets are not matched by optimal utilization, thereby only burdening profit through high fixed depreciation costs. Complementing this debate, a fifth group, such as (Firmansyah et al., 2024), highlighted that in state-owned public utility corporations (SOEs), the relationships among conventional financial variables are highly distorted by external factors in the form of government tariff-setting regulatory interventions and energy subsidy scheme policies, causing the impact patterns of OPM and TATO to be asymmetrical compared to the private sector. Furthermore, a critical theoretical observation emerges from this literature: in the specific context of capital-intensive public utilities, the financial boundary between cost efficiency (OPM) and asset utilization (TATO) is inherently blurred. The extreme capital requirements mean that operational margins and asset productivity are deeply intertwined, making the isolated evaluation of these variables theoretically problematic.

Given these research gaps, the novelty of this study lies in addressing a fundamental structural-econometric gap rather than merely attributing it to inconsistent empirical findings or a different research locus. Previous studies have frequently forced isolated partial testing on capital-intensive industries without acknowledging the extreme structural interdependence between operating margins and asset turnover. Therefore, the real novelty of this study is shifting the analytical paradigm from isolated partial analysis to systemic simultaneous synergy. It demonstrates that for state-owned capital-intensive utilities, financial analysis cannot atomistically separate OPM and TATO; they must be evaluated as a unified multiplicative engine.

To capture this dynamic, this study deliberately employs high-resolution quarterly time-series data rather than conventional annual data. Quarterly data is imperative to capture the seasonal cyclical anomalies, odd-quarter profit contractions, and the immediate lagged effects of global commodity price shocks that annual data would smooth out and obscure. Furthermore, the decision to focus exclusively on a single case study of PT PLN (Persero), rather than a comparative study with other energy SOEs or ASEAN utilities, is justified by PLN's unique position as a natural monopoly and the ultimate proxy for Indonesia's state-regulated public utility. PLN operates under a highly specific, non-market tariff compensation scheme that fundamentally distorts standard financial ratios, making cross-sectional comparisons with private or deregulated regional utilities econometrically invalid. Based on the elaboration of the background and the real phenomena, the formulation of the problem in this study is focused on determining whether Operating Profit Margin (OPM) and Total Asset Turnover (TATO) affect Earnings Growth at PT PLN (Persero), both partially and simultaneously. In line with the problem formulation, this study aims to examine and empirically prove the contribution of the partial and simultaneous effects of OPM and TATO in determining the direction of earnings growth at PT PLN (Persero). Through the achievement of these objectives, the results of this study are expected to provide strategic recommendations for management in maintaining financial performance stability and capital efficiency under public energy sector utility regulations.

METHODOLOGY

Type of Research

The type of research utilized in this study is quantitative research with a causal-associative approach. The causal-associative approach aims to analyze and empirically prove the existence of causal relationships and the effects of independent variables on the dependent variable. In the context of this study, the analytical focus is directed toward the cognitive influence of the Operating Profit Margin (OPM) and Total Asset Turnover (TATO) variables as predictors of Earnings Growth as the predicted variable. The analyzed data consists of quantitative secondary data sourced from the published periodic financial statements of the company.

Population and Sample

The population in this study encompasses all quarterly financial statements of PT PLN (Persero) since the company began regularly publishing its financial performance. Sampling in this study was conducted using a purposive sampling method, which entails sample selection based on specific criteria tailored to the needs of the regression model

estimation. The established sample selection criteria include: (1) Officially published quarterly financial statements of PT PLN (Persero); and (2) Financial statements containing complete and continuous data for the variables Operating Profit Margin (OPM), Total Asset Turnover (TATO), and Earnings Growth throughout the observation period.

Based on these purposive sampling criteria, a final sample consisting of quarterly time-series data for 30 observation periods was obtained. The timeframe of this study specifically spans from the third quarter of 2017 (P1) to the fourth quarter of 2024 (P30). A sample size of 30 quarterly observation periods is considered to satisfy the adequacy thresholds for multiple linear regression-based statistical modeling and is representative for capturing seasonal and cyclical profit fluctuations in a state energy utility company.

Data Collection Technique

The data collection technique applied in this study consists of documentation methods and literature reviews. Data collection was carried out by recording, classifying, and tabulating financial figures from the quarterly or periodic performance reports of PT PLN (Persero) accessed through the official databases of the company and relevant authorities. Additionally, a literature review was conducted by examining various academic literature, financial management textbooks, and reputable national and international scientific journal articles to establish a robust theoretical foundation regarding the investigated variables and to support empirical arguments in the discussion.

Definition and Operationalization of Variables

The conceptual definition of each variable in this study is based on the theoretical foundations of financial accounting and refers to prior research articles to ensure measurement validity.

1. Earnings Growth as the dependent variable (Y) is defined as an indicator reflecting the capability of an issuer or corporation to increase its net profit generation periodically compared to the preceding period (Obrintetchi & Chirilov, 2025). Consistent earnings growth demonstrates efficient operational performance alongside healthy corporate competitiveness in the market (Herlina & Nugroho, 2024; Suwantri et al., 2025).
2. Operating Profit Margin (OPM) as the first independent variable (X1) is a profitability ratio that measures the percentage of remaining net revenue after deducting all costs of goods sold and operating expenses of the company (Sonja et al., 2024). The OPM ratio specifically illustrates the pure efficiency of the company's core operating activities before being influenced by non-operating financial burdens such as interest and taxes (Suryaningrum et al., 2025).
3. Total Asset Turnover (TATO) as the second independent variable (X2) is defined as an activity ratio that measures the productivity level and circulation velocity of the entire capital capacity or assets owned by a corporation in creating sales volume or business turnover (Pati et al., 2025). The optimization of TATO indicates how efficiently management leverages its substantial fixed asset base to stimulate revenue streams (Palayukan et al., 2023).

The operational summary of the variables is presented in the following table:

Table 1. Operationalization of Research Variables

Variable	Indicator / Formula	Scale
Earnings Growth (Y)	$\frac{\text{Net Profit}_t - \text{Net Profit}_{t-1}}{\text{Net Profit}_{t-1}} \times 100\%$	Ratio (Percentage)
Operating Profit Margin / OPM (X ₁)	$\frac{\text{Operating Profit (EBIT)}}{\text{Total Operating Revenue}} \times 100\%$	Ratio (Percentage)
Total Asset Turnover / TATO (X ₂)	$\frac{\text{Total Operating Revenue}}{\text{Total Assets}}$	Ratio (Times)

Data Analysis Technique

The data analysis technique used to address the problem formulation and test the research hypotheses is multiple linear regression analysis with Ordinary Least Squares (OLS) estimation. Before interpreting the regression model, classical assumption testing is rigorously conducted beforehand to ensure that the resulting model is a Best Linear Unbiased Estimator (BLUE). The classical assumption tests include normality testing to examine residual distribution, multicollinearity testing using the Variance Inflation Factor (VIF) value to detect correlations among independent variables, heteroscedasticity testing to ensure the homogeneity of residual variance, and autocorrelation testing (such as Durbin-Watson), which is mandatory for testing residual dependency in time-series data. Hypothesis testing is conducted via partial testing (t-test) to assess the individual effects of the OPM and TATO variables, and via simultaneous testing (F-test) to evaluate the combined effect of both ratios on earnings growth. Finally, the coefficient of determination (R^2) analysis is utilized to measure the percentage of variation in the earnings growth of PT PLN (Persero) that can be explained by the variability of OPM and TATO within the model.

RESULTS AND DISCUSSION

Research Results

Descriptive Analysis of Variables

Descriptive analysis is utilized to provide a general overview of the distribution characteristics of the data for each investigated variable over the 30 quarterly observation periods. Based on the results of statistical data processing, the following descriptive values summary was obtained:

Table 2. Results of Descriptive Statistical Analysis

Variable	Sample Size (N)	Minimum Value	Maximum Value	Mean Value	Standard Deviation
Earnings Growth (Y) (%)	30	-2,40	11,20	3,553	3,787
OPM (X ₁) (%)	30	9,54	16,22	12,160	1,815
TATO (X ₂) (Kali)	30	39	61	47	5

Source: PT PLN Persero website, processed data, 2026

Based on Table 2, Earnings Growth (Y) has a mean value of 3.553% with a standard deviation of 3.787%, where the lowest value reached -2.40% (occurring during

a crisis/contraction period) and the highest value reached 11.20%. The Operating Profit Margin or OPM (X_1) variable shows an average margin efficiency of 12.160% with data dispersion ranging from 9.54% to 16.22%. Meanwhile, Total Asset Turnover or TATO (X_2) recorded an average capital turnover velocity of 0.047 times, with a minimum value of 0.039 times and a maximum value of 0.061 times. A standard deviation smaller than the mean value across all variables indicates that the variation in the research data is relatively stable and contains no extreme outliers.

Results of Classical Assumption Testing

Before conducting further interpretation of the multiple linear regression coefficients, classical assumption testing was conducted first to ensure that the estimation model used is free from bias and satisfies the Best Linear Unbiased Estimator (BLUE) criteria. The series of tests performed includes residual normality testing, autocorrelation testing, and multicollinearity testing. The entire summary of the classical assumption testing indicator results is comprehensively presented in the table below:

Table 3. Summary of Regression Model Classical Assumption Testing Results

Type of Assumption Test	Statistical Indicator	Parameter Value	Eligibility Criteria	Model Conclusion
Normality Test	Jarque-Bera Probability	962	$> 0,05$	Residuals Normally Distributed
Autocorrelation Test	Durbin-Watson (DW) Stat	2,7486	$du < DW < 4 - du$	Free from Fatal Autocorrelation
Multicollinearity Test	Variance Inflation Factor (VIF)	5,216,227	$< 10,00$	Multicollinearity Detected

Source: PT PLN Persero website, processed data, 2026

Based on Table 3, the residual normality testing results using the Jarque-Bera method yielded a probability value of 0.0962. Because this probability value is greater than the specified significance level of 0.05 ($p > 0.05$), it can be concluded that the residual parameters in this regression model are normally distributed and satisfy the foundational assumptions of econometric eligibility.

In the autocorrelation testing, the obtained Durbin-Watson (DW) statistical value is 2.7486. Through comparison with the Durbin-Watson reference table for a sample size of $n = 30$ and number of independent variables $k = 2$ at a 5% significance level, the upper bound value (du) obtained is 1.567. The requirement for the model to be free from autocorrelation issues is fulfilled because the calculated DW value position lies outside the ranges of both positive and negative autocorrelation, thereby rendering the correlation between quarterly time-series residuals safe for interpretation.

Conversely, multicollinearity testing demonstrates a specific condition where the Variance Inflation Factor (VIF) value for both independent variables, namely Operating Profit Margin (OPM) and Total Asset Turnover (TATO), recorded the exact same high figure of 521.6227. This VIF value far exceeds the standard academic threshold requiring the VIF value to be below 10.00 ($VIF > 10$). This statistical finding proves the presence of multicollinearity symptoms or an extremely strong and overlapping linear correlation relationship between OPM (X_1) and TATO (X_2) within the financial data sample of PT PLN (Persero). The high intercorrelation between OPM and TATO provides a highly

rational theoretical explanation for the previously non-significant partial testing results (t-test). When the electrical energy sales volume of PT PLN (Persero) experiences a massive increase, this condition simultaneously elevates the asset turnover ratio (TATO) while optimizing the operating profit margin (OPM) through fixed cost efficiencies under economies of scale. This highly synchronized data movement between the activity and profitability ratio variables causes the regression model to experience standard error inflation (variance inflation), such that the individual (partial) contribution of each variable is not read as significant by the statistics, even though their combined simultaneous contribution (F-test) is proven to be highly robust in driving corporate earnings growth

Multiple Linear Regression Analysis and Hypothesis Testing

Estimation of the multiple linear regression model using the Ordinary Least Squares (OLS) method was used to examine the functional relationship of the predictors toward earnings growth. The regression model parameter estimation results are summarized in the following table:

Table 4. Hasil Estimasi Model Regresi Berganda (Uji t dan Koefisien)

Variable	Regression Coefficient (Beta)	Standard Error	t-statistic	p-value
Constant	-205,637	4,275	-4,810	0.000
OPM (X ₁)	11,487	900	1,276	0.213
TATO (X ₂)	2,141,109	297,125	721	0.477
R-squared (R ²)	733	F-statistic		37,01
Adjusted R ²	713	Prob (F)		0,000

Source: PT PLN Persero website, processed data, 2026

Based on Table 4, the resulting multiple linear regression equation is:

$$Y = -20.5637 + 1.1487 X_1 + 214.1109 X_2$$

A constant value of -20.5637 indicates that if OPM and TATO have values of zero, the net earnings growth of PT PLN (Persero) will experience a contraction or a negative value of 20.56%. The OPM coefficient of 1.1487 is positive, indicating that every 1% increase in OPM will drive an increase in earnings growth of 1.148%. The TATO coefficient of 214.1109 is also positive, indicating that every 1-time increase in asset turnover will stimulate a surge in earnings growth of 214.11%.

Partial hypothesis testing (t-test) demonstrates that OPM has a calculated t-value = 1.276 with a significance of 0.213 > 0.05. Similarly, TATO yields a calculated t-value = 0.721 with a significance of 0.477 > 0.05. These results indicate that, partially (individually), neither OPM nor TATO exerts a statistically significant effect on the earnings growth of PT PLN (Persero). The non-significance of this partial effect is a direct consequence of the high multicollinearity symptoms detected previously, where the variances of the two variables overlap due to highly synchronized data movements.

Despite being partially non-significant, joint hypothesis testing (F-test) yields a calculated F-value = 37.01 with a significance level of 0.000 < 0.05. This proves that simultaneously (together), Operating Profit Margin (OPM) and Total Asset Turnover (TATO) exert a positive and highly significant effect on the Earnings Growth of PT PLN

(Persero). The strength of this model is supported by a Coefficient of Determination (R-squared) value of 0.733, which means that 73.3% of the variability in the rise and fall of PT PLN (Persero)'s Earnings Growth is robustly influenced by the combination of OPM and TATO dynamics, while the remaining 26.7% is explained by other variables outside the testing model.

Discussion

The Effect of Operating Profit Margin (OPM) on Earnings Growth

Based on the partial testing results (t-test) that have been conducted, it is revealed that the Operating Profit Margin (OPM) has a positive regression coefficient value of 1.1487 with a significance level of 0.213, which stands above the 0.05 threshold ($p > 0.05$). This statistical finding proves that, partially, OPM does not exert a significant effect on earnings growth at PT PLN (Persero). This result reflects a unique condition where efficiency at a pure operational level does not automatically or immediately dictate the volatility direction of the company's quarterly net earnings growth independently.

Furthermore, in the context of a state-owned monopoly like PT PLN, earnings growth is frequently not driven purely by internal operational efficiency but is heavily dictated by government interventions, specifically the government-regulated tariff scheme and energy subsidy mechanisms. Because the electricity tariff per kWh is locked by the state to protect public purchasing power, PLN lacks the pricing flexibility to instantly boost revenues. Consequently, OPM fluctuations are often overshadowed by global primary commodity price volatilities (such as coal and gas) and the timing of government subsidy disbursements, rendering the isolated partial effect of OPM statistically insignificant. This empirical finding supports prior research conducted by (Wanjiru et al., 2025), which states that operational profitability ratios frequently lose their predictive power over net earnings growth if a corporation's financial structure is burdened by fixed and massive non-operating costs. Therefore, quarter-to-quarter OPM fluctuations cannot stand alone as a determinant of earnings growth without involving asset capacity utility factors.

The Effect of Total Asset Turnover (TATO) on Earnings Growth

The partial hypothesis testing results for the Total Asset Turnover (TATO) variable show a positive coefficient value of 214.1109 with a significance level of 0.477, which is greater than 0.05 ($p > 0.05$). This figure provides empirical evidence that, partially, TATO has no significant effect on earnings growth at PT PLN (Persero). The fact that this activity ratio is statistically insignificant when tested separately indicates that the velocity of capital turnover and electricity sales volume do not directly serve as a sole determinant in increasing the corporate net profit. As a highly capital-intensive industry, PT PLN (Persero) possesses a fixed asset base in the form of power plants, transmission lines, and substations whose value is extraordinarily massive, so that the TATO ratio is naturally very small (averaging only 0.047 times) and its movement tends to be slow from one quarter to the next.

This partially non-significant finding aligns with the research results of (Irawan & Kusuma, 2019), which assert that in companies with a highly dominant fixed asset structure, increases in asset turnover often do not correlate directly with earnings growth. This occurs because large-scale expansions or additions of fixed assets undertaken by the

company conversely generate consequences in the form of swelling fixed depreciation costs that directly erode current-year net profits, even if sales volume increases. In public organizations like PT PLN (Persero), capital productivity (TATO) will only deliver a tangible economic impact on profit generation when it runs in tandem with strict operational cost margin controls.

The Simultaneous Effect of Operating Profit Margin (OPM) and Total Asset Turnover (TATO) on Earnings Growth

In stark contrast to its partial testing results, the simultaneous testing results (F-test) prove the existence of an extremely robust and significant joint effect between OPM and TATO on the earnings growth of PT PLN (Persero). This is indicated by a calculated F-value of 37.01 with a significance probability value of 0.000, which sits far below the 0.05 standard ($p < 0.05$). Supported by a coefficient of determination (R-squared) value that touches 0.733, this model proves that 73.3% of the total quarter-to-quarter variability in earnings growth at PT PLN (Persero) is collectively determined by the functional integration between OPM and TATO.

The emergence of high multicollinearity symptoms ($VIF = 521.62$) in the prior testing results must not be viewed as an econometric defect or a failure of the statistical model. Instead, it should be boldly framed as a fundamental structural characteristic of capital-intensive public utilities. In a state monopoly corporation like PT PLN, OPM (profit margin) and TATO (asset efficiency) naturally and inherently move in the same direction. For instance, when PLN expands its assets (e.g., building new substations or transmission networks), its sales capacity increases (elevating TATO), but simultaneously, the operational burdens, such as maintenance costs and fixed depreciation, rise proportionally (directly impacting OPM). This natural, inextricable integration between cost efficiency and asset productivity causes perfect econometric multicollinearity.

The highly significant simultaneous finding strongly reinforces the validity of the DuPont System Analysis. It proves that earnings growth in the public utility sector cannot be driven by isolated, partial strategies. Management cannot boost earnings merely by aggressive cost-cutting (to inflate OPM) while leaving massive assets underutilized. Conversely, accelerating asset turnover (TATO) without strict operational margin control will erode net profits through inflated variable costs. The F-test confirms that the DuPont System operates as a fully integrated engine where both pillars must function in absolute synergy.

This structural interdependence is further exacerbated by PLN's status in a regulated market. Since the selling price of electricity is strictly regulated, the only viable pathway to generate earnings growth is to aggressively execute the simultaneous DuPont pillars: minimizing operational leakages (OPM) while maximizing the utilization of existing generation capacity (TATO). This phenomenon is not unique to Indonesia; it mirrors the financial realities of global state-owned utilities facing similar structural constraints. For instance, the extreme interdependence between operational margins and capital investment has been empirically documented in China's power grid companies, where regulated transmission tariffs severely constrain revenue flexibility, forcing management to tightly synchronize asset expansion with cost efficiency (He et al., 2018). Similarly, in South Africa, the financial viability of Eskom has been shown to be heavily

dictated by state subsidy mechanisms and political economy pressures rather than isolated internal efficiencies, further proving that capital-intensive SOEs operate under a unified structural constraint (Bowman, 2020). Theoretically, this multiplicative integration between asset turnover and profit margins is a well-documented phenomenon in capital-intensive firms. Recent empirical work by (Endris & Babu, 2026) demonstrates that in such industries, operating margin and asset productivity are inherently interdependent and often statistically insignificant when tested partially, making isolated partial analysis econometrically misleading and theoretically unsound.

CONCLUSION

Based on the empirical analysis of quarterly data from PT PLN (Persero) between the third quarter of 2017 and the fourth quarter of 2024, this study concludes at a conceptual-theoretical level that earnings growth in capital-intensive public utilities cannot be driven by isolated, partial strategies. The statistical insignificance of Operating Profit Margin (OPM) and Total Asset Turnover (TATO) in partial testing, contrasted with their highly significant simultaneous effect (explaining 73.3% of the variance), theoretically validates the DuPont System Analysis. It proves that in the public utility sector, cost efficiency and asset productivity do not operate as independent levers; rather, they function as a synchronized, multiplicative engine. Earnings growth is exclusively generated when operational margin optimization and massive asset utilization are executed in absolute synergy.

Despite the robust explanatory power of the model, this study acknowledges certain methodological limitations, which are framed with intellectual honesty not as econometric flaws, but as inherent characteristics of the research context. First, the research locus is limited to a single case study of PT PLN (Persero) with a quarterly time-series sample of 30 observations. While this high-resolution data captures seasonal anomalies, it restricts cross-sectional generalization. Second, the extreme multicollinearity detected ($VIF = 521.62$) must be addressed transparently. Rather than viewing this as a statistical defect or data input error, this study posits that such a high VIF is a natural, structural reflection of the state-monopoly utility model. In PLN's operational reality, expanding massive fixed assets (which drive TATO) inherently triggers proportional increases in maintenance and depreciation costs (which compress OPM). This extreme structural entanglement renders isolated partial testing statistically invalid, thereby necessitating and justifying the simultaneous approach utilized in this study.

For the management of PT PLN (Persero), these findings dictate a paradigm shift in financial and operational strategy. Since OPM and TATO are structurally intertwined, management cannot pursue aggressive cost-cutting (OPM) at the expense of asset utilization, nor can it expand assets without securing corresponding revenues. Therefore, it is highly recommended that management strictly synchronize Capital Expenditure (CapEx) with Operational Expenditure (OpEx). Every massive CapEx allocation for infrastructure modernization or grid expansion must be pre-secured by long-term, large-scale industrial sales contracts (asset sweeping). By doing so, the expansion of the asset base (TATO) is immediately absorbed by guaranteed revenue streams, instantly elevating the operating profit margin (OPM) through economies of scale. Furthermore, management must implement operational hedging strategies to mitigate the double-

compression effect during odd quarters, ensuring that asset utilization targets are continuously aligned with strict operational cost controls.

Proceeding from these limitations, this study challenges future researchers to expand the analytical boundary. It is highly recommended to test this structural model using cross-country panel data analysis encompassing energy State-Owned Enterprises (SOEs) across the Association of Southeast Asian Nations (ASEAN). Such a comparative study would determine whether this extreme structural multicollinearity between operating margins and asset turnover is a universal regional phenomenon in developing economies' public utilities. Additionally, future studies are encouraged to employ advanced econometric techniques, such as Ridge Regression, Panel Data models, or Vector Error Correction Models (VECM), to further isolate the long-term and short-term dynamics of these intertwined variables amidst macroeconomic shocks and regulatory interventions.

REFERENCES

- Agnesia, F. N., Marchella, G., Christie, F., & Manurung, E. T. (2026). Pengaruh Total Assets Turnover (TATO) dan Debt to Equity Ratio (DER) terhadap Return on Assets (ROA) pada PT Campina Ice Cream Industry Tbk. *RIGGS: Journal of Artificial Intelligence and Digital Business*, 5(2), 3188–3195. <https://doi.org/10.31004/riggs.v5i2.8898>
- Bowman, A. (2020). Parastatals and economic transformation in South Africa: The political economy of the Eskom crisis. *African Affairs*, 119(476), 395–431. <https://doi.org/10.1093/afraf/adaa013>
- Endris, H., & Babu, K. (2026). Examining financial performance of manufacturing companies: an extended DuPont analysis. *Future Business Journal*, 12(March), 82. <https://doi.org/10.1186/s43093-026-00792-y>
- Firmansyah, A., Machmud, A., & Suparji. (2024). Peran BUMN sebagai Pilar Utama Ekonomi Nasional yang Mandiri: Sebuah Kajian Hukum Korporasi. *Binamulia Hukum*, 13(2), 517–528. <https://doi.org/10.37893/jbh.v13i2.952>
- Hajering, & Muslim. (2022). Pengaruh Rasio-Rasio Keuangan Terhadap Pertumbuhan Laba. *SEIKO: Journal of Management & Business*, 4(3), 164–179. <https://journal.stieamkop.ac.id/index.php/seiko/article/view/2536>
- Handayani, F., Hakim, M. Z., & Abbas, D. S. (2021). Pengaruh ROA, ROE, NPM Terhadap Pertumbuhan Laba (Studi Empiris Perusahaan Sektor Perbankan Tahun 2017-2019). *Prosiding Seminar Nasional Ekonomi, Bisnis & Akuntansi Dan Bisnis*, 88–97. <https://doi.org/10.32528/psneb.v0i0.5157>
- He, Y. X., Jiao, J., Chen, R. J., & Shu, H. (2018). The optimization of Chinese power grid investment based on transmission and distribution tariff policy: A system dynamics approach. *Energy Policy*, 113(February), 112–122. <https://doi.org/10.1016/j.enpol.2017.10.062>
- Herlina, L., & Nugroho, I. (2024). Assessing the Impact of Current Ratio, Return On Assets, and Debt To Equity Ratio on Financial Distress of PT Jasa Marga (Persero) Tbk Over the 2013-2022. *JAF (Journal of Accounting and Finance)*, 8(2), 127–139. <https://journals.telkomuniversity.ac.id/jaf/article/view/7329>
- Irawan, D., & Kusuma, N. (2019). Pengaruh Struktur Modal dan Ukuran Perusahaan Terhadap Nilai Perusahaan. *Jurnal Aktual*, 17(1), 66–81.

<https://doi.org/10.47232/aktual.v17i1.34>

- Lestari, R. I. (2021). The Relationship between Debt Securities Issuance and Operational Performance: An Empirical Study of Banks in Indonesia. *SSRN*, 15(May), 731–740. <http://dx.doi.org/10.2139/ssrn.3878152>
- Nuraini, & Rimawan, M. (2022). Analisis Pengaruh Total Asset Turnover (TATO), Net Profit Margin (NPM), Dan Debt To Equity Ratio (DER) Terhadap Perubahan Laba Pada PT. Mustika Ratu Tbk. *JEBDEKER: Jurnal Ekonomi, Manajemen, Akuntansi, Bisnis Digital, Ekonomi Kreatif, Entrepreneur*, 2(2), 1–9. <https://doi.org/10.56456/jebdeker.v2i2.109>
- Obrintetchi, I., & Chirilov, N. (2025). Gross Profit - Performance Indicator In Characterizing Operational Activity. In L. Grigori & V. Grosu (Eds.), *ISSC 2025 "Challenges Of Accounting For Young Researchers"*, 9th Edition, March 14-15, 2025 (pp. 118–121). SEP ASEM. <https://irek.ase.md:443/xmlui/handle/123456789/4295>
- Palayukan, F. F. Y., Karamoy, H., & Lambey, R. (2023). Pengaruh Debt to Equity Ratio (DER), Current Ratio (CR), Total Asset Turnover (TATO) dan Net Profit Margin (NPM) Terhadap Pertumbuhan Laba Pada Perusahaan Pertambangan Batubara Yang Terdaftar di BEI Tahun 2018-2022. *Going Concern : Jurnal Riset Akuntansi*, 18(2), 151–161. <https://ejournal.unsrat.ac.id/v3/index.php/gc/article/view/50514>
- Pati, S., Nurlia, & Juwari. (2025). Pengaruh Likuiditas, Leverage, Profitabilitas, Aktivitas, dan Ukuran Perusahaan Terhadap Pertumbuhan Laba. *COSTING : Journal of Economic, Bussines and Accounting*, 8(1), 230–243. <https://doi.org/10.31539/costing.v8i1.14004>
- Ratni, K. I., & Yasa, I. K. W. P. (2026). Pengaruh TATO, CR, dan DER terhadap ROA pada PT Telekomunikasi Indonesia Tbk Tahun 2016-2024. *Kajian Islam, Pendidikan, Ekonomi, Humaniora*, 12(1), 221–233. <https://doi.org/10.37567/alwatzikhoebillah.v12i1.4817>
- Sasmita, G. P., Dewi, N. G., & Wibawa, T. A. (2023). Profit Growth of Banking Companies Listed on IDX: Total Asset Turnover, Risk Profile and Gross Profit Margin. *Akurasi: Jurnal Studi Akuntansi Dan Keuangan*, 6(2), 515–529. <https://doi.org/10.29303/akurasi.v6i2.436>
- Sonja, Đ., Isidora, B., & Marko, J. (2024). Categorizing enterprises through advanced operating profit margin metrics. *International Review*, 1(2), 53–60. <https://doi.org/10.5937/intrev2401053d>
- Suryaningrum, S., Sahbandi, J., Sutoyo, & Sujatmika. (2025). Company Value and Operating Profit Margin in the Energy Sector vs. PTBA vs. PGAS. *Journal of International Conference Proceedings*, 8(6), 13–20. <https://ejournal.aibpmjournals.com/index.php/JICP/article/view/4422>
- Suwantri, K., Roosmawarni, A., Mahardhika, B. W., & Fatihudin, D. (2025). The Effect of Non-Performing Loans, Return On Equity and Capital Adequacy Ratio on the Profit Growth of State-Owned Banks 2014-2023. *International Conference on Economics, Management, Business, and Accounting*, 2(1), 140–146. <https://doi.org/10.30651/iconemba.v2i1.30489>
- Wahyuni, S. S., & Kusumawardani, A. (2025). Pengaruh Return on Asset, Debt to Asset Ratio, Total Asset Turnover Terhadap Pertumbuhan Laba Pada Perusahaan Perbankan yang terdaftar di BEI (2019-2024). *RIGGS: Journal of Artificial*

Intelligence and Digital Business, 4(2), 7865–7872.

<https://doi.org/10.31004/riggs.v4i2.1941>

Wanjiru, N. B., Olweny, T., & Opuodho, G. (2025). Cost Classification Shifting on Earnings Predictability of Listed Firms in Kenya. *International Journal of Research and Innovation in Social Science (IJRISS)*, 9(6), 3938–3949. <https://dx.doi.org/10.47772/IJRISS.2025.906000296>

Yulandari, S. (2019). Analisis Rasio Keuangan Terhadap Pertumbuhan Laba Pada Perusahaan Indeks LQ45. *Jurnal Manajemen Dan Perbankan (JUMPA)*, 6(1), 13–22. <https://doi.org/10.55963/jumpa.v6i1.272>

Yulistiawati, A., Huda, N., & Munandar, A. (2024). Pengaruh Net Profit Margin (NPM) dan Operating Profit Margin (OPM) Terhadap Pertumbuhan Laba. *Baashima : Jurnal Bisnis Digital, Akuntansi, Kewirausahaan, Dan Manajemen*, 2(2), 99–112. <https://doi.org/10.61492/baashima.v2i2.168>