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Beyond the Liquidity Illusion: Evaluating the Efficiency of Indonesia's Himbara Banks

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Abstract
Analyze the efficiency levels of Himbara banks after receiving Rp200 trillion in funds from the Ministry of Finance. Compare the efficiency levels between Himbara banks in the periods before and after the fund placement policy. Identify internal factors that influence the efficiency of government fund management at Himbara banks. This study uses a quantitative approach with the non-parametric Data Envelopment Analysis (DEA) method. This approach was chosen because it can measure the relative efficiency between decision-making units (DMUs) without requiring specific production function assumptions (Charnes, Cooper, & Rhodes, 1978). DEA allows researchers to evaluate the ability of Himbara banks to efficiently convert inputs (resources) into outputs (intermediation results). The analysis was conducted for the period 2024–2025, covering conditions before and after the placement of IDR 200 trillion in funds from the Ministry of Finance. To analyze factors influencing efficiency, the Tobit regression model was used. Data Envelopment Analysis (DEA) results show that the Rp200 trillion injection of funds was only effective in increasing efficiency at already productive banks (BRI, Mandiri, and BTN), while BNI still exhibited inefficiency due to its inability to convert additional funds into proportional credit growth and interest income. This indicates the need for improvements in credit distribution strategies, operational cost management, and risk management so that the injection of public funds truly has an optimal impact on efficiency and economic growth. Tobit Regression results indicate that bank efficiency in Indonesia tends to increase if banks have strong capital adequacy, good asset quality, and optimal intermediation capabilities. Conversely, increasing NPLs and excessive asset expansion can be factors that reduce efficiency. Therefore, future banking policy strategies need to focus on improving asset quality, cost efficiency, and implementing effective governance across all bank scales

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1. INTRODUCTION

The banking sector is one of the main pillars of the national financial system, playing a role in intermediating public funds and financing development. In the Indonesian context, state-owned banks that are members of the Association of State- Owned Banks (Himbara) — consisting of Bank Mandiri, BRI, BNI, and BTN — have a strategic position in distributing government programmes and maintaining national economic stability.

Himbara is an acronym for Himpunan Bank Milik Negara, which is a collaborative forum consisting of four state-owned banks, namely Bank Mandiri, Bank Rakyat Indonesia (BRI), Bank Negara Indonesia (BNI), and Bank Tabungan Negara (BTN) (Antaranews, 2024). The establishment of Himbara aims to strengthen synergy among state-owned banks in supporting strategic government programmes and enhancing the efficiency and competitiveness of the national banking industry (Medcom.id, 2024). Through coordination facilitated by the Ministry

of State-Owned Enterprises, Himbara is expected to be able to provide an inclusive financial system, expand the reach of banking services, and improve national economic performance (Metrotvnews, 2024).

Himbara's strategic role became even more apparent when the government placed Rp 200 trillion in state funds in Himbara member banks to accelerate credit distribution to the productive sector and support national economic recovery (Tempo, 2025). In addition, Himbara is also involved in priority programmes such as financing housing construction for low-income communities and developing village cooperatives (IDN Financials, 2025; VOI.id, 2025). Through these roles, Himbara has become the government's main partner in maintaining economic stability, strengthening the real sector, and promoting inclusive financial transformation.

However, Himbara's existence also faces several challenges. One of them is the potential for unhealthy competition among members if the synergy is not regulated in a transparent and balanced manner (Bircu Journal, 2023). Differences in the financial performance of each bank can also affect the effectiveness of collaboration, especially if it is not managed with strong accountability principles. In addition, in the context of digitalisation and operational efficiency, Himbara is required to continue to transform in order to compete with increasingly innovative private banks and digital financial institutions (BNI, 2024).

Overall, Himbara serves as an important instrument in Indonesia's national banking system, both as a development agent and a strategic partner of the government. Collaboration between state-owned banks reflects efforts to strengthen the financial sector based on synergy and efficiency, which is expected to accelerate national economic growth and expand financial inclusion for all levels of society.

However, banking efficiency does not always correlate directly with an increase in funds received. Several studies show that an increase in bank liquidity does not automatically increase operational efficiency or input productivity, such as labour, assets, or credit distribution, because the effectiveness of fund utilisation is highly dependent on risk management and asset allocation strategies (Nasution & Mahardika, 2021); (Yuliani & Sari, 2020). Furthermore, other studies confirm that although government policies such as placing state funds in Himbara banks increase short-term liquidity, their impact on operational efficiency and profitability is not always statistically significant (Hidayat & Wibowo, 2022). Therefore, it is important to analyse the extent to which these policies contribute to improving the efficiency of Himbara banks quantitatively through the *Data Envelopment Analysis (DEA)* approach

The *Data Envelopment Analysis (DEA)* method is considered appropriate because it is able to measure the relative efficiency levels between banks based on input-output ratios without requiring a specific production function. Through this analysis, it can be determined whether Himbara banks have managed government resources and funds efficiently in generating outputs such as profits, interest income, and productive financing. The *Data Envelopment Analysis (DEA)* method is considered appropriate for measuring the relative efficiency levels between banks because it is able to compare input-output ratios without requiring a specific production function. This method is widely used in banking research in Indonesia to assess the efficiency performance of banks, both conventional and Islamic, with results showing that most banks are still operating below the optimal efficiency level due to suboptimal resource management (Riani & Maulani, 2021); (Hendrawan & Suryanto, 2019). Through this approach, it can be determined whether Himbara banks have managed government resources and funds efficiently in generating outputs such as profits, interest income, and productive financing. Several studies also confirm that DEA is capable of providing specific recommendations for banks to improve efficiency through the optimisation of cost structures and productive assets (Kristianto & Hendrawan, 2019).

Various studies on banking efficiency in Indonesia have been conducted, both on commercial banks and state-owned banks. A number of previous studies (e.g., Mulyaningsih & Daly, 2020; Widyastuti et al., 2021; Rachmawati & Firmansyah, 2022) generally use the *Data Envelopment Analysis (DEA) or Stochastic Frontier Analysis (SFA)* methods to measure the technical

efficiency and scale efficiency of banks. The results show that the efficiency levels of state-owned banks are relatively volatile.

However, most of these studies were conducted prior to the government fund placement policy and did not specifically examine the impact of fiscal policy in the form of government fund placement on the operational efficiency of state-owned banks. In other words, empirical studies on how liquidity stimulus from the government—in this case, the placement of Rp200 trillion in Himbara banks—affects the technical and intermediary efficiency of banks are still very limited.

In addition, most previous studies have focused only on measuring static efficiency using a single time period without comparing changes in efficiency before and after policy intervention. In fact, these fiscal policies have the potential to cause structural changes in the intermediation behaviour and productivity of banks. Few studies have linked banking efficiency to fiscal policy and the role of the government as a direct provider of liquidity to financial institutions. Abu-Alrop, J. (2025) conducted research related to the evaluation and forecasting of bank efficiency levels in Russia, followed by Maside-Sanfiz et al (2025) on market structure and technical efficiency of banks in the MENA region and Lao et al (2025) on operational efficiency and strategic competitiveness of banks in Cambodia.

Another limitation in the literature is the lack of analysis assessing efficiency variations among Himbara banks, even though the four banks have different business characteristics, cost structures, and financing orientations. BRI, for example, focuses on the micro sector, while Mandiri and BNI are more dominant in the corporate sector. Therefore, the impact of government funds is likely to be uneven across Himbara banks.

This study is the first to specifically analyse the impact of the government's fund placement policy (Rp200 trillion) on the efficiency of state-owned banks (Himbara) in Indonesia. By focusing on the post-fund placement period of 2024– 2025, this article provides new insights into the effectiveness of fiscal policy on the stability and efficiency of the national banking sector. This article exclusively examines Himbara banks (Mandiri, BNI, BRI, BTN), which have a strategic function as agents of development as well as commercial entities. This approach provides an empirical contribution to understanding how different business characteristics among Himbara banks (micro vs corporate) affect post-liquidity stimulus efficiency.

This study uses *output-oriented Data Envelopment Analysis* (DEA) with an intermediation model, where efficiency is measured based on the bank's ability to convert third-party funds and assets into credit and interest income. In addition to static efficiency measurement, this study can be expanded using *the Malmquist Productivity Index (MPI)* to analyse changes in efficiency between periods (*before– after policy)* — which is rarely used in the context of Indonesian state-owned banks. The second stage (second-stage analysis) with Tobit regression or panel data is used to test the determinants of efficiency (*e.g. NPL, CAR, BOPO, and LDR)* — this approach provides a more in-depth causal analysis than previous descriptive DEA studies.

This study integrates the theory of intermediation efficiency with the theory of *countercyclical* fiscal policy, demonstrating that fiscal policy can function as a balancing mechanism for the financial sector. Thus, this study extends the application of bank efficiency theory to the context of direct government fiscal intervention — an area that has been minimally explored in Indonesian banking literature. The empirical results are expected to strengthen the theory of the relationship between fiscal support and the intermediation efficiency of state-owned financial institutions.

The intermediation performance of state-owned banks (Himbara) showed a positive trend in 2025. Based on data published by Warta Ekonomi (2025), the total credit disbursed by the four Himbara banks reached Rp 3,714.35 trillion as of June 2025, or grew by 7.35% year-on-year. This growth indicates a recovery in financing activities following the government's policy of placing Rp 200 trillion in funds in the previous year. Meanwhile, the total Third Party Funds (DPK) collected by Himbara also increased to Rp 4,228.32 trillion, growing 10.56% yoy, reflecting increased public confidence in the national banking system (Warta Ekonomi, 2025).

The parallel growth between credit and DPK shows that government fund placement has the potential to strengthen the banking intermediation function, although it is not yet certain whether this increase is accompanied by efficiency in the use of financial inputs. Thus, an analysis of Himbara's efficiency is important to measure the extent to which this fiscal policy contributes to the productivity and operational effectiveness of state-owned financial institutions.

In terms of profitability, Himbara also showed solid financial performance after the placement of government funds. Based on the same report, the consolidated net profit ofof Himbara banks reached IDR 60.42 trillion, reflecting increased revenue efficiency amid macroeconomic fluctuations (Warta Ekonomi, 2025). In addition, liquidity indicators such as the Liquidity Coverage Ratio (LCR) and Net Stable Funding Ratio (NSFR) were at healthy levels, ranging from 129.80% to 187.04% and 110.37% to 143.02% respectively, well above the minimum limits set by regulators.

These conditions indicate that structurally, Himbara has strong funding capacity and liquidity resilience. However, high liquidity does not necessarily correlate with increased operational efficiency. Large liquidity can reflect idle funds if they are not optimally channelled into productive credit. Therefore, measuring technical efficiency using the Data Envelopment Analysis (DEA) method is relevant to assess the extent to which these funds are actually used to increase the productivity of banking inputs and outputs.

Based on this description, there is still a research gap that needs to be further explored, namely the absence of empirical analysis assessing the effect of government fund placement on the technical efficiency of Himbara banks in Indonesia.

2. RESEARCH METHODS

1. Type and Approach of Research

This study uses a quantitative approach with the non-parametric Data Envelopment Analysis (DEA) method. This approach was chosen because it is capable of measuring relative efficiency between decision-making units (DMUs) without requiring specific production function assumptions (Charnes, Cooper, & Rhodes, 1978). DEA enables researchers to evaluate the ability of Himbara banks to efficiently convert inputs (resources) into outputs (intermediation results). The analysis was conducted for the period 2024–2025, covering the conditions before and after the placement of Rp200 trillion in funds from the Ministry of Finance.

2. Research Object and Scope

The research object includes four state-owned banks (Himpunan Bank Milik Negara/Himbara), namely:

1. PT Bank Mandiri (Persero) Tbk
2. PT Bank Negara Indonesia (Persero) Tbk
3. PT Bank Rakyat Indonesia (Persero) Tbk
4. PT Bank Tabungan Negara (Persero) Tbk

These four banks were selected because they play a strategic role as the main distributors of government funds and agents for implementing fiscal policy, particularly in the Rp200 trillion fund placement programme.

3. Type and Source of Data

This study utilises secondary data obtained from:

- The annual reports of each bank (for the period 2024–2025)
- Indonesian Banking Statistics (SPI) reports from the OJK
- Consolidated financial reports of state-owned banks from the official website of the Ministry of Finance
- Macroeconomic data publications (GDP, inflation, BI rate) from Bank Indonesia and BPS.

4. Research Variables

The intermediation model is used because it reflects the main function of banks as financial institutions that convert funds into credit and income. The selection of variables refers to Hadad et al. (2011), Magisma et al. (2023), and Dini et al. (2023).

Type	Variable	Symbol	Data Source
Input 1	Third-Party Funds (DPK)	X1	Financial Statements Bank / OJK
Input 2	Operating Expenses	X2	Profit and Loss
Input 3	Total Assets	X3	Statement Bank Balance Sheet
Output 1	Total Credit Distributed	Y1	Financial Report Bank
Output 2	Interest Income & Non-Interest	Y2	Financial Report Bank

5. Data Analysis Method

1. Data Envelopment Analysis

There are basically two classic DEA models: the *Constant Return Scale (CRS)* model, also known as CCR (Charnes, Cooper & Rhodes, 1978) and *the Variable Return Scale (VRS) model, also known as BCC* (Banker, Charnes, & Cooper, 1984). The first model considers constant returns to scale, while the second model assumes variable returns to scale with no proportionality between inputs and outputs. In the use of DEA in health centre analysis, the assumption used is Variable Returns to Scale. DMUs, k = 1, …, n, are considered production units that use inputs r xik, I = 1, …,r, to produce outputs s yjk, J = 1, …, s. The BCC model described by (1) maximises the ratio between the linear combination of outputs and the linear combination of inputs, with the constraint that for each DMU the ratio is not greater than one. Thus, specifically for DMUs, ho is efficiency; xio and yjo are inputs and outputs, and vi and uij are calculated weights for inputs and outputs. Maximise the objective function:

$$\textbf{Max } h_o = \frac{\sum_{j=1}^{s} U_j Y_{jo}}{\sum_{i=1}^{r} V_j X_{jo}}$$

Dengan kendala

$$\frac{\sum_{j=1}^{s} U_j Y_{jk}}{\sum_{i=1}^{r} V_j X_{jk}} \leq 1, k = 1, \ldots\ldots,n$$

$$u_j, v_i - \geq 0 \quad V_{i,j}$$

As linear programming for each DMU, if we have n DMUs, n linear programming problems must be solved, with r + s decision variables. The model is only presented as a basis for all other DEA models. In addition to efficiency indices, the DEA model generates for each DMU: weight variables, benchmarks and targets for inefficient DMUs.

Data Envelopment Analysis (DEA) Stages

1. Collection of input and output data from the financial reports of each Himbara bank for the 2024–2025 period.
2. Normalisation of data so that all variables are in comparable units.
3. DEA processing using software such as DEAP 2.1 or MaxDEA.
4. Interpretation of efficiency scores: a value o f 1 means fully efficient, a value of < 1 means inefficient.
5. Scale Efficiency (SE) analysis to distinguish between pure technical efficiency and scale efficiency.
6. Analysis comparing the periods before and after the Rp200 trillion fund placement policy.6. Analysis and Testing Techniques

2. Tobit Regression Analysis

To analyse the factors that influence efficiency, the Tobit regression model is used. This model was first introduced by James Tobin (1958). Tobit regression (or censored regression model) is a regression model used when the dependent variable is limited (censored), meaning that some of the data is only known up to a certain limit, not its actual value. The Tobit regression model is as follows:

$$\mathbf{EFF\_it = \alpha + \beta 1\ CAR\_it + \beta 2\ NPL\_it + \beta 3\ BOPO\_it + \beta 4\ LDR\_it + \beta 5\ SIZE\_it + \varepsilon\_it}$$

The variables are described as follows:

EFF_it : DEA efficiency score of bank i in year t
CAR : capital adequacy ratio
NPL : non-performing loan ratio
BOPO : operating expense to operating income ratio
LDR : loan to deposit ratio
SIZE : Bank size (log total assets)

Observed value

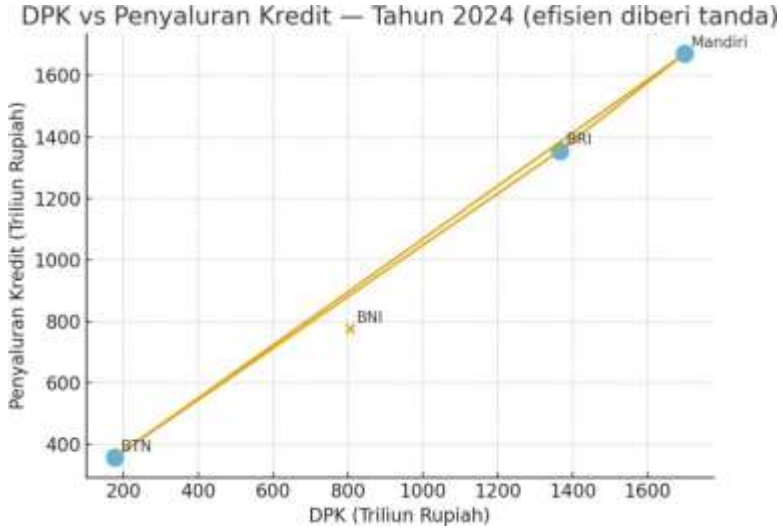
$$= \begin{cases} EFF_i^* & \text{jika } 0 < EFF_i^* < 1 \\ 0 & \text{jika } EFF_i^* \leq 0 \\ 1 & \text{jika } EFF_i^* \geq 1 \end{cases}$$

3. RESULT

Data Envelopment Analysis (DEA) Results

In 2024, the results of Data Envelopment Analysis (DEA) using an output- oriented BCC model show that three of the four Himbara banks—BRI, Mandiri, and BTN—are in an efficient position. These three banks formed an efficiency frontier that served as a benchmark for other banks in maximising output with a certain level of input. The frontier line formed between BTN–BRI–Mandiri illustrated the optimal capacity for converting DPK into credit distribution. Meanwhile, BNI was located below the frontier, indicating relative inefficiency. This can be seen in the graph below.

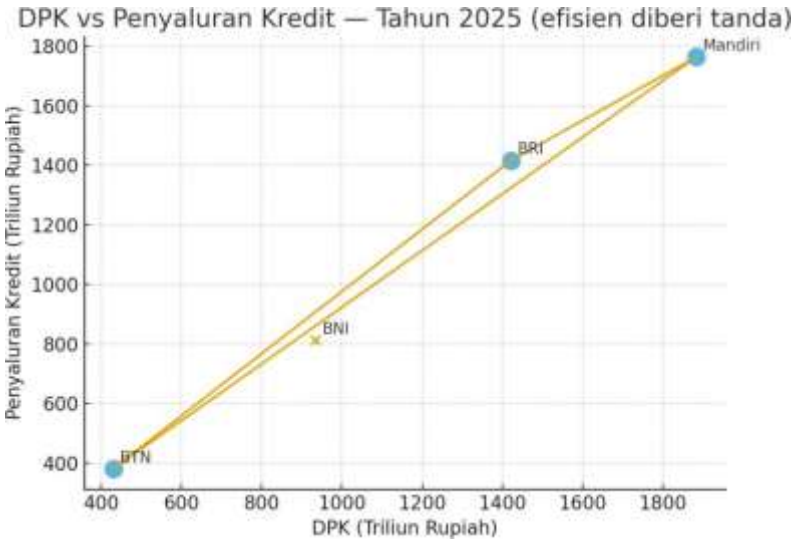
Figure 1. 2024 Frontier Graph



BNI, with total DPK of around 800 trillion rupiah, is only able to distribute credit below its optimal potential. Theoretically, BNI can still increase credit distribution without having to significantly increase input. Thus, BNI's efficiency value (phi), which is greater than one, indicates room for improvement in output productivity, especially in the components of credit distribution and interest income.

In 2025, the relative efficiency pattern shows consistency with the previous year. BRI, Mandiri, and BTN remain at full efficiency (phi = 1), indicating stable operational performance and the ability to maintain an optimal ratio between input and output. Meanwhile, BNI still shows a position below the efficiency frontier, which means that there has been no significant improvement in the performance of converting DPK into productive credit and interest income. This can be seen in the graph below.

Figure 2. 2025 Frontier Graph



The consistent efficient position of the three banks (BRI, Mandiri, BTN) indicates that they have succeeded in maintaining a balance between asset growth, operational efficiency, and credit expansion. Conversely, BNI's lag indicates structural or operational policy factors that have prevented optimal utilisation of funds despite an increase in liquidity.

Data Envelopment Analysis (DEA) with an output-oriented BCC model for the four Himbara banks, BNI, BRI, Mandiri, and BTN, shows significant variations in efficiency for the 2024–2025 period. This model assesses the extent to which each bank is able to convert inputs (DPK, operating expenses, and total assets) into outputs (credit distribution and interest income) proportionally. In this context, the efficiency value (phi) indicates a bank's relative capacity to achieve maximum output from its inputs.

Table 1. Efficiency Scores of Indonesian Himbara Banks

Bank Name	Efficiency Score	
	2024	**2025**
BNI	1.01536	1.042705
BRI	1	1
Mandiri	1	1
BTN	1	1

Source: Secondary data, processed, 2025

The DEA results show that BRI, Mandiri, and BTN are in an efficient position with a phi value of 1 in the two years of observation. This indicates that the three banks are able to optimally utilise their available resources to produce maximum output. Conversely, BNI is recorded as inefficient with a phi value > 1, which means that BNI can still increase its output (credit distribution and interest income) without the need to increase input. This inefficiency indicates that there is untapped productivity potential compared to the efficiency frontier formed by BRI, Mandiri, and BTN.

Tobit Regression Analysis Results

Table 2. Results of Tobit Model Estimation of Efficiency Scores

Variable	Coefficient	SE Bootstrap	t-statistic (approx.)	Direction of Influence
Intercept	1.780286	0.114	15.62	Positive

CAR	0.06 6803	0.030	2.23	Positive
NPL	- 0.06 6889	0.027	-2.48	Negative
BOPO	0.20 2468	0.085	2.38	Positive
LDR	0.25 6376	0.101	2.54	Positive
LogTo talAss e ts	- 0.03 5123	0.016	-2.19	Negative
Sigma (σ)	0.00 7452	—	—	—

Source: Secondary data, processed, 2025

Based on the results of the Tobit model estimation, the direction of the independent variables' influence on the efficiency score (Y) can be described as follows:

1. Capital Adequacy Ratio (CAR) has a positive effect on efficiency scores. This indicates that the higher a bank's capital adequacy, the greater its ability to operate efficiently. Strong capital allows banks to bear operational risks and optimise intermediation activities.
2. Non-Performing Loans (NPL) have a negative effect on efficiency. An increase in NPL reflects an increase in bad debt risk, which hinders the bank's intermediation function, thereby reducing efficiency. These findings are in line with previous studies such as Sufian (2011) and Batir et al. (2017), which confirm that asset quality plays an important role in efficiency performance.
3. BOPO (Operating Expenses to Operating Income) shows a positive effect, although theoretically it is expected to be negative. This may be due to the high cost structure of large banks, which is offset by their larger scale of operations and income, so this result needs to be re-examined in a larger sample.
4. The Loan to Deposit Ratio (LDR) has a positive effect on efficiency. This means that the greater the proportion of third-party funds disbursed as loans, the higher the bank's efficiency in utilising its liquidity resources.
5. Bank size (LogTotalAssets) has a negative effect on efficiency. This result indicates that an increase in asset size is not always followed by

Increased efficiency; large banks may face higher coordination and bureaucratic costs

DISCUSSION

Analysis of the Efficiency of Indonesian Himbara Banks

The results of Data Envelopment Analysis (DEA) provide significant empirical insights into the efficiency of Indonesian banks. The placement of government funds or additional sources of liquidity has been shown to increase total assets and improve banking intermediation capacity. However, not all banks are able to convert these additional funds into proportional productive output. Banks such as BRI, Mandiri, and BTN demonstrate high efficiency levels because they are able to channel additional liquidity to the real sector through credit expansion and increased interest income (Muarief & Miranti, 2022). Other studies also confirm that state-owned banks tend to be more efficient than private banks because they have larger asset scales and better liquidity risk management. Conversely, BNI shows signs of a decline in relative efficiency because the increase in funds has not been accompanied by a commensurate increase in output. This condition is in line with empirical findings that several large banks experience scale inefficiency, where an increase in inputs such as third-party funds and assets does not directly increase credit volume or operating income (Satrio & Wijaya, 2023). Thus, the DEA results confirm that an increase in liquidity does not necessarily improve efficiency, depending on the bank's management's ability to convert inputs into productive outputs.

Optimising credit distribution and operational cost efficiency remain key factors in improving national banking efficiency. Conceptually, these findings indicate that the placement of large amounts of government funds does not automatically improve the operational efficiency of all recipient banks. This is in line with findings that an increase in liquidity without improvements in risk management and optimisation of credit distribution can actually reduce the technical efficiency of banks. The effectiveness of fund placement policies is highly dependent on managerial capabilities, cost structure efficiency, and credit intermediation strategies in each bank (Soetanto & Ricky, 2012). In this context, BNI is an example of a bank that needs to strengthen its operational cost structure management, accelerate productive credit expansion, and increase asset utilisation so that additional liquidity can be converted into real output and higher interest income (Muarief & Miranti, 2022). The results of Data Envelopment Analysis (DEA) show that several efficient banks, such as BRI, Mandiri, and BTN, are able to optimally utilise government funds by increasing productive credit and profitability, while inefficient banks face input overload problems, where additional funds are not followed by a proportional increase in output (Satrio & Wijaya, 2023). Thus, these DEA results have important policy implications: the Ministry of Finance needs to consider implementing a performance-based placement mechanism. This scheme allows for greater incentives to be given to banks that have proven to be efficient in managing public funds, so that government liquidity policies are not only short-term stimuli but also encourage increased efficiency and competitiveness in the national banking industry. on an ongoing basis.

Factors Affecting the Efficiency Score of Indonesian Himbara Banks

The results of the Tobit model estimation used in this study show that bank efficiency (DEA score) is influenced by several main variables, namely Capital Adequacy Ratio (CAR), Non-Performing Loan (NPL), BOPO, Loan to Deposit Ratio (LDR), and Bank Size (LogTotalAssets). The Tobit model was chosen because the dependent variable is a bounded variable with a value range between 0 and 1, so that the use of an ordinary linear regression model (OLS) could cause estimation bias (censored data bias).

In general, the test results show that CAR, BOPO, and LDR have a positive effect on bank efficiency, while NPL and bank size (Total Assets) have a negative effect on efficiency. These findings are consistent with financial intermediation theory and previous research highlighting the importance of capital structure, asset quality, and liquidity management in influencing banking efficiency performance.

A positive CAR coefficient indicates that the higher the capital adequacy, the greater the level of bank efficiency. Strong capital enables banks to better bear credit and operational risks, while increasing their ability to expand productive businesses. These results are in line with the findings of Anggraeni, D., & Citarayani, I. (2022), which show that CAR plays an important role in strengthening efficiency because it reflects the resilience of a bank's capital against potential losses. In the context of Indonesian banking, an increase in CAR also strengthens public and regulatory confidence in bank stability, thereby reducing the cost of funds and improving intermediation efficiency.

The negative coefficient on the NPL variable indicates that an increase in the non-performing loan ratio will reduce bank efficiency. Non-performing loans reflect weak risk assessment processes and credit management quality, which ultimately increase provisioning costs. These results are consistent with the study by Putri, R. N., & Yafiz, I. A. (2023), which found that an increase in NPL has a direct impact on a decline in technical banking efficiency. In the Indonesian context, NPL control is a strategic component in maintaining financial performance sustainability and operational efficiency.

The estimation results show that BOPO has a positive effect on efficiency scores, even though theoretically the expected relationship is negative. Conceptually, an increase in BOPO indicates a rise in operating costs relative to income, which should reduce efficiency. However, this positive direction can be explained by the phenomenon of scale efficiency, whereby banks with high operating costs actually have a larger scale of business and are able to optimise resources productively. Similar findings are also explained by Sakti, J. P., & Rachmawati, N. A. (2024), who state that large banks in Indonesia tend to have relatively high efficiency even though their BOPO ratio is also high, due to their ability to generate greater income from product diversification and service digitalisation.

A positive LDR coefficient indicates that the higher the proportion of third- party funds channelled into credit, the more efficient the bank is in performing its intermediary function. A high LDR reflects the optimisation of bank liquidity in generating interest income, thereby increasing the efficiency of asset utilisation. These results are in line with the findings of Hanif et al (2024), which show that effective liquidity management contributes to improved technical efficiency and profitability. However, banks still need to maintain a balance so that the LDR does not exceed the prudential threshold, which could increase liquidity risk.

Bank size, measured by the logarithm of total assets, shows a negative relationship with efficiency. These results indicate that an increase in size is not always followed by an increase in efficiency. Large banks often face diseconomies of scale due to organisational complexity, bureaucracy, and high coordination costs. These findings are consistent with the research by Putri,

R. N., & Yafiz, I. A. (2023), which states that large scale does not always result in higher efficiency, especially when asset growth is not balanced with managerial effectiveness. In the context of national banking, these results imply the need to strengthen good corporate governance and internal operational efficiency in large banks so that asset growth does not become a cost burden.

4. CONCLUSION

The results of the Data Envelopment Analysis (DEA) show that the injection of Rp200 trillion was only effective in increasing efficiency in banks that were already productive (BRI, Mandiri, BTN), while BNI still showed inefficiency because it was unable to convert the additional funds into proportional credit growth and interest income. This indicates the need to improve credit distribution strategies, operational cost management, and risk management so that public fund injections can truly have an optimal impact on efficiency and economic growth.

The Tobit Regression results indicate that bank efficiency in Indonesia tends to increase when banks have strong capital adequacy, good asset quality, and optimal intermediation capabilities. Conversely, an increase in NPLs and excessive asset expansion can be factors that reduce efficiency. Thus, future banking policy strategies need to focus on improving asset quality, cost efficiency, and implementing effective governance across all scales of banks.

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