



Determinan efisiensi industri perbankan di Indonesia

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Abstrak

Konsep efisiensi menggarisbawahi tentang kecakapan dalam memanfaatkan sumber daya yang tersedia secara ekonomis. Efisiensi pada perbankan dinyatakan sebagai indikator kinerja bank yang diperlukan agar dapat bertahan dalam persaingan dan perubahan perilaku konsumen. Penelitian ini bertujuan untuk menilai bagaimana kinerja efisiensi pada bank umum di Indonesia. Sebanyak 85 sampel bank dipilih secara purposive dan digunakan dalam penelitian selama tahun 2018 - 2022. Penaksiran nilai efisiensi pada seluruh bank umum dilakukan menggunakan pendekatan non parametrik dengan Data Envelopment Analysis. Hasil penaksiran menunjukkan bahwa selama periode pengamatan bank umum di Indonesia belum beroperasi secara efisien. Hal ini ditunjukkan dengan nilai rata-rata efisiensi seluruh bank yang bernilai lebih kecil dari 1. Hasil empiris menunjukkan efisiensi tertinggi terdapat pada kelompok bank besar yang memiliki modal di atas 70 triliun dengan rata-rata berkisar 97% sampai 98%. Sedangkan efisiensi terdapat terjadi pada kelompok bank kecil yang memiliki modal di bawah 6 triliun. Hasil pengujian hipotesis menunjukkan bahwa ukuran perusahaan, profitabilitas dan rasio permodalan berpengaruh signifikan terhadap efisiensi bank.

Determinant efficiency of the banking industry in Indonesia

Keywords:

commercial bank; data; efficiency; envelopment analysis

Abstract

The concept of efficiency emphasizes the ability to utilize available resources economically. Efficiency in banking is stated as an indicator of bank performance that is needed to survive in competition and changes in consumer behavior. This study investigates the efficient performance of commercial banks in Indonesia, crucial for their resilience amidst competitive pressures and evolving consumer behaviors. Utilizing a purposive sample of 85 banks from 2018 to 2022, we employ Data Envelopment Analysis, a non-parametric method, to assess efficiency. Our findings reveal suboptimal operational efficiency across Indonesian commercial banks during the study period, with an average efficiency score consistently below 1. Notably, larger banks, with capital exceeding 70 trillion, exhibit superior efficiency, averaging between 97% to 98%. Conversely, smaller banks, with capital under 6 trillion, demonstrate varied efficiency levels. Hypothesis testing underscores the significant impact of company size, profitability, and capital ratios on bank efficiency.

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INTRODUCTION

As intermediary institutions, banks play an important role in Indonesia's economic growth. Ensuring effective intermediation is vital for these institutions to become development agents and drive improvements in societal welfare. Since the implementation of the Indonesian Banking Architecture established by Bank Indonesia in 2004, all Indonesian banks in carrying out their business must be oriented towards the stated vision, namely creating a healthy, strong, and efficient banking system to create financial system stability to help encourage national economic growth (Latumaerissa, 2013). To realize this vision, every bank is required to have a large business scale and capital. This is essential to meet their financial obligations in extending credits, guarantees, currency and securities trading, insurance, finance consulting, and other financial services for customers and investors. Table 1. reflecting progress since 2018 indicates a substantial growth in the total assets of commercial banks, from 7,751 trillion rupiah in 2018 to 11,113 trillion rupiah in 2022. This asset growth is supported by increased deposits and credit distribution.

Table 1. Total Asset, Third-Party Funds, and Commercial Bank Credit (Billion Rupiah)

| | 2018 | 2019 | 2020 | 2021 | 2022 |
|------------------|-----------|-----------|-----------|------------|------------|
| Asset | 7,751,655 | 8,212,610 | 8,780,820 | 10,112,304 | 11,113,321 |
| Third-Party Fund | 5,630,448 | 5,998,648 | 6,665,390 | 7,479,463 | 8,153,590 |
| Credit | 5,358,012 | 5,683,757 | 5,547,618 | 5,820,636 | 6,497,620 |
| Credit Growth | 12.05% | 6.08% | -2.40% | 4.92% | 11.63% |

Source: Indonesian Banking Statistics, 2022

The rapid growth of the Indonesian banking industry doesn't mean that bank operational activities are free from various obstacles. These obstacles include several aspects.

Table 2. Third-Party Fund Distribution and Credit by Core Capital

| Year | KBMI-1 | KBMI-2 | KBMI-3 | KBMI-4 |
|------|------------------------------------|-----------------|------------------|---------------|
| | 6 trillion | 6 – 14 trillion | 14 – 70 trillion | > 70 trillion |
| | Credit (billion rupiah) | | | |
| 2018 | 46,933 | 525,714 | 1,851,141 | 2,731,459 |
| 2019 | 37,994 | 569,146 | 1,756,342 | 3,094,668 |
| 2020 | 12,479 | 539,011 | 1,582,336 | 3,166,835 |
| 2021 | 698,332 | 651,624 | 1,494,599 | 2,976,081 |
| 2022 | 772,695 | 720,129 | 1,708,709 | 3,296,088 |
| | Third-Party Funds (billion rupiah) | | | |
| 2018 | 50,814 | 549,986 | 1,769,026 | 3,003,015 |
| 2019 | 42,621 | 621,089 | 1,672,217 | 3,373,744 |
| 2020 | 12,676 | 648,871 | 1,783,049 | 3,897,941 |
| 2021 | 970,137 | 793,773 | 1,865,083 | 3,850,469 |
| 2022 | 989,871 | 888,107 | 1,992,606 | 4,283,006 |

Source: Indonesian Banking Statistics, 2022

Firstly, concerning input in the form of funding, Indonesian commercial banks encounter competition in obtaining relatively inexpensive and long-term third-party funds. Second, from an operational perspective, banks are compelled to continually advance their technology to reduce operational costs. Third, from the output side in the form of financing, banks will be required to expand their market share by providing competitive interest rates. This can be seen in Table 2, illustrating the distribution of fund collection and allocation predominantly led by large banks with core capital exceeding 70 trillion.

The difference in the ability to acquire market share is primarily caused by competitive and performance factors measured by efficiency. Efficiency stands as a pivotal metric in management theory, where an organizations or bank's performance hinges on its capability to streamline costs and foster wealth creation. The concept of efficiency underscores the bank's adeptness in leveraging available resources economically while maximizing wealth generation. An efficient bank is more adept at withstanding negative shocks and contributes to financial system stability (Delis & Papanikolaou, 2009). Low bank efficiency can undermine profit generation potential, posing a significant risk to the bank's long-term sustainability (Ganefi et al., 2020).

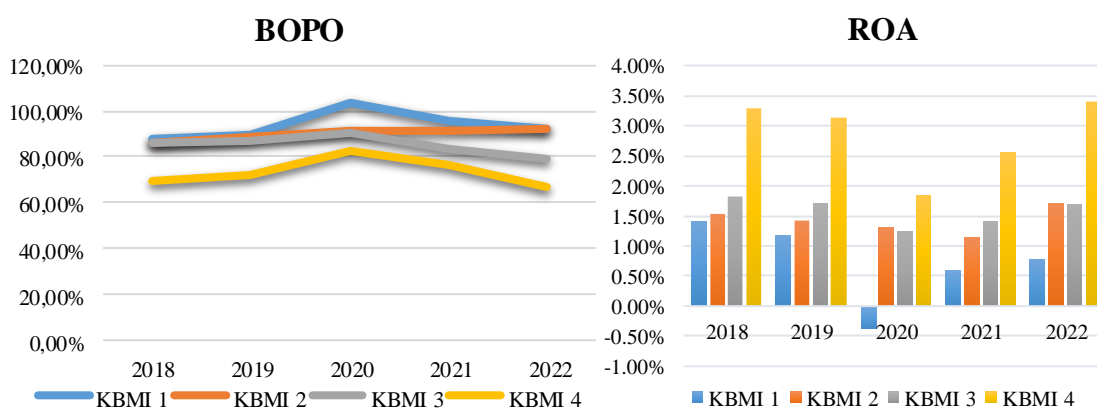


Figure 1 Kinerja Bank Umum Periode 2018-2022
Source: (Indonesian Banking Statistics, 2022)

Figure 1 illustrates that the performance level of the small bank group is inferior to that of the large bank group. Small banks generally have problems in creating efficient operational costs. This is because it is difficult for this bank group to create competitive interest rates, thus causing a high cost of funds. Another factor is the use of digital banking, where the use of banking technology is currently not fully distributed, so it still relies on conventional systems, which causes large costs to be incurred. Operational costs and returns have a negative correlation, when BOPO decreases, ROA tends to increase, and vice versa. Moreover, the intensity of competition in credit supply, which shapes the structure of the credit market, also impacts the operational efficiency of banks. Related to the urgency of efficiency analysis in the banking sector, power

banking competitiveness can be reflected in the level of operational efficiency. Hence, understanding the determinants impacting efficiency levels within banking sector firms is crucial. Efficiency serves as a primary metric for assessing company performance (Andhyka et al., 2017). This study aims to investigate the efficiency levels of Indonesian banks and identify the factors influencing them.

Previous researchers have conducted investigations into bank efficiency, but most of them did not carry out an overall analysis by dividing them based on the capital they have, and the differences in results related to factors that influence bank efficiency have made it a consideration to carry out research again.

METHODS

This study utilizes secondary data sourced from annual financial reports, Indonesian banking statistics reports, academic journals, and prior research. It focuses on all commercial banks categorized into groups based on core capital, as defined by OJK regulation No. 12/POJK,03/2021. The sampling approach employs a purposive sampling method, guided by criteria outlined in Table 3.

Table 3. Research Samples

| Criteria | Amount |
|---|--------|
| A commercial bank in Indonesia during operational 2018-2022 | 106 |
| Conventional Commercial Bank | 94 |
| Incomplete financial reports | 9 |
| Number of final samples bank | 85 |
| KBMI-1 (Core capital < 6 trillion) | 53 |
| KBMI-2 (Core capital 6-14 trillion) | 17 |
| KBMI-3 (Core capital 14-70 trillion) | 11 |
| KBMI-4 (Core capital > 70 trillion) | 4 |
| Period of observation (Annual) | 5 |
| Number of observations | 425 |

The operationalization or measurement of variables is summarized in Table 4. The object of this research consists of efficiency as the dependent variable, while the bank size, profitability, credit risk, and capital are the independent variables.

Table 4. Variable Operationalization

| Object | Description | Scale |
|-----------------|--|--------|
| Efficiency bank | Input: W_1 Price of labor, W_2 Operational cost, W_3 Third-Party Funds, Output: Y_1 Credit, Y_2 Other income, | Rupiah |
| size bank | Total assets owned by the Bank | Rupiah |
| profitability | The ratio of the total profit before tax to total asset | Ratio |
| Credit risk | Non-Performing Loan | Ratio |
| Capital | The capital adequacy ratio | Ratio |

To assess efficiency, this study employs an intermediation approach to define input and output variables. This perspective views banks as intermediaries that gather funds and subsequently allocate them. Input variables encompass the cost of funds, capital, and labor. Outputs consist of credit and other operational revenues generated by banks.

Data Envelopment Analysis. The Data Envelopment Analysis (DEA) is a method tailored for assessing efficiency scores in economic activities characterized by substantial inputs and outputs. DEA operates as a nonparametric technique rooted in linear programming, enabling the measurement of efficiency in Decision-Making Units (DMUs), also known as Economic Activity Units (UEs), which encompass diverse input and output variables (Marsondang et al., 2019). Farrell (1957) first introduced DEA, which conceptualizes the measurement of multiple inputs utilized, thereby dividing firm efficiency into two distinct components: Technical Efficiency and Allocative Efficiency (Nasution et al., 2020).

Charnes, Cooper, dan Rhodes (CCR, 1978) further advanced DEA by introducing the Constant Return to Scale (CRS) model. This model compares each Decision-Making Unit (DMU) against others under the assumption of uniform internal and external conditions. It provides an overall efficiency assessment for each DMU based on the comparison of outputs to inputs, yielding a score ranging from 0 to 1, where higher scores indicate greater efficiency. The CRS model assumes a constant ratio between additional inputs and outputs, implying that a proportional increase in input results in a proportional increase in outputs. Additionally, the model assumes that each bank or DMU operates optimally at its scale (Nainggolan, 2020). Mathematically the model is defined as follows:

Maximization:

$$h_s = \sum_{i=1}^N \mu_i y_{ir}$$

Subject to

$$\sum_{r=1}^N \mu_i x_{ir} - \sum_{j=1}^N v_j x_{jr} \leq 0 : r = 1, \dots, N \quad (1)$$

$$\sum_{j=1}^N v_j x_{jr} = 1$$

Where h_s is banking technical efficiency s , μ_i is output weight i , y_{ir} input weight i , v_j input weight j , x_{jr} is total input. The main aim of this equation's objective function is to maximize the output value under the constraint that the input value equals one, so that the output value minus the input value results in less than or equal to zero, all BUS will be below their optimum technical efficiency level. In 1984, Banker, Charnes, and Chooper introduced the Variable Return to Scale (VRS) or BSS model as an extension. Unlike the CRS model, the VRS model acknowledges that DMUs may not operate under identical conditions or at optimal scales. Factors such as imperfect competition and financial constraints can lead firms to operate below their maximum potential. Consequently, a 1% increase in input does not necessarily result in a 1% increase in output; the relationship

may be either larger or smaller. The VRS model modifies the CRS framework by incorporating convexity constraints into the equation to accommodate these variations.

Maximization:

$$h_s = \sum_{i=1}^N \mu_i y_{ir} + U_0$$

Subject to :

$$\sum_{r=1}^N \mu_i x_{ir} - \sum_{j=1}^N v_j x_{jr} \leq 0 : r = 1, \dots, N \quad (2)$$

$$\sum_{j=1}^N v_j x_{jr} = 1$$

In the last few years, studies related to efficiency and factors that can influence the financial sector have become a topic that has been widely observed by researchers in various countries, including Indonesia. Abbas et al, (2016) conducted a comparative study on bank efficiency in Pakistan, focusing on both Islamic and conventional banks and employing DEA standards. Their research revealed that conventional banks outperform Islamic banks in terms of efficiency. Furthermore, they identified several factors – such as years of operation, Return on Asset (ROA), loan-to-asset ratio, capital, operational costs, and service offerings – that significantly impact bank efficiency in Pakistan.

In another study, Sufian et al., (2016) investigated the primary determinants of bank efficiency, examining both external and internal factors. Their findings indicate that bank-specific factors like shareholder capital and total assets positively influence bank efficiency. They also found that external factors such as market concentration level and risk, measured by z -score, contribute positively, whereas indicators of financial development, represented by capitalization ratios, have a negative impact.

Research conducted in Indonesia by Shalehanti et al, (2021) reveals that ROA positively impacts efficiency, whereas technology exerts a notable negative influence. Research Majdina et al, (2019); (Perwitaningtyas et al., 2015) states that the number of assets, ROA, type of bank, capital, and banks that have gone public affect efficiency. While Susilowati et al, (2019) in their study shows that market power factors have a positive effect on efficiency. Meanwhile, in (Lestari et al., 2020) bank performance as measured by ROA is influenced by net interest margin as a proxy for efficiency.

Tobit Regression Models. The efficiency score derived from the DEA method serves as the development variable, which is then combined with independent variables to determine efficiency determinants. The Tobit model assumes that independent variables are not constrained (non-censored), whereas the dependent variable is censored, confined within a range of 0 to 1. This characteristic makes the Tobit model suitable for estimating regression coefficients in analyzing efficiency performance determinants. The optimal Tobit regression model formulated in this study typically takes the following structure:

$$EF_{it} = \beta_0 + \beta_1(TA)_{it} + \beta_2(ROA)_{it} + \beta_3(CAR)_{it} + \beta_4(NPL)_{it} + \varepsilon_{it} \quad (3)$$

Where EF is the efficiency of bank i , TA is the total asset of bank i , ROA is the Return on Asset of bank i , CAR is the Capital Adequacy Ratio of bank i , and NPL is a non-performing loan.

RESULT

Input and Output Description. In Assessing banking efficiency scores through the Data Envelopment Analysis (DEA) program, inputs consist of labor costs, third-party fund expenditures, and other operational expenses. Outputs, on the other hand, include credit allocation and additional income streams.

Table 5. Input and Output Variable Description

| Variable | KBMI-1 | | KBMI-2 | | KBMI-3 | | KBMI-4 | |
|------------------------|--------|------|--------|-------|------------|-------|--------|------------|
| | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| Price Labor | 0,26 | 0,21 | 0,91 | 0,66 | 2,22 | 0,94 | 15,10 | 6,71 |
| DPK | 10,87 | 8,33 | 49,96 | 2,96 | 126,9 2 | 64,31 | 871,36 | 211,5 7 |
| Other operational cost | 0,25 | 0,28 | 1,07 | 0,77 | 2,48 | 0,96 | 15,68 | 4,21 |
| Credit | 8,81 | 6,48 | 42,81 | 23,19 | 112,3 9 | 50,29 | 717,20 | 160,8 9 |
| Other Income | 0,06 | 0,12 | 0,18 | 0,24 | 0,39 | 0,35 | 5,40 | 4,08 |

Sumber: Result of data analysis (2023)

According to Table 5, KBMI-4 demonstrates the highest value for both input and output variables. In the input variable, the average labor cost for KBMI-4 is 15.10 trillion, the average DPK is 871.36 trillion, and the average other operational costs amounted to 15.68 trillion. Meanwhile, in the output variable, the average KBMI-4 credit distribution was 717.20 trillion and other income was 5.40 trillion.

Efficiency Measurement Utilizing DEA. The efficiency score varies from 0 to 1, indicating higher score signify greater efficiency in the bank's performance. A graphical representation below illustrates the efficiency scores across different bank groups from 2018 to 2022.

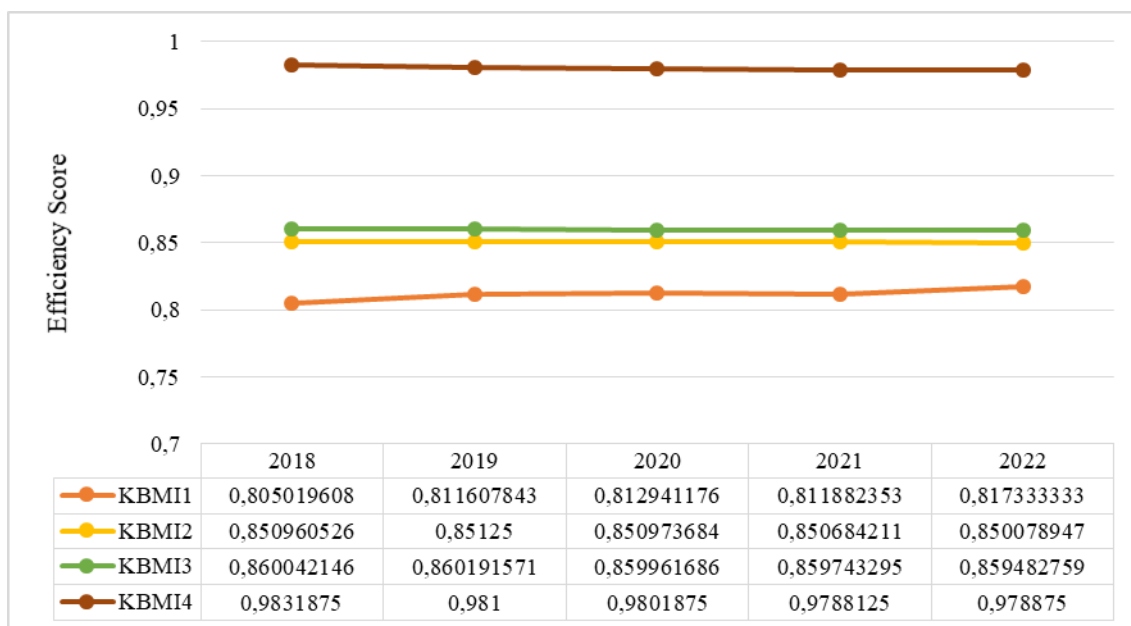


Figure 4. Score Efficiency Bank

Based on Figure 4. above, there are 33 Decision-Making Units (DMUs) that are declared efficient with an efficiency score of 1. This means that these banks have succeeded in optimizing their resources to produce maximum output. The distribution of DMUs that have reached an efficient level based on year is 9 banks in 2018, 6 banks in 2019, 4 banks in 2020, 6 banks in 2021, and 8 banks in 2022. The other DMUs were declared inefficient with efficiency scores below 1. Figure 4 also provides a description of the development of efficiency scores which shows a trend pattern, where the average efficiency score for each KBMI only changes slightly from year to year. This means that the efficiency score for each KBMI is relatively more stable. KBMI with core capital above IDR 70 trillion consisting of BNI, BRI, Mandiri, and BCA produces the highest average efficiency score (close to 1) followed by KBMI-3, KBMI-2, and KBMI-1. This indicates that banks with higher capital scores have a greater potential to achieve optimal efficiency levels.

The Measurement of Efficiency Determinant by Using Tobit Analysis. In the subsequent phase, the Tobit method is employed to examine the factors influencing efficiency. Variables under investigation include bank size, return on assets, non-performing loans, and capital. The results obtained using the Tibit method are presented below. The Tobit regression model estimation can accommodate all observations, both zero and non-zero. Tobit regression model parameter estimation generally uses the Maximum Likelihood Estimation (MLE) method which is based on conditional mean, that is, the estimator obtained focuses on the average of the distribution of the dependent variable.

According to Table 3, the size variable shows a p-value of 0.000, which is less than the significance level of 0.05. therefore, the null hypothesis (H_0) is rejected, indicating that bank size significantly influences efficiency.

Table 5. Determinants of Efficiency Bank during the period 2018 - 2022

| Variable | Coefficient | Std. Error | t-Statistic | P-Value |
|----------|-------------|------------|-------------|---------|
| C | -0,1854 | 0,1256 | -1,48 | 0,141 |
| Size | 0,0402 | 0,0070 | 5,76 | 0,000* |
| ROA | 0,0122 | 0,0047 | 2,61 | 0,009* |
| CAR | 0,0011 | 0,0004 | 3,18 | 0,002* |
| NPL | 0,0016 | 0,0045 | 0,36 | 0,716 |

*significant at 5%

Sumber: Result of data analysis (2023)

The ROA variable yields a p-value of 0.009, which is less than the significance level of 0,05, leading to the rejection of the null hypothesis (H_0). This signifies that the profitability ratio notably impacts banking efficiency. Positive parameter estimates indicate that higher ROA ratios correlate with increased efficiency levels for banks. These results align with findings from previous studies by Afza & Asghar (2017) and Ramli & Hakim (2017).

The CAR variable shows a p-value of 0.002, which is less than the significance level of 0.005, leading to the rejection of the null hypothesis (H_0). This indicates that the Capital Adequacy ratio (CAR) significantly influences banking efficiency. Positive parameter estimates suggest that higher CAR ratios are associated with increased efficiency levels in banks.

The NPL variable yields a p-value of 0.716, which is greater than the significance level of 0.005, leading to the failure to reject the null hypothesis (H_0). This suggests that non-performing loans (NPL) do not significantly impact bank efficiency. High NPL levels typically indicate lower credit quality within banks, increasing non-performing loans. However, the results of this study indicate that varying levels of NPL do not consistently raise or lower bank efficiency. This observation is consistent with the data showing that, on average, NPL at the four KBMIs is relatively low (below 5%).

DISCUSSION

Commercial Bank Efficiency Analysis. The contribution of conventional commercial banks is currently still a major concern in driving the country's economic growth. Therefore, it is important to maintain performance so that the intermediation function runs well. Based on empirical results of commercial bank performance in terms of efficiency using DEA technique measurements. Efficiency measurements are carried out with input orientation. Identifying inputs and outputs is approached through an intermediation perspective, as banks serve as intermediaries that transform public savings into investment assets. Figure 4 illustrates the average efficiency of commercial banks categorized by core capital groups. Empirical findings indicate that commercial banks in

Indonesia did not reach optimal efficiency between 2018 and 2022. The less-than-optimal efficiency is caused by the still high credit interest rate, the fact can be seen that general banks in Indonesia still apply a basic credit interest rate of around 9-10%. This is still relatively high compared to other countries in ASEAN which provide credit interest rates of around 5-6% (Lestari, 2021). However, these findings highlight that the highest average efficiency is observed in the KBMI-4 group, characterized by substantial core capital, indicating its larger scale with the banking sector. This finding aligns with Dellatti et al, (2015) research on banking efficiency in Europe, which suggests that larger bank groups in European countries exhibit greater efficiency compared to smaller banks. The higher average efficiency observed among large banks from 2018 to 2022 is likely attributed to synergies derived from economies of scale and scope, along with the advantages of extensive diversification. In addition, it is believed that large banking groups are adopting higher levels of technology so that this can create broader financial inclusion and accommodate every transaction service offered to consumers.

The hypothesis testing shows that company size has a positive effect on efficiency. Positive parameter estimates indicate that the larger the bank size, the greater the bank's efficiency level. This finding is in line with Fitroh et al, (2020) and Rahma & Mayasari (2021) which states that the substantial size of a bank correlates with its large total assets, enabling such banks to conduct daily operations more effectively and optimize their available resources to a greater extent. The results of this research are also strengthened by Otero et al, (2020) revealing that large banks tend to have better resources, relatively cheap transaction costs, can face competition, and can withstand economic shocks.

The profitability ratio which is measured by the ROA, notably influences the efficiency of banks. Positive parameter estimates indicate that the greater the ROA ratio of a bank, the greater the bank's efficiency level. This finding is in line with Afza & Asghar (2017) dan Ramli & Hakim (2017). ROA is usually widely observed by stock investors because it is related to the potential for dividend distribution. The ROA variable indicates how effectively a bank generates profits from its assets. A higher ROA ratio signifies greater net profit generated by the bank, thereby enhancing its overall performance efficiency. This is because the bank will have a relatively large total revenue from increased sales (Wahab, 2015).

The Capital Adequacy ratio (CAR) significantly influences banking efficiency. Positive parameter estimates suggest that banks with higher CAR ratios tend to exhibit higher levels of efficiency. The CAR variable describes the capital ratio of a bank to mitigate the risk of operational losses. A CAR value that is higher than Bank Indonesia's provision reflects the bank's financial ability to develop business, and increase investment in the use of technology. On the other hand, the NPL variable shows no substantial impact on bank efficiency. Elevated NPL levels typically signify lower credit quality within banks, leading to an increase in non-performing loans. However, the findings in this research show that high or low non-performing credit ratios may not necessarily increase or decrease bank efficiency.

CONCLUSION

This study seeks to assess the efficiency levels of commercial banks and identify the factors influencing their performance. Empirical findings indicate that commercial banks in Indonesia did not reach optimal efficiency between 2018 and 2022. Among different groups, large banks with core capital exceeding 70 trillion show the highest efficiency, while smaller banks with capital below 6 trillion exhibit the lowest efficiency levels. Small bank groups currently still dominate because they are very large in number. Therefore, several things can be done so that efficiency can be increased by increasing capital. Banks with large capital have the flexibility to adopt financial technology so that they can improve financial inclusion services to all elements of society and efficient economic transactions that will ultimately have an impact on profit creation. The statistical analysis reveals that key determinants impacting bank efficiency include the size of the bank, its return on assets (ROA), and its capital ratios. Understanding the factors that affect bank efficiency is crucial for stakeholders and policymakers aiming to enhance the financial performance and stability of banks. By identifying variables such as bank size, ROA, and capital ratios, this research contributes valuable insights into improving operational effectiveness and strategic decision-making within the banking sector. These findings underscore the importance of robust financial management practices and strategic investments in optimizing bank efficiency amid dynamic economic conditions.

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