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Analysis The Effect Of Capital Adequacy Ratio, Operating Expenses On Operating Income, Net Interest Margin, Non-Performing Loan To Deposit Ratio On Financial Performance (A Case Study on PT. Bank Sumut)

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Abstrak

Industri perbankan merupakan infrastruktur penting dari ekosistem keuangan, yang beroperasi sebagai saluran di mana para pelaku ekonomi mengakses instrumen dan layanan keuangan yang disesuaikan dengan kebutuhan kelembagaan dan individu yang beragam. Berfungsi sebagai perantara keuangan, bank memfasilitasi mobilisasi dan redistribusi modal dengan menghubungkan pihak kelebihana dana dengan pihak yang mengalami kendala likuiditas, sehingga memperkuat keseimbangan ekonomi sistemik. Investigasi empiris ini berpusat pada PT Bank Sumut - sebuah Bank Pembangunan Daerah (RDB) yang beroperasi di provinsi Sumatera Utara - dengan tujuan untuk menilai bagaimana indikator CAR, BOPO, NIM, NPL & LDR, memengaruhi kinerja keuangan yang diukur melalui ROA di seluruh periode fiskal mulai dari Januari 2021 hingga Desember 2024. Dengan menggunakan pendekatan kuantitatif, kausal-komparatif, penelitian ini menggunakan data sekunder dari 48 laporan keuangan bulanan, yang dianalisis melalui sampling jenuh. Regresi linier berganda digunakan untuk menilai hubungan antar variabel, didukung oleh uji asumsi klasik, statistik deskriptif, dan pengujian hipotesis menggunakan EViews versi 12. Hasil empiris menunjukkan bahwa CAR dan BOPO memiliki pengaruh negatif yang signifikan secara statistik terhadap ROA, yang menunjukkan adanya ketidakefisienan dalam alokasi modal dan manajemen biaya operasional. NIM dan NPL, meskipun juga berhubungan negatif dengan ROA, tidak mencapai signifikansi statistik, yang mengindikasikan adanya potensi volatilitas atau faktor sistemik yang laten. Sebaliknya, LDR menunjukkan hubungan yang positif namun tidak signifikan dengan ROA. Uji F menegaskan bahwa semua variabel independen secara bersama-sama mempengaruhi ROA. Temuan ini menggarisbawahi pentingnya mengoptimalkan kecukupan modal dan efisiensi operasional untuk meningkatkan profitabilitas dan memastikan ketahanan kelembagaan dalam lanskap perbankan regional.

Kata Kunci: CAR; BOPO; NIM; NPL; LDR; ROA

Abstract

The banking industry constitutes an essential infrastructure of the financial ecosystem, operating as a conduit through which economic actors access tailored financial instruments and services responsive to multifaceted institutional and individual demands. Functioning as financial intermediaries, banks facilitate the mobilization and redistribution of capital by connecting units in surplus with those facing liquidity constraints, thereby reinforcing systemic economic equilibrium. This empirical investigation centers on PT Bank Sumut—a Regional Development Bank (RDB) operating in the province of North Sumatra—with the aim of assessing how selected financial performance indicators, including the CAR, BOPO, NIM, NPL & LDR, affect profitability as measured by ROA across the fiscal periods spanning January 2021 to December 2024. Using a quantitative, causal-comparative approach, the research draws on secondary data from 48 monthly financial statements, analyzed via saturated sampling. Multiple linear regression is employed to assess relationships among variables, supported by classical assumption tests, descriptive statistics, and hypothesis testing using EViews version 12. Empirical results demonstrate that both CAR and BOPO exert a statistically significant negative influence on ROA, suggesting inefficiencies in capital allocation and operational cost management. NIM and NPL, while also negatively associated with ROA, do not achieve statistical significance, indicating potential volatility or latent systemic factors. In contrast, LDR shows a positive yet non-significant relationship with ROA. The F-test confirms that all independent variables jointly influence ROA. These findings underscore the importance of optimizing capital adequacy and

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operational efficiency to enhance profitability and ensure institutional resilience within the regional banking landscape. adaptation through motivation from superiors and a fair reward system; strengthening team communication and collaboration; increasing work efficiency and accuracy with appropriate appreciation; and developing stress management and work focus to deal with pressure and lack of guidance.

Keywords: CAR; BOPO; NIM; NPL; LDR; ROA

1. Introduction

The industrial sector, particularly the financial services sector at its core, offers an extensive a diverse portfolio of financial instruments and service offerings designed address varied and evolving requirements of its clientele. As articulated by Segera (2019: 26), banks function as pivotal financial institutions that mobilize public funds and subsequently redistribute them to clients through mechanisms such as credit provision, investment activities, and various other financing instruments. Fundamentally, banks serve as financial intermediaries, actively bridging the gap between surplus units—entities possessing excess capital—and deficit units—those in need of additional funding. By performing this intermediary role, banks facilitate capital flow within the economy, support financial inclusion, and contribute significantly to economic stability and development. Banks mobilize funds through a variety of financial instruments, inclueded saviings accounts, currents accounted & timed depositedss, which serve as essential mechanisms for attracting and managing public funds efficiently. The focus of this research is on analyzing financial ratios that relate to the health level of banks, although the topic has been a concern in many previous studies researchers, but there has been no research conducted starting from the endemic state of Covid 19 to stable financial performance. This study also incorporates data from the period 2021 to 2024, during which monthly financial reports are available. Accordingly, the object of this research focuses on PT Bank Sumut as the subject of analysis.

The bank selected for this study is PT Bank Sumut, which is categorized as a government-owned bank due to its significant role in promoting and sustaining economic development, particularly within the North Sumatra region. This institution serves as a key financial agent in driving regional growth through the provision of various banking services and development-oriented financial support. If seen in 2021, that there is a Covid-19 pandemic which causes obstacles to transactions between banks to customers or the public. For instance, a heightened exposure to credit risk, with a primary impact observed in MSMEs and trading-related business activities. This most impactful ratio can be seen from the NPL ratio. The presence of a pandemic heightens credit risk exposure, thereby increasing the potential for non-performing loans within the financial sector. In addition, there is a phenomenon of increased downside risk to interest income due to non-performing loans. In 2022, there will be positive developments through asset growth, profit improvement, and financial health. However, on the other hand, the phenomenon of global inflation challenges and economic uncertainty still requires attention, especially in risk management strategies and operational efficiency so that banks can continue to grow sustainably. Then in 2023, there are challenges in the form of increasing costs, credit and liquidity risks that must be managed effectively and efficiently so as not to reduce competitiveness among banks in the long term. Then, in 2024, that the development has greatly increased. By having stable financial performance, it will maintain its position as one of the best development banks.

This study assesses the financial performance of banks using the Return on Assets (ROA) ratio, a key indicator that reflects how effectively a bank leverages its total assets to generate net earnings. ROA chosen for its effectiveness in capturing both the operational efficiency and overall profitability of a bank. Initial observations reveal fluctuations in several key financial indicators, including the CAR, BOPO, NIM, NPL and then LDR, all of which are considered influential factors in determining ROA performance, suggesting inconsistencies in financial performance across periods. These fluctuations underscore the need for a more in-depth empirical investigation to evaluatedd financiial health PT Bank Sumut, this study seeks to investigate and analyze the effect of key financial ratios—including the Capital Adequacy Ratio (CAR), Operational Efficiency Ratio (BOPO), Net Interest Margin (NIM), Non-Performing Loans (NPL), and Loan to Deposit Ratio (LDR) on the bank's financiial perforrmance. Return on Assets (ROA) ratio is employed as the primary metric to measure the bank's ability to generate profits from its asset bas, in PT Bank Sumut during the period from 2021 to 2024.

2. Literature Review

2.1 Signalling Theory

Retrieved from Brigham and Houston (2019:32), signalling theory posits that companies convey information through signals reflecting managerial actions aligned with shareholder interests. Firms with favorable future prospects tend to avoid issuing new equity, opting instead for alternative financing methods, while firms with less favorable outlooks are more inclined to sell shares.

In the banking sector, signalling theory functions as a key mechanism for communicating market-relevant information regarding a bank's quality, financial performance, and growth potential.

2.2 Return on Assets

Polat et al. (2020) emphasize that corporate financial performance is fundamentally assessed through financial ratio analysis, offering essential insights into a firm's financial health and operational effectiveness. As highlighted by Fitriani (2024:47), this metric functions as a critical gauge of an entity's operational effectiveness, reflecting its capacity to convert total asset holdings into net earnings within a given financial period, reflecting how effectively the organization utilizes its asset base to produce earnings, thereby reflecting managerial efficiency in optimizing the use of both debt and equity. This aligns with the regulatory framework established by Bank Indonesia through Regulation No. 6/10/PBI/2004, which delineates standardized criteria and methodological guidelines for evaluating financial performance and safeguarding the stability of the national banking sector, which designates ROA as a critical indicator of bank performance, emphasizing its role in assessing profitability relative to the overall asset base, an ROA ranging from 0.5% to 1.25% is classified as highly sound. High profitability, as indicated by an elevated ROA, sends a positive signal to investors, enhancing corporate valuation and investment attractiveness.

2.3 Capital Adequacy Ratio

Capital Adequacy Ratio (CAR) is included in the capital ratio. According to Agustin and Tanjung (2020: 104), the assessment of capital includes the level of capital adequacy, bank companies must refer to the provisions of Bank Indonesia which regulate the minimum capital provision obligations for each Commercial Bank company. The BI standard for the Capital Adequacy Ratio based on BI regulation Number: 6/10/PBI/2004 is 8%.

2.4 Operation Expenses on Operating Income

According to Car, et al (2021) serves as a reliable measure of a bank's efficiency and its ability to control operational expenses. As stated by Sugiarti and Sunandar (2022), a higher BOPO value indicates lower financial performance, whereas a lower BOPO ratio reflects improved efficiency and stronger financial outcomes. In line with this, Bank Indonesia stipulates that an optimal BOPO ratio should remain below 90%. When the BOPO ratio exceeds the 90% threshold—approaching or surpassing 100%—the bank is considered inefficient in managing its operational activities.

2.5 Net Interest Margin

NIM reflects a bank’s ability to generate operating income from interest-earning assets, particularly loans or credit disbursements. A higher NIM value indicates greater effectiveness in utilizing productive assets to generate income, signifying efficient credit management (Dewi & Ghalib, 2024: 4). In accordance with the Financial Services Authority Circular Letter No. 14/SEOJK.03/2017 regarding amendments to the commercial bank soundness assessment framework, a NIM value exceeding 3% is classified as very healthy, emphasizing the importance of maintaining strong interest income relative to interest-bearing assets.

2.6 Non-Performing Loan

NPL are a key component of credit risk, which refers to the potential loss arising from a borrower's failure to meet contractual obligations. As noted by Agustin and Tanjung (2020: 101), credit risk emerges when customers or third parties fail to fulfill their financial commitments to the bank as outlined in loan agreements. A high NPL ratio, exceeding the maximum threshold of 5% as stipulated by Bank Indonesia Regulation No. 15/15/PBI/2013, can significantly elevate a bank’s financial burden, including increased provisioning for impaired assets and additional operational costs. According to Wildan (2018), a rise in NPLs negatively affects a bank’s overall performance, as it indicates deteriorating credit quality and inefficiencies in credit risk management.

2.7 Loan to Deposit Ratio

According to Fitriani (2024: 55) explains that the LDR a financial indicator used to assess the proportion of credit extended by a bank in relation to the public funds and internal capital utilized. Pursuant to the provisions stipulated in Bank Indonesia Regulation No. 17/11/PBI/2015, an LDR within the range of greater than 50% and up to 75% is considered very healthy.

A height LDR retrieved the bank has disbursed more loans compared to the deposits it holds, which may lead to increased liquidity risk. However, this condition also presents an opportunity for higher profitability through greater interest income from loans. But, the LDR is low, will show the Bankss company cannot utilize existing deposits as much as possible to provide loans, so that the potential income from interest will decrease. In addition, it will be a bank that has excess liquidity available.

3. Method

Hypotheses play a very important role in new research. By using a hypothesis or temporary conclusion statement, it will be known how to test and prove the truth through data analysis. Based on the problem identification, problem formulation and

conceptual framework above, there are 5 research hypotheses that have been determined to be researched:

- **H1** Capital Adequacy Ratio (CAR) has a positive and significant effect on Return on Assets at PT Bank Sumut.
- **H2** Operating Costs Against Operating Income have a negative and significant effect on Return on Assets at PT Bank Sumut.
- **H3** Net Interest Margin has a positive and significant effect on Return on Assets at PT Bank Sumut.
- **H4** Non Performing Loan (NPL) has a negative and significant effect on Return on Assets at PT Bank Sumut.
- **H5** Loan to Deposit Ratio (LDR) has a positive and significant effect on Return on Assets at PT Bank Sumut.

This study employs a quantitative research design with a causal approach to examine the effect of CAR, BOPO, NIM, NPL and then LDR on the financial performance of PT Bank Sumut, as measured by Return on Assets (ROA). PT Bank Sumut is registered with the Financial Services Authority (OJK). The research sample consists of 48 monthly financial statements covering the period from 2021 to 2024, obtained from a single banking institution headquartered in Medan, Indonesia. The sampling technique employed is saturated sampling, wherein the entire population is utilized as the sample, aligning with the approach recommended by Sugiyono (2019). This research utilizes secondary data, primarily sourced from the bank's official financial statements. Given the temporal nature of the dataset, the study applies a time series data analysis framework. The data processing and analysis are performed through multiple linear regression analysis, supplemented by a series of statistical procedures such as descriptive statistics, classical assumption testing, and hypothesis testing, utilizing EViews version 12 as the analytical tool.

4. Result & Discussion

The analytical framework adopted in this study encompasses several stages designed to ensure the robustness and validity of the empirical model. Initially, descriptive statistical analysis is performed to provide a foundational understanding of the dataset, summarizing key measures such as the mean, median, maximum, minimum, and standard deviation. These indicators elucidate the central tendency, variability, and distributional properties of the research variables. Subsequently, classical assumption tests are conducted to examine the suitability of the regression model, including assessments of normality, multicollinearity, autocorrelation, and heteroscedasticity. The core analytical method involves the application of multiple linear regression on time series data, allowing for the investigation of causal relationships between selected financial ratios and the bank's performance. To determine the statistical relevance of each independent variable, hypothesis testing is employed using established significance thresholds. Furthermore, the model's explanatory strength is evaluated through the coefficient of determination (R^2), which quantifies the proportion of variance in the dependent variable—Return on Assets (ROA)—that is explained by the predictor variables. All data processing and statistical computations are carried out using EViews version 12. This analysis helps to understand the distribution and central tendency of the data prior to further inferential testing.

Table 1. Descriptive Statistical Analysis

		Y_ROA	X1_CAR	X2_BOPO	X3_NIM	X4_NPL	X5_LDR
		Y_ROA	X1_CAR	X2_BOPO	X3_NIM	X4_NPL	X5_LDR
Mean	Mean	2.079937	20.79652	77.16117	6.440625	2.940813	82.12112
Median	Median	2.055000	20.73750	77.33450	6.430000	2.790000	82.85050
Maximum	Maximum	2.450000	24.39000	86.28800	7.040000	3.800000	89.01000
Minimum	Minimum	1.250000	18.78000	71.33000	6.110000	2.191000	71.43000
Std. Dev.	Std. Dev.	0.244949	1.246169	3.035667	0.216657	0.462694	4.987912
Skewness	Skewness	-0.933316	0.781648	0.803810	0.465334	0.594584	-0.396439
Kurtosis	Kurtosis	4.409021	3.539670	3.760695	2.605900	2.103958	1.863002
Jarque-Bera	Jarque-Bera	10.93930	5.470273	6.326192	2.042913	4.434027	3.842839
Sum	Sum	99.83700	998.2330	3703.736	309.1500	141.1590	3941.814
Sum Sq. Dev.	Sum Sq. Dev.	2.820001	72.98799	433.1178	2.206197	10.06205	1169.325
Observations	Observations	48	48	48	48	48	48

Sumber: *data olahan Eviews* versi 12*, 2025*

The total number of research samples is one company that has 48 observed data, meaning that the company is multiplied by 4 years with a monthly period. This ratio scale uses ROA, CAR, BOPO, NIM, NPL and LDR.

Second, to ensure that the empirical data satisfy the criterion of the Best Linear Unbiased Estimator (BLUE), a series of classical assumption tests are implemented to validate the reliability of the regression model. The normality test is employed to determine whether the residuals are symmetrically distributed around the mean, ensuring the appropriateness of parametric inference. The multicollinearity test is conducted to identify potential linear interdependencies among the independent variables, which could distort coefficient estimates. The heteroscedasticity test assesses the constancy of variance across residual terms, as heteroscedastic errors may compromise the efficiency of estimators. Finally, the autocorrelation test evaluates whether residuals are serially independent over time—a key assumption in time series analysis—to prevent biased standard errors and invalid statistical inference.Meeting these assumptions is essential to validate the reliability and accuracy multtiple liinear regressiion model applied in this studied.

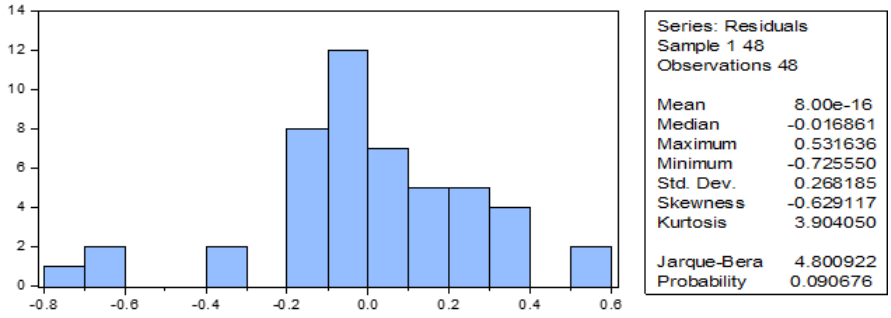

Figure 1. Normality Test Result (Source: Data Olahan E-Views Versi 12, 2025)

The Jarque-Bera test results yielded a probability value obtained was 0.0906, which exceeds the significance level (α) of 0.05. Outcome suggests that the residuaals follows normal distriibution, thereby fulfilling normality assumption essential required for the regression model.

Table 2. Multicollinearity Test Results. (Source: Data Olahan E-Views Versi 12, 2025)

	X1_CAR	X2_BOPO	X3_NIM	X4_NPL	X5_LDR
X1_CAR	1.000000	0.594473	-0.295926	0.017755	0.156678
X2_BOPO	0.594473	1.000000	-0.221570	0.360093	-0.153883
X3_NIM	-0.295926	-0.221570	1.000000	-0.169441	-0.160873
X4_NPL	0.017755	0.360093	-0.169441	1.000000	-0.714384
X5_LDR	0.156678	-0.153883	-0.160873	-0.714384	1.000000

Based on the multicollinearity test results, all correlation coefficients among the independent variables are below 0.9, indicating no multicollinearity issue in the model.

Table 3. Heteroscedasticity Test

Heteroskedasticity Test: ARCH

F-statistic	2.068974	Prob. F(5,37)	0.0914
Obs*R-squared	9.395515	Prob. Chi-Square(5)	0.0943

Sumber: *data olahan Eviews* versi 12, *2025*

The findings from the ARCH heteroscedasticity test reveal that the probability value of the Obs*R-squared statistic is 0.094, greater than the 0.05 significance level. Accordingly, it can be concluded that the model does not exhibit heteroscedasticity The results of the heteroscedasticity test using the ARCH method indicate that the significance values for all independent variables exceed the 0.05 threshold, suggesting the absence of heteroscedasticity in the regression model. This confirms that the variance of

the residuals is constant, thereby meeting one of the classical assumptions required for reliable linear regression analysis Obs * R-squared at Prob.

Table 4. Autocorellation Test Result

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.794215	Prob. F(30,12)	0.0314
Obs*R-squared	41.98913	Prob. Chi-Square(30)	0.0717

Sumber: *data olahan Eviews* versi 12, *2025*

The results of the autocorrelation test, conducted using the Serial Correlation LM Test, show that the probability value of the Obs*R-squared statistic is 0.071, which is greater than the 5% significance level (α = 0.05). This finding suggests that the regression model does not suffer from autocorrelation, thereby meeting one of the key assumptions of the classical linear regression model.

Table 5. Multiple Linear Regression

Dependent Variable: Y ROA
Method: Least Squares
Date: 03/09/25 Time: 12:39
Sample: 1 48
Included observations: 48

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X1_CAR	-0.108424	0.017863	-6.069773	0.0000
X2_BOPO	-0.008291	0.003950	-2.098776	0.0419
X3_NIM	-0.217953	0.217943	-1.000046	0.3230
X4_NPL	-0.192320	0.147785	-1.30130,19248	0.2002
X5_LDR	0.008358	0.013119	0.637067	0.5275
C	6.249688	2.386687	2.618561	0.0122

R-squared	0.720303	Mean dependent var	2.141563
Adjusted R-squared	0.687006	S.D. dependent var	0.507097
S.E. of regression	0.283700	Akaike info criterion	0.434670
Sum squared resid	3.380400	Schwarz criterion	0.668570
Log likelihood	-4.432081	Hannan-Quinn criter.	0.523061
F-statistic	21.63250	Durbin-Watson stat	0.921648
Prob(F-statistic)	0.000000		

Sumber : *data olahan Eviews* versi 12, *2025*

Referring to the regression equation derived from the analysis, the following model was established:

Y = 6.249 - 0.108CAR - 0.008BOPO - 0.217NIM - 0.192NPL + 0.008LDR

The multiple linear regression equation above produces shows the following results:

a. The constant value of 6.249 indicates that if all independent variables (CAR, BOPO, NIM, NPL, and LDR) are assumed to be zero, the ROA is predicted to be 6.249.
b. The regression coefficient on CAR of -0.108 suggesting that for every 1% increase in CAR will affect the decrease in CAR by 0.108 or 10.8%.
c. The regression coefficient on BOPO of -0.008 indicates that any increase in BOPO worth 1% will affect the decrease in BOPO by 0.008 or 0.8%
d. The regression coefficient on NIM of -0.217 indicates that every 1% increase in NIM will affect the decrease in NIM by 0.217 or 21.7%.
e. The regression coefficient on NPL of -0.192 indicates that every 1% increase in NPL will affect the decrease in NPL by 0.192 or 19.2%.

f. The regression coefficient on LDR of 0.008 indicates that every 1% increase in LDR will affect the decrease in LDR by 0.008 or 0.8%.

Table 6. Result of The Determination Coefficient Test

Dependent Variable: Y_ROA
Method: Least Squares
Date: 03/09/25 Time: 12:39
Sample: 1 48
Included observations:
48

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X1_CAR	-0.108424	0.017863	-6.069773	0.0000
X2_BOPO	-0.008291	0.003950	-2.098776	0.0419
X3_NIM	-0.217953	0.217943	-1.000046	0.3230
X4_NPL	-0.192320	0.147785	-1.301348	0.2002
X5_LDR	0.008358	0.013119	0.637067	0.5275
C	6.249688	2.386687	2.618561	0.0122

R-squared	0.720303	Mean dependent var	2.141563
Adjusted R-squared	0.687006	S.D. dependent var	0.507097
S.E. of regression	0.283700	Akaike info criterion	0.434670
Sum squared resid	3.380400	Schwarz criterion	0.668570
Log likelihood	-4.432081	Hannan-Quinn criter.	0.523061
F-statistic	21.63250	Durbin-Watson stat	0.921648
Prob(F-statistic)	0.000000		

Sumber : *data olahan Eviews* versi 10. *2025*

The analysis results indicate an Adjusted R-Squared value of 0.687, which implies that approximately 68.7% of the variation in Return on Assets (ROA) can be statistically explained by the independent variables: Capital Adequacy Ratio (CAR), Operating Expenses to Operating Income (BOPO), Net Interest Margin (NIM), Non-Performing Loans (NPL), and Loan to Deposit Ratio (LDR). The remaining 31.3% of the variation in ROA is attributable to other factors not included in the model, such as macroeconomic conditions, management practices, market dynamics, or other financial and non-financial variables.

The regression analysis reveals that the Capital Adequacy Ratio (CAR) has a coefficient of −6.069 with a p-value of 0.000, indicating a statistically significant effect at the 5% level ($p < 0.05$). This negative coefficient suggests that higher levels of CAR are associated with lower Return on Assets (ROA).

An excessively high CAR may reflect inefficiencies in capital utilization, as surplus capital retained within the bank is not optimally deployed into productive assets or income-generating activities. This underutilization of capital can constrain profitability, thereby lowering performance metrics of the banking institution. These findings contrast with the assumptions of signaling theory, which argues that a higher CAR is a positive signal of financial strength and stability. In this case, however, an elevated CAR appears to convey a mixed or even adverse signal, potentially indicating inefficiency in translating capital adequacy into profit.This study's results are consistent with prior research conducted by Raharjo et al. (2014), Abdurrohman et al. (2020), Widyaningsih & Sampurno (2022), Maulidah et al. (2022), Ridho (2023), and Kusuma and Dharma (2024), all of whom reported a significant and negative relationship between CAR & ROA suggesting that higher levels of capital reserves are associated with lower profitability in the context of banking sector performance.

The regression coefficient for the Operating Costs to Operating Income ratio (BOPO) is recorded at −2.098, accompanied by a significance value of 0.041, which is below the threshold of $\alpha = 0.05$. These results indicate that BOPO exerts a negative and statistically significant influence on Return on Assets (ROA). This finding aligns with signaling theory, which posits that a high BOPO ratio signals inefficiencies in cost management, potentially undermining stakeholders perceptions of the bank's financial health. Inefficient cost utilization reduces operational efficiency and, consequently, profitability.Furthermore, these results corroborate prior research conducted by Parhusip and Cakranegara (2021), Widyaningsih and Sampurno (2022), Maulidah et al. (2022), Anggraeni and Citarayani (2022), Kirana and Waluyo (2022), Ridho and Aprilia (2024), as well as Kusuma and Dharma (2025), all of whom concluded that BOPO has a negative and significant relationship with ROA in the banking sector.

The regression analysis shows that the Net Interest Margin (NIM) variable has a regression coefficient of −1, with a significance level of 0.323, which exceeds the standard threshold of $\alpha = 0.05$. This indicates that NIM has a negative but statistically insignificant effect on Return on Assets (ROA). The decline in NIM may be attributed to a greater reliance on non-interest income sources or a reduction in interest income derived from lending activities. These findings contradict the expectations of signaling

theory, which suggests that a lower NIM conveys a negative signall for invesetors and stakeeholders about bankss financial health & performance. A declining NIM may reflect inefficient asset and liability management, where interest income generated from loans is insufficient to offset the cost of funds.This result aligns with earlier studies by Pamularsih (2015), Dewi (2018), and Tsany & Bagana (2022), which also found a negative and statistically insignificant relationship between NIM and ROA. Although, in theory, a higher NIM is generally associated with increased profitability through stronger returns on interest-earning assets, the insignificance observed in this study suggests that NIM is not a dominant determinant of profitability for PT Bank Sumut during the observed period.

The regression analysis indicates that the Non-Performing Loan (NPL) variable has a regression coefficient of −1.301, with a significance value of 0.200, which exceeds the standard significance level of $\alpha = 0.05$. These findings suggest that NPL exerts a negative but statistically insignificant effect on Return on Assets (ROA). The insignificance of this relationship may imply bank has implemented effective credit rissk manageement strategies, allowing it mitigatedd the adverse impacts of npl on overrall profitability. This could include proactive loan restructuring, provisioning practices, or the strengthening of internal credit evaluation and recovery processes. In such cases, even though NPL levels may rise, the bank's financial performance—as reflected by ROA—remains relatively unaffected due to compensatory management mechanisms. This study shows the same findings as previous research implemented in Darmawan, Laksana, & Danisworo (2020), Yanti & Setiyanto (2021), Widyaningsih, N. & Sampurno, R. D. (2022), Septiyani, E. et al (2022) and Heliani, et al (2023) and Ridho, Ahmad A., (2024) the findings of this study indicate that Non Performing Loan (NPL) hasa negatiive but insigniificant relationship wiith ROA. According to signal theory, a high NPL ratio should give a bad signal about the bank's financial condition, because increasing non-performing loans have the potential to reduce profitability. One of the reasons PT Bank Sumut NPL is not significant to ROA is because this bank has a management policy that is classified as excellent credit risk. The bank implements stringent risk management practices, enabling it to mitigate the potential impact of NPL through the establishment of substantial loan loss reserves and the adoption of an efficient loan management approach.

The regression analysis reveals that the Loan to Deposit Ratio (LDR) exhibits a positive coefficient of 0.637 with a significance level of 0.527, which exceeds the α threshold of 0.05. This indicates that LDR has a positive yet statistically insignificant impact on Return on Assets (ROA). While a higher LDR ratio theoretically enhances banks potential generated interrest inccome by increasing loan disbursement relative to deposits, the insignificant effect observed suggests the influence of other moderating factors.These findings diverge from the expectations set by signaling theory, which suggests that a higher LDR should convey a positive signal to stakeholders regarding the bank's financial health. However, in line with prior studies conducted by Winarso and Salim (2017), Sunaryo (2020), and Widyaningsih and Sampurno (2022), this research corroborates the conclusion that LDR does not exert a statistically significant effect on ROA. In practice, while LDR remains a critical metric for assessing a bank's credit disbursement efficiency, its direct influence on profitability may be moderated by risk management strategies and diversified income sources.

5. Conclusion

Based on the empirical data analysis, hypothesis testing, and an in-depth discussion of the influence of key financial ratios, including the Capital Adequacy Ratio (CAR), Operating Costs to Operating Income (BOPO), Net Interest Margin (NIM), Non-Performing Loan (NPL), and Loan to Deposit Ratio (LDR) on financial performance, as reflected through Return on Assets (ROA) at PT. Bank Sumut, several important conclusions can be drawn. These findings contribute significant knowledge about how internal financial indicators shape the bank's profitability over the study period. The conclusions are as follows:

1. The Capital Adequacy Ratio (CAR) exhibits a negative and statistically significant effect on Return on Assets (ROA) at PT Bank Sumut, indicating that excessive capital reserves may hinder optimal asset utilization and profitability.
2. The Operating Expenses to Operating Income (BOPO) variable has a negative and significant impact on ROA, suggesting that higher operational inefficiencies directly reduce the bank's profitability.
3. The Net Interest Margin (NIM) demonstrates a negative but statistically insignificant effect on ROA, implying that fluctuations in interest income have not played a decisive role in shaping financial performance during the observed period.
4. The Non-Performing Loan (NPL) variable also shows a negative and insignificant influence on ROA, reflecting the possibility that effective credit risk management has mitigated the adverse effects of defaulted loans on overall profitability.
5. The Loan to Deposit Ratio (LDR) exerts a positive but statistically insignificant effect on ROA, suggesting that while increased lending activity may enhance returns, it has not significantly influenced profitability in this context.

6. Managerial Implications

Therefore, the negative and significant effect of the Capital Adequacy Ratio (CAR) on Return on Assets (ROA) implies that banks must manage their capital adequacy more efficiently to avoid excessive capital reserves, which may hinder the optimal utilization of assets and suppress profitability. If capital is too large and not utilized properly, banks cannot maximize potential

profits. Managing CAR optimally will help banks maintain a balance between stability and profitability. If there is capital that is not used efficiently, Banks are encouraged to develop alternative revenue-generating strategies beyond traditional lending activities, such as leveraging digital banking services to increase fee-based income and optimizing investment in securities to enhance financial performance. To enhance fee-based income, banks are encouraged to diversify and expand their banking services beyond traditional interest-earning activities. This includes offering value-added services such as wealth management, bancassurance, electronic banking, payment solutions, and transaction-based services. By doing so, banks can reduce reliance on interest income, mitigate risks associated with credit portfolios, and create more stable revenue streams. Strengthening non-interest income not only improves profitability but also reflects a bank's adaptability and responsiveness to changing customer needs and the evolution of financial institutions through digiital transformation.

The implication that the variable Operating Expenses to Operating Income has a negative & significant effect on ROA indicates that the management observes an increase in operating cost efficiency. More efficient cost management will enable banks to increase profit margins and improve financial performance. Evaluating and reformulating internal processes will identify improvements. For example, improving the organizational structure or implementing data-driven cost management to improve efficiency.

The implication of the NIM showing a negative but statistically insignificant effect on Return on Assets (ROA) suggests that, while NIM remains a key component in profit generation, its influence may not be immediately evident in the current financial context. This highlights the importance of adopting a more strategic and efficient approach to managing the Net Interest Margin (NIM). Bank management should concentrate on maximizing the interest spread between income generated from loans and the costs associated with interest-bearing deposits. Sustaining a favorable and stable margin requires effective asset and liability management, which is critical for enhancing overall profitability and safeguarding the bank's financial stability. Especially in a competitive and dynamic banking environment. Banks can improve NIM by adjusting interest rates on loans and deposits according to changes in market conditions. The bank will maintain a balance between the attractiveness of interest rates for customers and the profits earned by the bank which greatly affects the increase in NIM.

The implications for NPL variables doesn't exhibit statistically signiificant effeect on ROA, bank management must continue to prioritize the quality of the loan portfolio. Maintaining prudent credit risk practices is essential to minimizing the likelihood of unforeseen losses that could undermine financial performance over time. Selective risk management in lending can reduce the NPL ratio, thereby reducing the need for loss reserves and improving profitability. Banks need to tighten their credit assessment processes, ensuring that loans are only granted to borrowers with manageable risk profiles. Enhancing credit quality plays a critical role in preserving the bank's overall financial stability while simultaneously mitigaating the rissk of loan defaults that might negatively effect Return on Assets (ROA). By strengthening credit assessment and monitoring processes, banks can minimize potential losses and sustain long-term profitability.

The implication on the LDR variable reveals a positive yet statistically insignificant effect, indicating that although a high LDR can increase interest income from loans, management maintains the LDR at an optimal level to avoid liquidity problems. Bank management needs to balance the need to grant loans with maintaining sufficient liquidity reserves. This is essential for a financially healthy LDR in banking. Banks have flexible credit policies to adapt to changes in market conditions.

7. Recommendations

1. Recommendations for Academics, for further research, academics should conduct in-depth research and studies to analyze the deeper relationships between several variables. Academics can review financial and bank management theories to ensure that existing principles can be applied appropriately in the modern digital-based banking world.
2. Recommendations for Customers or the Public, Customers should understand bank financial ratios by selecting stable and secure banks to deposit their funds, and be aware effect of operational costs services they receive. Finaancial ratios such as CAR, NPL, and LDR directly impact a bank's stability and financial performance. Customers should choose banks with healthy ratios and not solely focus on interest rates or promotions offered by banks. Diversifying across several banks with good risk management policies can provide greater security, especially during times of economic uncertainty.
3. Recommendations for Companies, companies should prioritize cost efficiency, better risk management, and ensure financial ratios are at optimal levels to enhance profitability without compromising stability. Banks can conduct a gradual evaluation of capital needs. Banks can improve internal efficiency to reduce unproductive expenses and enhance profitability. By implementing stricter credit risk management policies, conducting more thorough loan eligibility evaluations, and strengthening loan loss reserves, potential losses can be reduced.

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