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Original Article

Determinants of Efficiency of Islamic Commercial Banks in Indonesia

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Abstract

Islamic banking plays a crucial role in Indonesia's economy and faces risks that impact the sustainability of bank performance as a mediator in the financial system. For the sake of the bank's sustainability, it is necessary to measure efficiency and control risk, measuring the level of efficiency is better than measuring profitability because it is measured by various outputs and inputs, so it does not only focus on company profits. This research aims to investigate the influence of NPF, FDR, BOPO, and CAR on the efficiency of Islamic commercial banks. The research employs quantitative techniques and is based on data obtained from the annual reports of Islamic commercial banks released by the OJK from 2019 to 2023. With the first test using DEAP (VRS) to assess the efficiency level of Islamic commercial banks, then measuring between variables using Eviews 12 (tobit regression). The sampling technique with purposive sampling (sample of 11 banks from 13 population banks). The results indicate that FDR positively impacts the efficiency of Islamic commercial banks, while CAR has a negative impact. However, NPF and BOPO calculations do not influence the efficiency of Islamic commercial banks. In summary, FDR positively affects efficiency, while CAR negatively impacts it in Islamic commercial banks, with NPF and BOPO having no effect.

Keywords: Efficiency, DEA, Intermediation, Islamic Banking.

1. Introduction

The role of the banking industry is vital in promoting economic growth as it helps connect individuals with excess funds, like savers and investors, with those in need of funds, such as borrowers and businesses (Ramli & Desmiza, 2022; Rodoni et al., 2020). Through this intermediary function, banks facilitate the smooth operation of economic activities (Komarudin & Saepudin, 2021; Marni, 2022)

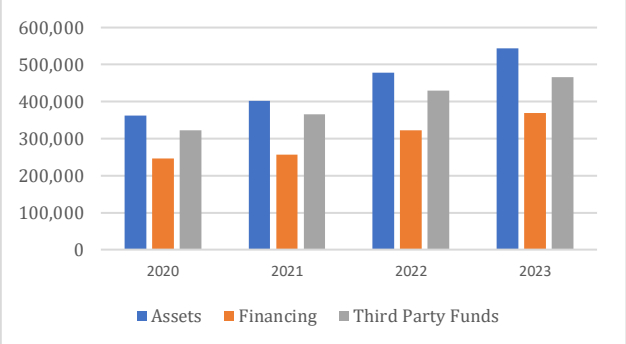

Figure 1. Performance of Islamic Commercial Banks (Billion IDR)
Source: https://www.ojk.go.ig

Information disseminated by the Financial Services Authority (refers to OJK) indicates a notable increase in the assets, financing, and third-party funds (refers to DPK) of Islamic Commercial Banks from the year 2020 through the year 2023. However, there are risks in bank performance that can affect efficiency, such as the percentage of FDR, which decreased dramatically in 2020 by 76.36% to 2021 by 70.12%. This decline indicates a diminution in the bank's capacity to provide financing, particularly in light of the OJK data consistently demonstrating an upward trend. Therefore, will the increasing trend that results in an increase and decrease in the ratio affect the efficiency of Islamic commercial banks?

On May 15, 2023 (Sabardin, 2023) published news about the problems experienced by Bank Muamalat from 2017-2022 which were less efficient in their performance, including high non-performing financing (NPF) and inadequate capital adequacy, which affected liquidity. However, the fact is that Bank Muamalat has implemented a strategy related to this problem.

With the existing gap in phenomena, banks need special attention in terms of the health of bank performance as an intermediary institution. The assessment of Islamic banks' performance employs various indicators, including profitability ratios (A. P. N. Sari & Maharani, 2022). However, it should be noted that profitability ratios have limitations in fully reflecting operational efficiency. Consequently, a more comprehensive approach to efficiency measurement is necessary to comprehensively assess the performance of Islamic banks. This efficiency measure is particularly advantageous when compared to the measurement of profitability ratios (Chowdhury et al., 2023). The efficiency score is calculated using the Data Envelopment Analysis (DEA) technique, which involves a range of inputs and outputs. Efficiency signifies the extent to which a bank can leverage its resources to generate optimal output (intermediary institution).

That said, the author will deliberate on various risks that have the potential to compromise bank efficiency, including credit risk, liquidity risk, and operational risk. These risks are represented through financial ratios including NPF, FDR, BOPO, and CAR. Based on the existing literature and the identified research gaps, this study endeavors to determine whether the aforementioned ratios exert an influence on the efficiency levels of Islamic commercial banks. What distinguishes this study from previous studies is the measurement of efficiency using DEA measurements that can be measured with multiple inputs and outputs, and considering control variables, namely ROA, ROE, age, and bank branches in order to maintain the influence of independent variables.

2. Literature Review

2.1. Intermediation Theory

Referring to Abdul et al. (2021), there exist three primary banking theories, specifically the credit creation theory, the financial reserve theory, and the intermediation theory. Of these, the theory most frequently referenced is the intermediation theory. This theory elucidates the function of banks as intermediaries between entities possessing surplus funds and those that require financing (Simatupang, 2019). In other words, this theory emphasizes the role of banks as mediators between those who have savings and those who need credit while still minimizing risk so that the output is always optimal. Islamic banks must ensure equilibrium in handling financing, expenses, and capital adequacy through the management of NPF, FDR, BOPO, CAR ratios in order to ensure smooth operations.

2.2. Efficiency of Islamic Banks

This efficiency for banking institutions is the bank's ability to manage inputs to produce banking services (operating costs) to produce outputs (operating income) effectively and efficiently (Anggraeni et al., 2020). Efficiency is essential for the prosperity of a business as it significantly influences the company's sustainability in the long run. Meanwhile, the efficiency of banks that act as intermediary institutions is that banks channel funds from parties who have surplus funds (depositors) and parties who need funds (debtors) through financing schemes based on sharia principles. Efficiency in this role reflects how well the bank collects public funds, distributes funds in the form of financing and manages operational costs and financial risks in order to continue to generate optimal profits. Study by Setyono et al. (2021) using the DEA method of CRS and VRS assumptions concluded that the decline in efficiency during the pandemic banks must meet their respective targets, especially in terms of financing and reducing cost efficiency. Another study conducted by Riani & Maulani (2020) resulted in the average achievement of technical efficiency of all Islamic banks decreasing from 2014 to 2018 due to the lack of optimization in the allocation of deposits and capital.

2.3. The Effect of NPF (Non-Performing Financing) on the Efficiency of Islamic Commercial Banks

Islamic banking focuses primarily on loan activities, which inevitably involves the risk of credit default. Credit risk occurs when a borrower does not meet their financial obligations, leading to potential financial losses. One method to evaluate this risk is by analyzing the Non-Performing Financing (NPF) ratio. NPF refers to financing that is categorized as substandard, doubtful, or loss (Khairunisa & Musrifah, 2020). The calculation of NPF could impact the performance of Islamic commercial banks by reducing their efficiency when dealing with non-performing financing. In the intermediary function, banks must be able to channel funds efficiently with controlled risks. The high NPF shows the ineffectiveness of the bank in channeling financing, which leads to inefficiency because bad funds cannot be used for productive activities. Based on study of Anggraeni et al. (2020), the NPF has a considerable adverse impact on the level of efficiency, it means that the more bad debts the more inefficient an Islamic bank is. Likewise, research of Fitroh et al. (2020) and Ranaswijaya et al. (2019) stated that NPF has a negative and significant effect on the efficiency of Islamic banks, it means that the more bad debts the more inefficient an Islamic bank is. In contrast with Komarudin & Saepudin (2021) that the impact of non-performing finance on the performance of Islamic commercial banks is both positive and not statistically significant, it means that there are some banks that have high efficiency when Credit Risk is high, and there are also some banks that have high efficiency when credit risk is low.

H1: NPF has a negative effect on the efficiency of Islamic Commercial Banks

2.4. The Effect of FDR (Financing to Deposit Ratio) on the Efficiency of Islamic Commercial Banks

FDR is used to gauge the extent to which a bank can cover withdrawals from depositors by using external financing for liquidity (Fajriah & Jumady, 2021). The FDR indicates the level of external funds used for financing activities. A higher FDR suggests better efficiency in the bank's role as an intermediary. An optimal FDR indicates that the bank has succeeded in channeling funds well, thereby increasing efficiency. However, FDR that is too high (>100%) can increase liquidity risk because reserve funds become minimal. According to research (Rodoni et al., 2020) FDR in measuring liquidity risk has no effect on the efficiency of Islamic Commercial Banks. The results of other studies produce inversely proportional findings that

research of Riani & Maulani (2020) and Wulandari et al. (2020) generate a favorable and notable impact of FDR on the effectiveness of Islamic banks operating in Indonesia.
H2: FDR has a positive effect on the efficiency of Islamic Commercial Banks

2.5. The Effect of BOPO (Operating Expenses to Operating Income) on the Efficiency of Islamic Commercial Banks

Another risk that may arise is operational risk. In Islamic banking, operational risk can be calculated based on the BOPO ratio. In the banking sector, including Islamic banking, the BOPO ratio is a key metric utilized to assess operational efficiency (Atiqah et al., 2023). The BOPO metric assesses the ratio of a bank's operational costs to its income. A high BOPO suggests that the bank is expending more resources on operational activities than it is generating in revenue, thereby indicating potential inefficiencies within its processes (Gayatri et al., 2019; Ramadhona & Hesi, 2023). Therefore, a high BOPO indicates a lot of unproductive operating costs, which can reduce intermediation efficiency because the bank incurs too many costs compared to the income generated. As per findings from Tamin et al. (2022), BOPO has been discovered to have a detrimental impact on profits, suggesting that higher operational expenses could potentially lower the efficiency of a bank. Likewise, Fauzi & Daud (2020) found that BOPO has a negative and significant effect on the level of efficiency of Islamic banking.
H3: BOPO has a negative effect on the efficiency of Islamic Commercial Banks

2.6. The Effect of CAR (Capital Adequacy Ratio) on the Efficiency of Islamic Commercial Banks

In addition, efficiency is also related to the capital owned so that it can cover all possible risks that occur. This relates to CAR or Capital Adequacy Ratio, CAR serves as a capital buffer that shows how prepared the bank is to face risks arising from its operational activities, including credit, liquidity, operational, and market risks (Rahman et al., 2022; Riani & Maulani, 2020). An efficient bank will be better able to manage these various risks well, which allows them to maintain CAR at a healthy level without having to increase capital excessively. Nurcahyani et al. (2020) and Riani & Maulani (2020) find that CAR negatively affects Islamic bank efficiency, indicating that while CAR is crucial for financial security, poor management can result in operational inefficiencies.
H4: CAR has a negative effect on the efficiency of Islamic Commercial Banks

2.7. The Effect of ROA (Return on Assets) on the Efficiency of Islamic Commercial Banks

ROA is a metric that evaluates the efficiency of a bank in generating profits from its total assets (Riani & Maulani, 2020). In the context of Islamic commercial banks, ROA serves to measure the bank's operational efficiency in generating net income using all assets owned, without considering external financing sources or capital structure directly (Muttaqin et al., 2020).

2.8. The Effect of ROE (Return on Equity) on the Efficiency of Islamic Commercial Banks

ROE is a metric employed in finance to assess the efficiency of a bank in producing profits from the funds provided by shareholders (Andriani et al., 2023). ROE, within the realm of Islamic commercial banks, is utilized to evaluate how effectively banks are able to generate profits from their current capital while considering the sharia principles that guide their operations (Diana et al., 2021; M. Yusuf Amar et al., 2023).

2.9. The Effect of Bank Age on the Efficiency of Islamic Commercial Banks

Bank age refers to how long the bank has been operating since it was established or obtained an operational license from an authorized authority, such as Bank Indonesia or the Financial Services Authority (OJK). The age of the bank is considered as a control variable in order to ensure that the impact of efficiency on the independent variable is consistent. When examining data from Islamic Commercial Banks across Indonesia, the variability in bank age needs to be taken into account. Bank efficiency in this study is taken in a broad scope with different capacities, abilities, and ages of banks.

2.10. The Effect of Bank Branches on the Efficiency of Islamic Commercial Banks

A bank branch refers to a physical office or operational unit of a bank located outside the head office, which provides banking services to customers. Bank branches function to provide various financial products and services, such as savings, financing, money transfers, cash withdrawals, deposits, and other services, depending on the policies and needs of the bank. In accordance with this research, the bank used is large in scope, so it is necessary to describe the number of branches owned so that the measurement can be fairly assessed according to the capacity of each Islamic bank.

2.11. Framework of Thinking Between Variables

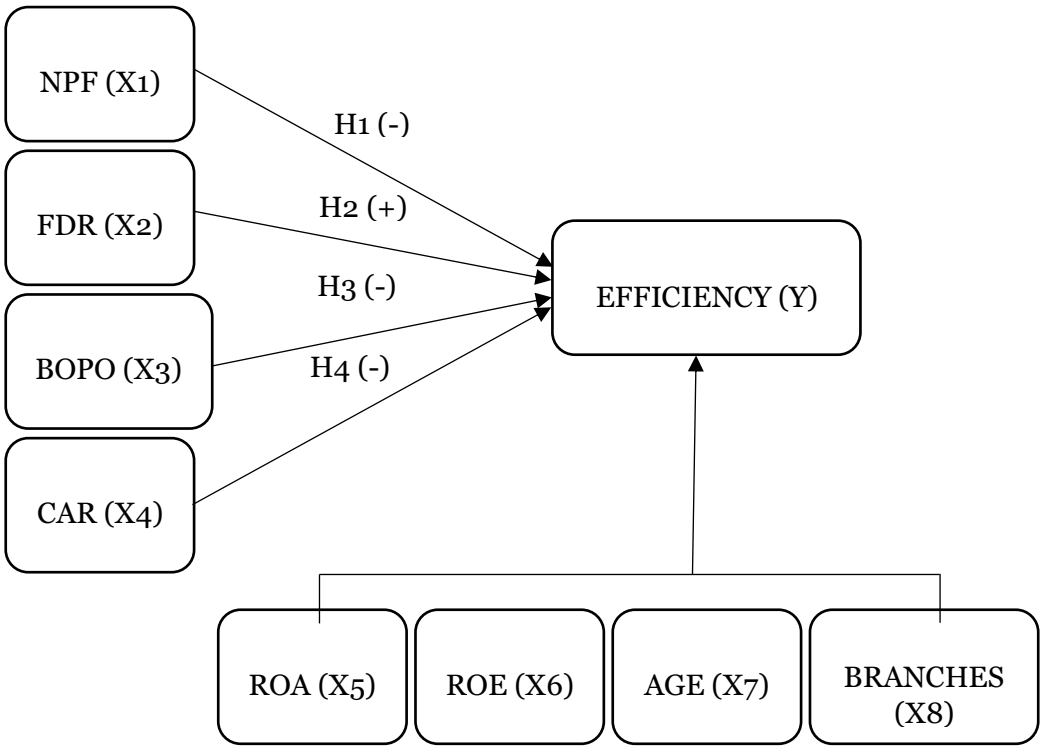

Figure 2. Research Framework
Source: Author's Calculations

3. Methods

This study adopts a quantitative methodology, utilizing data derived from the annual reports of Islamic commercial banks for the period from 2019 to 2023, as published by the Financial Services Authority (OJK). The primary objective of this investigation is to assess the performance of Islamic banks. In order to achieve this, various analytical methods may be

employed, including ratio analysis, regression analysis, and the application of a frontier approach to evaluate their efficiency (Fahmi & Yuliana, 2019). There are two types of frontier approaches: parametric and nonparametric. The parametric approach includes Stochastic Frontier Approach (SFA) and Distribution Free Approach (DFA), while the nonparametric approach uses the Data Envelopment Analysis (DEA) method (Awaluddin et al., 2019; P. M. Sari et al., 2020).

This research will use a nonparametric approach, namely the DEA method in the form of the Variable Returns to Scale (VRS) assumption. The use of DEA measurement is used because it is able to measure multiple inputs and outputs in accordance with the indicators used in this study (Chowdhury et al., 2023). In addition, the assumption used is VRS because the data used are all Islamic Commercial Banks in Indonesia, meaning that these banks have varying sizes and operational capacities, a bank is deemed efficient if its results reach a value of 1, but if the value is below 1, the bank is considered to be less efficient (Abdullah et al., 2020). Therefore, this assumption was chosen, the results of allow banks to have different efficiencies based on their respective operational scales. The following independent and control variables were utilized:

Table 1. Indicators of Variables

No	Variable	Indicator
1.	Efficiency	Input: deposits, fixed assets, and labor expenses. Output: financing and operating income. (Chowdhury et al., 2023)
2.	NPF	$NPF = \frac{\text{Loan Non} - \text{Performing}}{\text{Total Financing}} \times 100\%$ (Angraeni et al., 2022; Suprianto et al., 2020)
3.	FDR	$FDR = \frac{\text{Financing}}{\text{Third Part Funds}} \times 100\%$ (Munandar, 2022)
4.	BOPO	$BOPO = \frac{\text{Operating Costs}}{\text{Operating Income}} \times 100\%$ (Tamin et al., 2022)
5.	CAR	$CAR = \frac{\text{Bank Capital}}{\text{Total ATMR}} \times 100\%$ (Rahman et al., 2022)
6.	ROA	$ROA = \frac{Net\ Profit\ Before\ Tax}{\text{Total Assets}} \times 100\%$ ROA (Ranaswijaya et al., 2019; Suprianto et al., 2020)
7.	ROE	ROE (Diana et al., 2021) $= \frac{Net\ Profit}{\text{Shareholder Equity}} \times 100\%$
8.	Bank Age	Bank Age = Current Year – Year of the Banks's Establishment (Indriyani & Yuliandhari, 2020)
9.	Bank Branch	Summation of the number of branches according to the current year selected by researchers (Chowdhury et al., 2023)

Source: Author's compilation, 2024

The study included 11 Islamic banks that were chosen based on specific criteria from a pool of 13 potential candidates. Purposive sampling was utilized as the method for selecting the research sample, ensuring that the selected banks met the required criteria for the study (Sugiyono, 2019). The criteria are that the bank is an Islamic commercial bank since 2019, the Islamic commercial bank must have been registered by the OJK, the Islamic commercial bank must have been operating from 2019 to 2023, in its financial statements there must be all the accounts needed the study. The process of data analysis is quite systematic and comprises two principal phases. Initially, we evaluate the performance of Islamic banks utilizing Data

Envelopment Analysis (DEA) software while accounting for Variable Return to Scale (VRS). Subsequently, more comprehensive examination employing a Tobit model regression is conducted to analyze the impact of various factors on their efficiency. For this segment of the analysis, we utilize Eviews 12 software. Below is the equation applied for the Tobit regression in this study:

$$Y^* = \beta_0 + \beta_1 NPF + \beta_2 FDR + \beta_3 BOPO + \beta_4 CAR + \beta_5 ROA + \beta_6 ROE + \beta_7 UB + \beta_8 CB + \epsilon$$

Information:
Y* : Observed variable (Efficiency)
β0 : Intercept or constant
βi : Coefficient for each independent variable xi (i= 1, 2, ..., 8)
xi : Independent variables that affect efficiency
Є : Error term which includes random error

4. Results and Discussion

4.1. Research Results

4.1.1. Islamic Commercial Banks Efficiency Analysis

The first test analyzed the efficiency of all the population of Islamic Commercial Banks in OJK for the period 2019-2023 using DEA.

Table 2. DEA Test Table of Islamic Commercial Banks Efficiency 2019-2023

Bank Name	Result (VRS)				
	2019	2020	2021	2022	2023
Bank Muamalat	0.85	0.82	0.62	0.67	0.95
Bank Aceh	1	1	1	1	1
Bank Mega Syariah	0.99	1	0.79	0.55	0.53
Bank Victoria Syariah	1	0.19	1	1	1
Bank Aladin Syariah	1	0.02	0.27	0.18	0.42
Bank Riau Kepri Syariah	1	1	1	1	0.95
Bank Panin Dubai Syariah	1	1	1	1	1
Bank BJB Syariah	1	1	1	1	1
Bank BCA Syariah	0.51	0.48	0.44	0.92	1
Bank BTPN Syariah	1	1	1	1	1
Bank KB Bukopin Syariah	0.48	0.46	0.31	0.37	0.47
Mean	**0.89**	**0.72**	**0.76**	**0.78**	**0.84**

Source: Author's calculations using DEAP software, 2024

4.1.2. Model Selection

Table 3. Chow Test Table

Effects Test	Statistic	df.	Prob.
Cross-section F	4.689272	(10,35)	0.0003
Cross-section Chi-squar	45.903351	10	0.0000

Source: Author's calculations using Eviews 12, 2024

According to the Chow test findings which yielded a probability value of 0.0000, it can be inferred that the Fixed Effects Model (FEM) is the most suitable choice for this panel data analysis. As stated in Basuki & Prawoto (2022) that the probability value< 0.05 the best model is the Fixed Effects Model (FEM).

Table 4. Hausman Test Table

Test Summary	Chi-Sq. Statistic	Chi-Sq. df.	Prob.
Cross-section random	9.281914	8	0.3191

Source: Author's calculations using Eviews 12, 2024

The Hausman test findings indicated a p-value of 0.3191, prompting the choice of the Random Effects Model (REM) for our examination of panel data. This decision was made due to the lack of significant evidence indicating the necessity of a fixed effects model (FEM) to account for individual differences. The REM model is more efficient in handling panel data when differences between individuals are random and do not have a strong relationship with the independent variables being analyzed.

Table 5. LM Test Table

	Cross-section	Time	Both
Breusch-Pagan	6.649520	0.891394	7.540914
	(0.0099)	(0.3451)	(0.0060)

Source: Author's calculations using Eviews 12, 2024

Referring on the Lagrange Multiplier (LM) test result with a p-value of 0.0099, we decided to choose the Random Effects Model (REM). The decision to choose these particular subjects was made because it was discovered that there are notable variations among people represented in the information.

4.1.3. Classical Assumption Test

After conducting tests on various models, the research concluded that the Random Effect Model (REM) is the most suitable option for evaluating this study. Following this decision, it is imperative to verify the traditional assumptions that are required, specifically the normality and multicollinearity tests (Septianingsih, 2022).

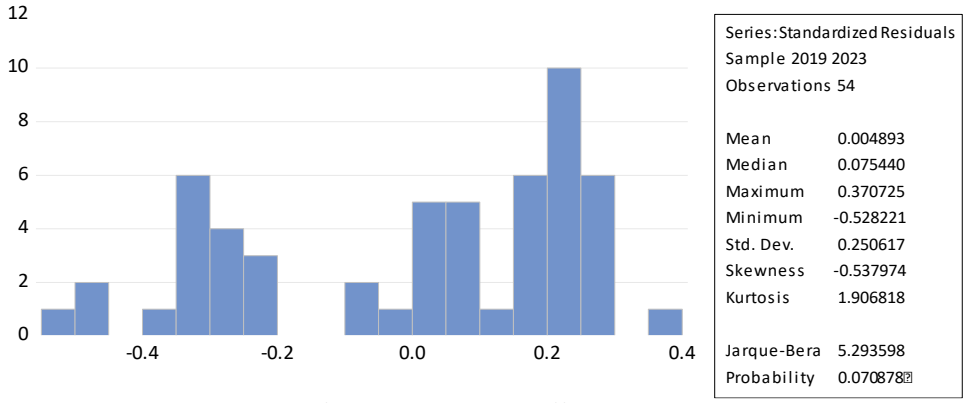

Figure 3. Normality Test

Source: Author's calculations using Eviews 12, 2024

After conducting a normality test, it was determined that the residual data from the regression model for Islamic Commercial Banks from 2019 to 2023 does not exhibit statistically significant deviations from a normal distribution, as indicated by a p-value of 0.07878 which is greater than the significance level of 0.05. In other words, the assumption of normality is met, which allows us to continue further analysis using the regression model without worrying about violating the basic assumption of normality.

Table 6. Multicollinearity Test Table

	NPF	FDR	BOPO	CAR
NPF	1	-0.12	0.03	-0.29
FDR	-0.117	1	-0.03	0.47
BOPO	0.028	0.030	1	0.23
CAR	0.290	0.470	0.233	1

Source: Author's calculations using Eviews 12, 2024

Based on the multicollinearity test results that show VIF values less than 0.85 for all independent variables, we can conclude that there is no significant multicollinearity problem in the 2019-2023 Islamic Commercial Banks panel data regression model. This suggests that the relationship between the variables in the model remains consistent, regardless of their individual impact on each other, making the coefficients in the regression model reliable for further analysis. Thus, the model is ready to be used without the need to make corrections or adjustments related to multicollinearity.

4.1.4. Tobit Regression (Censored Regression)

Table 7. Tobit Regression Table

Variable	Coefficient	Prob.
C	1.015680	0.0000
NPF	-3.899267	0.1486
FDR	9.63E-05	0.0350
BOPO	-0.081996	0.2086
CAR	-0.253795	0.0014
ROA	1.217188	0.0103
ROE	-0.022518	0.9601
Age	0.001889	0.2926
Branches	-0.000142	0.7608

Source: Author's calculations using Eviews 12, 2024

4.2. Discussion

The objective of this study is to assess how well Islamic banks in Indonesia have been doing in the last five years through the use of Data Envelopment Analysis (DEA). Furthermore, it will investigate how financial indicators like Non-Performing Financing (NPF), Financing to Deposit Ratio (FDR), Operating Expenses to Operating Income (BOPO), and Capital Adequacy Ratio (CAR) have influenced the efficiency of banks. In order to enhance the analysis, factors like Return on Assets (ROA), Return on Equity (ROE), age of the bank, and the number of branches will also be taken into consideration. Table 2 presents the findings from the evaluation of bank efficiency using the Data Envelopment Analysis (DEA) method. The results indicate that the banks analyzed are operating below optimal efficiency levels. Over the course of five years, the average efficiency values consistently fall short of reaching 100% or 1. Only 4 banks were recorded as efficient for 5 consecutive years according to DEA results, namely Bank Aceh, Bank Panin Dubai Syariah, Bank BJB Syariah, and Bank BTPN. In addition, there is BCA bank which shows very good results in terms of efficiency, because this bank has increased until in 2023 it can reach a value of 1.00. This shows that BCA has been able to improved their resource management in a highly efficient manner over the past five years.

Meanwhile, Bank Muamalat showed a significant decrease in efficiency during the period 2019 to 2022, with a decreasing efficiency value, reaching 0.67 in 2022. This value indicates that in that period, Bank Muamalat has not been able to manage resources (such as

assets and) optimally, resulting in lower output compared to other more efficient banks. However, in 2023 Bank Muamalat managed to show a significant improvement by achieving an efficiency of 0.95, which is close to the value of 1. This increase indicates a significant improvement in the bank's operations. Although the resulting value of Riau Kepri Syariah bank is not consistent, from 2019-2022 it has a value of 1.00 (efficient) but in 2023 the value is 0.95. This indicates that Riau Kepri Syariah bank has decreased even though it is not significant, meaning that there are some challenges or changes in operations that need to be overcome.

In contrast to Bank Victoria Syariah from 2021 to 2023 which managed to return to an efficiency position of 1.00, this indicates that the bank has returned to an efficient level after experiencing a drastic decline in 2020. This increase in efficiency may indicate that they managed to fix internal issues and manage their resources more effectively after 2020. In addition to those described, bank Mega Syariah, bank Aladin Syariah, and bank KB Bukopin Syariah experienced a decline until 2023, meaning that these banks are inefficient due to poor management of all operations or resources. Furthermore, the information provided in Table 2 is used to evaluate how each factor affects the outcome of the main variable. The purpose is to gauge the impact of each factor on the results of the main variable. This study recognizes various methodological constraints despite the results shown. First, the use of secondary data restricts the analysis to observable financial indicators, without capturing managerial or operational nuances that may affect efficiency. Second, the sample was limited to 11 Islamic commercial banks due to data availability, which may affect the generalizability of the results. Lastly, the model did not account for external macroeconomic factors, which have the ability to impact the bank's performance and efficiency.

4.2.1. NPF has a negative effect on the efficiency of Islamic Commercial Banks

The prob value of 0.1279 obtained from Table 7 tobit regression results indicates that the coefficient value of -4.040020 is more than 0.05. Therefore, H1 is rejected as there is no significant effect of NPF on the efficiency of Islamic commercial banks according to the results. It is assumed that even though NPF shows non-performing financing, effective management by the bank can minimize its impact on the operational efficiency of Islamic banks. Therefore, internal regulatory oversight related to credit risk management should be strengthened to prevent potential declines in efficiency in the future, and bank management should remain focused on improving the quality of financing. In accordance with one of the banks, namely Bank Aladin Syariah, which has an NPF value from 2019 to 2023 of 0.00%, which value is said to be healthy because the maximum value of NPF for a bank to be said to be healthy is (Komarudin & Saepudin, 2021) that NPF has no influence on the efficiency of Islamic commercial banks.

4.2.2. FDR has a positive effect on the efficiency of Islamic Commercial Banks

Based on Table 7, the tobit regression results obtained a prob value. 0.0323, with a coefficient value of 9.68E-05 or 0.0000968. This means that with the results of a more prob value small than 0.05, H2 is accepted that FDR has a significant positive effect on the efficiency of Islamic Commercial Banks for the 2019-2023 period. The result of the coefficient is 9.68E-05 or 0.0000968, meaning that if FDR increases by 1% then efficiency will also increase by 0.0000968. The assumption is that a bank that has a high FDR value means that the bank has the ability to channel funds to customers, which will increase the bank's income and efficiency, in other words, the bank has fulfilled its role as an intermediary institution. Regulatory bodies

should encourage policies that support healthy financing growth while maintaining prudent liquidity standards. A well-managed FDR reflects an effective intermediation function, which is critical to achieving economic development through Islamic banking. Bank management should focus on strengthening financing strategies by ensuring that third-party funds are efficiently distributed to productive sectors. Maintaining a high but sustainable FDR level can significantly improve operational efficiency and profitability. In accordance with two previous studies, namely (Harjanti & Farhan, 2021; Wulandari et al., 2020) that high FDR means that it will generate high profits as well, so that it will increase the efficiency of bank.

4.2.3. BOPO has a positive effect on the efficiency of Islamic Commercial Banks

According to the findings of the tobit regression in Table 7, the probability value obtained is 0.2025, indicating that it is greater than 0.05. The coefficient value is -4.082469. Thus, it can be concluded that H3 is refuted as the data suggests that BOPO does not impact the performance of Islamic commercial banks. Hence, internal regulatory oversight concerning operational cost efficiency should be reinforced to maintain efficiency levels, and bank management should continue implementing improvements in operational efficiency, even if the impact is not yet significant in the short term. This result is supported by the data that has been obtained that the value of BOPO has a value of BOPO said to be healthy value below 94%, but in 2019 to 2023 Bank Muamalat always has a BOPO value above 96% while maintaining its efficiency level (value 1) until 2023. This result is in line with research of Fauzi & Daud (2020) that BOPO has no effect on the efficiency of Islamic banking.

4.2.4. CAR has a negative effect on the efficiency of Islamic Commercial Banks

According to the findings in Table 7, the tobit regression analysis revealed a prob value of 0.0012, along with a coefficient of -0.255300. This indicates that since the prob value is less than 0.05, it can be concluded that H4 is supported, showing that CAR has a notable adverse impact on the effectiveness of Islamic Commercial Banks from 2019 to 2023. The coefficient of -0.255300 suggests that for every 1% increase in CAR, efficiency will decrease by 0.255300. The assumption is that when CAR is high it can indicate that banks are more focused on fulfilling regulations than on financing growth. This can result in the distribution of funds that are not optimal, so that efficiency in the intermediation function is reduced. Regulatory authorities such as the Financial Services Authority (OJK) should consider reviewing minimum capital requirements to ensure they do not excessively constrain banks' operational flexibility and efficiency. Islamic banks must adopt strategies that optimize capital utilization. Rather than maintaining high levels of idle capital, banks should channel available resources into productive financing activities that enhance both profitability and operational efficiency. In line with research by Dewi (2023) that CAR is still found to be higher than BI regulations, so that an increased or high CAR value will result in banks having low efficiency. In addition, the same results were also presented by Nurcahyani et al. (2020) and Wulandari et al. (2020) regarding this CAR which has a significant negative effect on bank efficiency.

5. Conclusion

This study provides various findings regarding the effectiveness of Islamic Commercial Banks from 2019 to 2023. Only Bank Aceh, Bank Panin Dubai Syariah, Bank BJB Syariah, and Bank BTPN Syariah were able to sustain their efficiency level at 1.00 over a period of five years. Next, the following are the results of the independent variables on the efficiency of Islamic

commercial banks, where efficiency is more influenced by lending strategy than credit risk or operating costs. The impact of FDR on the efficiency of Islamic commercial banks is noticeable, unlike NPF and BOPO which do not show any significant influence. This means that Islamic banks that successfully distribute more financing (with high FDR) tend to be more efficient, despite credit risk and operational risk. Whereas CAR which has a significant negative effect shows that too much capital that is not distributed can hamper the efficiency of Islamic banks, because these funds are not used productively. Although NPF and BOPO are not significant, they still have a negative impact on the efficiency of Islamic banks. If allowed to increase, it could be a threat to the bank's performance in the future. The insignificant impact of these variables warrants a more critical analysis to understand why their effects deviate from theoretical expectations. This may involve exploring contextual factors such as regulatory environments, risk management practices, or differences in bank size and operational scale, which may moderate or obscure their true influence on efficiency outcomes. It is possible that Islamic banks have implemented strong risk management systems, which help reduce the adverse effects of high NPF and BOPO on efficiency. As a result, even when facing higher levels of non-performing financing or operational costs, these banks may still be able to allocate and utilize their resources efficiently. This suggests that internal policies and practices can play a significant role in maintaining efficiency despite financial challenges.

Based on the results obtained and the conclusions drawn, it is essential for banks to maintain a high but manageable Financing to Deposit Ratio (FDR) to ensure liquidity remains stable. Furthermore, banks must adopt a more optimal strategy for capital utilization to prevent a high Capital Adequacy Ratio (CAR) from negatively impacting the efficiency of Islamic banks. Additionally, effective credit risk management continues to be crucial, even though the Non-Performing Financing (NPF) ratio has not yet demonstrated a significant effect on the operational efficiency of Islamic banks.

This means that banks that are able to channel funds optimally (high FDR) will be more efficient, but must still maintain a balance in credit risk management, operational risk, and capital utilization. Which is the role as an intermediary institution that has been fulfilled, namely being able to provide financing distribution by controlling various risks in order to achieve optimal income. The study is limited by the fact that the independent variables have not been shown to have any impact, even though they could still potentially impact the bank efficiency variable. Suggestions for further researchers to be able to add other independent variables that might add a greater influence on the dependent variable, such as considering market risk or asset dissertation variables and so on.

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