JOURNAL OF ACCOUNTING AND BUSINESS EDUCATION
P-ISSN 2528-7281 E-ISSN 2528-729X
Email: jabe.journal@um.ac.id
http://journal2.um.ac.id/index.php/jabe/

Profit Efficiency and The Influence of Financial Performance Measures on Cost Efficiency of Rural Banks in Indonesia

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DOI: *http://dx.doi.org/10.17977/jabe.v8i2.44927*

Abstract: Efficiency is a crucial aspect for banks to achieve healthy and sustainable financial performance. This study aims to analyze the profit and cost efficiency of Rural Banks (BPRs) in Indonesia from 2018 to 2022, as well as examine the influence of financial performance measures on the cost efficiency of these banks. The sample for this research consists of 497 BPRs located in West Java, East Java, and Bali. Stochastic frontier analysis is used to test efficiency, employing an intermediation approach for cost efficiency and a production approach for profit efficiency. Tobit regression is utilized to test the impact of financial performance measures, represented by the NPL ratio, LDR, CAR, and total assets. The results indicate that the BPRs in the three regions were inefficient in terms of cost efficiency from 2019 to 2022, as well as profit efficiency during the same period. The Tobit regression results reveal that financial performance measures such as NPL, CAR, and total assets have an influence on cost efficiency, while the LDR ratio does not affect cost efficiency.

Article History
Received:
9 September 2023

Revised:
9 October 2023

Accepted:
11 Novemver 2023

Keywords
Efficiency, Costs, Profit, Financial Performance Measures

Citations: Imansari, A.R, Saraswati, E., & Prihatiningtias, Y.W (2023). Profit Efficiency and The Influence of Financial Performance Measures on Cost Efficiency of Rural Banks in Indonesia, *8(2)*, 29-45

INTRODUCTION

Efficiency is a crucial aspect to consider in achieving a healthy and sustainable financial performance for banks. Efficiency plays a significant role in banking as it directly impacts the output levels by influencing investment levels and output prices, which are affected by banks' efforts to cover higher operating costs (Apriyana et al., 2015). Inefficient banks face challenges in terms of price competitiveness and the quality of their products and services. Moreover, low banking performance results in a lack of funds in the productive sector, hindering production and impending a country's economic growth, while also weakening the financial system through high loan interest rates (Apriyana et al., 2015).

Cost efficiency is closely associated with banking through an intermediation approach. According to the Law of the Republic of Indonesia (1998), the primary function of banking is to collect funds from the public in the form of savings and distribute them to the public in the form of credit or other financial instruments (intermediation function). Banks are expected to operate efficiently in fulfilling their role as intermediaries. When banks are less efficient in carrying out their intermediation

function, the costs imposed on borrowers increase, making it difficult to obtain banking credit and resulting in higher costs (Jasmina & Goeltom, 1995).

Profit efficiency in the banking sector is analyzed using a production function approach. In this context, banks function as service providers, distributing credit and generating interest income, which directly impacts their profitability. As profit-driven entities, banks aim to maximize their profits by optimizing the margin between total income and total costs (Kadang & Surayya, 2020). A higher level of profitability indicates better performance for a bank (Arbelo et al., 2021). Profit efficiency serves as a valuable tool for management and decision-makers in enhancing bank performance, providing internal and external insights related to profit efficiency,

Research findings consistently indicate that the banking sector in Indonesia still exhibits inefficiencies. One of the contributing factors to inefficiency is the presence of high overhead costs, resulting from a large workforce and underutilization of information technology (Khoiriyah, 2009). Another factor is the intense deposit interest rate competition, which escalates the cost of funds (Sutaryono, 2017). The increased cost of funds diminishes optimal profits, leading to inefficiencies.

Studies conducted by Nugraha et al. (2018) reveal a relatively slow improvement in efficiency among conventional commercial banks in Indonesia from 2010 to 2015. Fatmala et al. (2019) find that banking efficiency in Indonesia, both in pre-crisis and post-crisis periods (2001-2016), remains relatively inefficient. Apriyana et al. (2015) present research results indicating that compared to banks in four ASEAN countries (Thailand, Singapore, Malaysia, and the Philippines), Indonesian banks operate with lower levels of efficiency. Khoirunnisa and Aliludin (2021) find that banking in Indonesia, particularly Sharia banks, still lacks efficiency. Furthermore, Kadang and Surayya (2020) demonstrate that banks in Indonesia have been consistently inefficient from 2010-2019.

Bank Indonesia highlights the Operating Expenses to Operating Income (BOPO) ratio as a key indicator for assessing banking efficiency. According to the OJK Annual Report for 2021, the BOPO ratio in Indonesia has exhibited fluctuations over the past five years, with a tendency to increase and surpass 83%. These observations indicate inefficiencies within the banking sector. Similarly, the BOPO ratio for BPRs experienced fluctuations from 2017 to 2021, with an increase from 80.50% to 83.61% (OJK, 2021a, 2022). The rising BOPO ratio and its value exceeding 83% suggest inefficiency within BPR operations.

The significant number of BPRs reflects intense competition, which can pose challenges within society. The primary concern lies in the quality and health of these institutions. Based on data from the Indonesian Banking Statistics as of December 2022 (OJK, 2023), the number of BPRs has consistently decreased over the years, from 1,619 in 2017 to 1,441 in 2022 (OJK, 2021b, 2023). This decline indicates intense competition in the banking industry and highlights operational inefficiencies.

Several studies have explored the relationship between financial performance measures and bank efficiency (Wasiaturrahma et al., 2020, Rithamaya & Anggraeni, 2021, and Ikhwan & Riani, 2022). Wasiaturrahma et al. (2020) reveal that the Capital Adequacy Ratio (CAR) and location ratios influence efficiency. Rithamaya and Anggraeni (2021) demonstrate that the Loan-to-Deposit Ratio (LDR) and Non-Performing Loan (NPL) ratio affect bank efficiency, while the CAR, Size, Return on Equity (ROE), and Board of Commissioners (BOC) ratio do not. Ikhwan and Riani (2022) find that Return on Assets (ROA) and LDR/Financing to Deposit Ratio (FDR) significantly impact bank efficiency, while CAR and NPL/NPF ratios do not.

Efficiency measurement employs the parametric Stochastic Frontier Analysis (SFA) method. Coelli et al. (2005) highlight the advantages of the SFA method, including the incorporation of disturbance terms that account for external factors beyond control, easier treatment of environmental variables, statistical hypothesis testing, and outlier identification. Efficiency measurements using SFA can be conducted through two types of functions: the production function and the cost function (T. J. Coelli et al., 2005).

This research aims to analyze the profit and cost efficiency of BPRs in Indonesia from 2018 to 2022 and investigate the influence of financial performance measures on the cost efficiency of BPRs. Given the varying research findings on financial performance measures and efficiency, further investigation is necessary. This research differs from previous studies by utilizing BPR samples from the 2018-2022 period. The data analysis employs Stochastic Frontier Analysis with a cost approach, considering the intermediation function of banking, and analyzes profit efficiency using a production approach. Assessing bank efficiency is crucial as it reflects the company's performance and is a key

factor for banks to remain competitive and adhere to the going concern principle. The subsequent sections of this article will delve into the literature review, hypothesis development, and research methodology, and conclude with the results and discussion.

LITERATURE REVIEW AND HYPOTHESES

Stewardship Theory

The Stewardship Theory, developed by Donaldson and Davis (1991), describes a situation where managers act as stewards whose motives align with the goals of the principal (Davis et al., 1997). Stewards are driven by a sense of service and believe that their interests are aligned with those of the company and the principal. According to the Stewardship Theory, there is a strong relationship between managers and principals, where managers strive to protect and maximize the wealth of the principal through company performance and service maximization (Davis et al., 1997). In the context of banking, stewards refer to bank administrators and employees who prioritize the banking function of collecting and distributing funds to the public (Keuangan, 1998). With increasing competition in the banking industry, efficient banking services have become crucial for better performance (Nugraha et al., 2018).

Performance Measurement Concept

Performance measurement is vital for companies as it allows them to evaluate the effectiveness of their implemented strategies. It serves as a reflection of a company's ability to manage and allocate its resources (Arbelo et al., 2021). Bank financial performance encompasses various aspects, including finance, marketing, fund collection and distribution, technology, and human resources. Good performance leads to good work performance within the bank (Kusumo & Karim, 2014). While financial ratios are commonly used to measure performance, they have limitations as they primarily reflect the economic interests of managers and shareholders, neglecting the interests of employees, suppliers, and customers (Richard et al., 2009). Arbelo et al. (2021) suggest using efficiency indicators for performance measurement, emphasizing the importance of resource utilization, cost reduction, market exploitation, and competition in improving company performance (Newbert, 2008).

Efficiency Concept

Efficiency is a key performance measurement in companies, indicating their ability to achieve higher output using the same inputs or produce the same output while minimizing inputs (Tan, 2016). Efficiency can be evaluated from both a cost perspective and a profit perspective (Tan, 2016).

According to Coelli et al. (2005), cost efficiency measures a company's costs compared to those of banks with the best operating costs (best-practice costs) in producing the same output under identical conditions. It encompasses technical efficiency, which minimizes input usage to achieve a predetermined output, and allocate efficiency, which focuses on selecting inputs that generate output at the lowest cost.

Profit efficiency measures a company’s ability to generate profits compared to other companies producing the same output within the same period (T. J. Coelli et al., 2005). It considers not only cost reduction but also revenue maximization, employee performance, and tax effects (Worimegbe et al., 2019). Berger and Humphrey (1997) propose two approaches to profit efficiency: standard profit efficiency, which assesses efficiency based on a bank’s ability to generate maximum profits at a given output price level in a perfect competition market, and alternative profit efficiency, which considers input and output prices determined by the market.

Efficiency Measurement

Efficiency can be measured using two approaches: the traditional approach and the frontier approach (Berger & Humphrey, 1997). The traditional approach involves comparing financial ratios and utilizing the CAMELS method as a partial approach (Berger & Humphrey, 1997). On the other hand, the frontier approach combines input and output measures (Berger & Humphrey, 1997). Within the frontier approach, efficiency measurement methods can be categorized as parametric and non-parametric. Parametric methods include SFA, Distribution Free Analysis (DFA), and Thick Frontier Analysis (TFA). Non-parametric methods encompass Data Envelopment Analysis (DEA) and Free Disposal Hull (FDH).

The frontier approach outperforms traditional financial ratio analysis by utilizing programming or statistical techniques to eliminate the influence of variations in input and output prices, as well as other external market factors that impact a company's performance benchmark (Iqbal & Molyneux, 2005). By employing the frontier approach, a more accurate evaluation of company performance can be achieved. This method has found significant application in the banking sector, particularly in assessing the effects of mergers and acquisitions, capital regulations, deregulation of deposit interest rates, and overall financial institution performance (Mohamad et al., 2008). Overall, the frontier approach provides valuable comparative and benchmarking information to enhance company performance.

BPRs

BPRs represent a distinct type of banking institution in Indonesia. While engaging in conventional banking activities, BPRs do not provide payment traffic services (Keuangan, 1998). Compared to commercial banks, BPRs have a narrower scope of operations, as they are prohibited from accepting demand deposits, engaging in foreign exchange activities, and offering insurance services.

BPRs primarily function by collecting funds from the public through savings and deposits, which are then distributed as credit to individuals and groups in need. Notably, BPRs differ from commercial banks in terms of their relatively smaller capital and their focus on serving the Micro, Small, and Medium Enterprises (MSMEs) sector, as well as providing credit to farmers, fishermen, retired employees, and other segments of society that may have limited access to commercial banks (Wasiaturrahma et al., 2020). Consequently, the services offered by BPRs are more targeted and specialized compared to the comprehensive services provided by commercial banks.

The Impact of Financial Performance Measures on Cost Efficiency

Stewardship theory posits a strong relationship between managers and principals, where managers aim to protect and maximize the wealth of principals by enhancing company performance through service maximization (Davis et al., 1997). A successful steward who improves organizational performance generally satisfies various stakeholder groups, as their interests are well served by increasing organizational wealth (Davis et al., 1997). Financial performance can be measured through several factors, including credit risk, which is assessed through NPL and LDR, as well as capital adequacy and reserves measured by CAR (Ikhwan & Riani, 2022; Kadang et al., 2018; Kadang & Surayya, 2020; Rithamaya & Anggraeni, 2021; Wasiaturrahma et al., 2020).

Credit risk, as measured by NPL, plays a crucial role in banking as it affects bank efficiency (Rithamaya & Anggraeni, 2021). Credit risk can diminish a bank's ability to meet its obligations or can also impact liquidity risk (Kadang et al., 2018; Kadang & Surayya, 2020). Moreover, an increase in non-performing loans, indicated by a rise in NPLs, can escalate bank costs. This occurs because banks need to allocate provisions for credit losses and incur additional costs to manage them, resulting in cost inefficiencies (Mongid & Muazaroh, 2017). The studies by Kadang et al. (2018), Kadang & Surayya (2020), and Rithamaya & Anggraeni (2021) demonstrate the influence of NPLs on efficiency.

Liquidity, measured by LDR, determines a bank's ability to hold sufficient cash or other liquid assets to meet funding requirements and fulfill payment obligations (Kadang et al., 2018; Kadang & Surayya, 2020). Reduced bank liquidity can impact efficiency by hindering the bank's ability to function as an intermediation institution. Additionally, a higher LDR indicates that third-party funds exceed the value of the credit provided, leading to increased liability for interest expenses for the BPR and subsequently decreasing cost efficiency. The research conducted by Kadang et al. (2018), Kadang & Surayya (2020), Ikhwan & Riani (2022), and Rithamaya & Anggraeni (2021) supports the influence of LDR on efficiency.

According to POJK No. 5/POJK.03/2015 (2015), which outlines the minimum capital requirements and core capital fulfillment, BPRs are required to maintain a CAR of at least 8% of the Risk-Weighted Assets (RWA). Sufficient capital is necessary for BPRs to mitigate financial and operational risks. If a BPR has funding sources derived from greater capital, similar to liquidity risk, it can reduce the interest burden payable to third parties, leading to decreased costs and increased cost efficiency. Studies by Kadang et al. (2018), Kadang & Surayya (2020), and Wasiaturrahma et al. (2020) have shown the influence of CAR on efficiency. Effective management of capital utilization can also contribute to increased levels of liquidity and reduced credit risk.

Financial performance reflects a bank's achievements in its operations and describes its financial condition over a specific period. It encompasses aspects such as fund collection and distribution, often measured by indicators of capital adequacy, liquidity, and profitability. Improved financial performance corresponds to higher efficiency or a more appropriate alignment between inputs and outputs produced (Ikhwan & Riani, 2022; Kusumo & Karim, 2014; Rithamaya & Anggraeni, 2021).

H1: Financial performance measures have an impact on cost efficiency.

METHODS

The population for this study consisted of all BPRs whose financial reports were publicly available on the Financial Services Authority website from 2018 to 2022. The sample selection utilized purposive sampling with the following criteria: BPRs operating between 2018 and 2022, presenting complete financial reports (Financial Position Reports, Profit and Loss Reports, and Productive Asset Quality) on the Financial Services Authority website, BPRs with an average NPL exceeding 7%, and BPRs with average total assets exceeding IDR 10 billion.

The dependent variable in this research is cost efficiency, while the independent variables used are financial performance measures including NPL, LDR, and CAR ratios, with total assets as a control variable. Additionally, a profit efficiency analysis was conducted. Cost efficiency and profit efficiency were derived from SFA using input and output variables.

The input variables for cost efficiency and profit efficiency were determined based on previous research by Nguyen (2018), Rivai et al. (2022), and Rabbaniyah & Afandi (2019), which include third-party funds, operational expenses, and fixed assets. The output variable for cost efficiency was determined using an intermediation approach, with credit granted serving as the output. For profit efficiency, the output variable was determined using a production approach, with the bank's current profit (loss) as the output.

The data were obtained from the Conventional BPR Publication Reports, specifically the Financial Position Reports, Profit and Loss Reports, and BPR Productive Asset Quality Reports from December 2018 to 2022. Data processing was conducted using appropriate tools for analysis. The data analysis method employed in this research involved several stages, including descriptive tests, efficiency results tests, and hypothesis tests in the form of Tobit regression tests.

Analysis of Efficiency Results

Berger and Mester (1997) explain the three fundamental approaches to modeling efficiency in the banking sector: cost efficiency, standard profit efficiency, and alternative profit efficiency. Cost efficiency results are estimated to have a value greater than 1. The production frontier measurement yields an efficiency value between 0 and 1, while the cost frontier ranges from 1 to infinity (T. Coelli, 1996). The closer the value is to 1, the more efficient it is (T. Coelli, 1996; Hadad et al., 2003).

Cost Efficiency

Cost efficiency measures the level of a bank's costs in comparison to best practice cost efficiency, resulting in the same output. Cost efficiency can be represented by the following general equation:

$$\ln C = f(w, y)$$

Using the stochastic cost frontier equation, the cost equation can be expressed as follows:

$$\ln C = f(w, y) + \ln u + \ln v$$

Where:

$\ln C$	:	Total bank costs
w	:	Vector of input prices
y	:	Vector of output quantities
Ɛ	:	Error term, Ɛ = u + v
u	:	Controllable factors that reflect inefficiency and can cause a bank's costs to exceed the costs of best practice banks
v	:	Uncontrollable factors or noise terms

Profit Efficiency

Alternative profit efficiency is employed in this research as it measures the level of profit efficiency under imperfect competitive market conditions, where companies possess market power to determine output prices. According to Kusumo and Karim (2014), Astiyah and Husman (2006), Wahyuni and Pujiharto (2016), and Kadang et al. (2018), the banking sector in Indonesia cannot be classified as a perfectly competitive market and tends to operate within an imperfectly competitive market. The general equation for alternative profit efficiency is as follows:

$$\ln\pi = f(w, y) + \ln u + \ln v$$

Where:
- $\ln\pi$: Total profit of a bank
- w : Vector of input prices
- y : Vector of output quantities
- Ɛ : Error term, Ɛ = u + v
- u : Controllable factors that reflect inefficiency and can cause a bank's costs to exceed the costs of best practice banks
- v : Uncontrollable factors or noise terms

t-Test

The t-test is conducted to determine the significance of the independent variable regression model on the dependent variable. With a significance level of 5%, if the calculated t-value is less than 0.05, the null hypothesis (H_0) is rejected or the alternative hypothesis (Ha) is accepted, indicating a significant influence of the independent variable on the dependent variable. Additionally, to assess the impact of the independent variable on the dependent variable, the t-value can be compared with the critical value from the t-table. If the calculated t-value exceeds the critical t-value, it indicates that the independent variable has a significant individual influence on the dependent variable. The critical t-value is calculated using the formula t-table = t (α/2; nk-1), where α represents the significance level 0.05, k is the number of independent variables, and n is the sample size.

Hypothesis test

Tobit Regression Test

The Tobit regression test is employed to evaluate the factors influencing efficiency values (dependent variables) that are subject to limitations. Several bank financial ratio variables, including NPL, LDR, and CAR, are selected as independent variables, while total assets (bank size) serve as a control variable. The data used for Tobit regression analysis is panel data, and the Tobit research model is as follows:

$$\gamma t = \beta_0 + \beta_1 NPL + \beta_2 LDR + \beta_3 CAR + \beta_4 SIZE + \mu$$

Where:
- γ : Cost Efficiency
- NPLs : The ratio of risk capital to weighted assets
- LDR : Loan-to-Third Party Fund Ratio
- CAR : The ratio of risk capital to weighted assets
- SIZE : Total Assets

Chi-Square Test

The chi-square test is a non-parametric statistical test used to compare categorized data among two or more groups. Additionally, it can be utilized to test a single group on an interval/ratio scale. With a significance level of 5%, if the chi-square significance value (p-value) is less than 0.05, the null hypothesis (H_0) is rejected or the alternative hypothesis (Ha) is accepted, indicating a significant influence of the independent variable on the dependent variable.

RESULTS AND DISCUSSION

The numbers of BPRs from 2018 to 2022 were as follows: 1,597, 1,545, 1,506, 1,468, and as of December 2022, it was 1,441 (OJK, 2021b, 2023). For the purpose of sampling, complete financial reports were considered, including the Financial Position Report, Profit and Loss Report, and BPR Productive Asset Quality Report, covering the years 2018 to 2022. However, the data from 2018 could not be included in the data processing due to the unavailability of the Productive Assets Quality Report on the Financial Services Authority website. BPRs that met the criteria for inclusion were those in the regions of West Java, East Java, and Bali, with an average NPL of more than 7% and average total assets of more than IDR 10 billion.

Table 1. Number of samples

Information	Number of BPRs
Total Number of BPRs for the Regions of West Java, East Java, Bali	732
Data Unavailable/Incomplete	(128)
Total BPR Assets < IDR 10 Billion	(107)
Total Number of BPR Samples	**497**

Source: Processed data (2023)

Analysis Results

The analysis conducted in this research includes descriptive analysis, efficiency results, and hypothesis testing through Tobit regression analysis. Cost efficiency and profit efficiency were assessed using Frontier 4.1 software for SFA, while the effect of financial performance measures on cost efficiency was examined using Tobit regression analysis with STATA software.

Descriptive Analysis Results

Table 2. Descriptive Statistics Results

Variables	Obs	Mean	Std. Dev.	Min	Max
NPLs	1,988	10,305	49,944	0	1559
CARKPMM	1,988	49,010	94,412	0	2896
LDR	1,988	79,488	228,876	0	7551
Ln_size	1,988	17,771	0.987	16,145	22,705
COST	1,988	1,870	0.825	1	12,942
EFFPROFIT	1,988	0.210	0.157	0.000	0.607

Source: Processed data (2023)

Based on Table 2, the research involved 1,988 observations over a period of four years, with a sample size of 497 BPRs. The cost variable represents the outcome of SFA testing for cost efficiency, ranging from 1 to 12,942, with a standard deviation of 0.825. The effprofit variable reflects the result of SFA testing for profit efficiency, ranging from 0.000 to 0.607, with an average of 0.201 and a standard deviation of 0.157.

Table 3. Results of Average BPR Cost Efficiency and Profit Efficiency by Year

Year	Obs	Cost Efficiency		Profit Efficiency	
		Mean	Std. Dev.	Mean	Std. Dev.
2019	497	1,878	0.038	0.231	0.007
2020	497	1873	0.037	0.216	0.007
2021	497	1,868	0.037	0.203	0.007
2022	497	1,863	0.036	0.190	0.007
Average	**1,988**	**1,870**	**0.825**	**0.210**	**0.157**

Source: Processed data (2023)

Based on Table 3, the average cost efficiency from 2019 to 2022 is 1,870, with the highest average observed in 2019 (1,878) and the lowest in 2022 (1,863). On average, the cost efficiency values

show a decreasing trend from 2019 to 2022, indicating an improvement in efficiency as the average value approaches 1.

For profit efficiency, the average value from 2019 to 2022 is 0.210. The highest average profit efficiency is observed in 2019 (0.231), while the lowest is in 2022 (0.190). The average profit efficiency shows a decreasing trend from 2019 to 2022, indicating a decline in efficiency as the average value approaches 0.

Table 4. Results of Average BPR Cost Efficiency and Profit by Region

Region	Obs	Cost Efficiency		Profit Efficiency	
		Mean	Std. Dev.	Mean	Std. Dev.
West Java	724	1,886	0.038	0.206	0.006
East Java	772	1,913	0.027	0.257	0.006
Bali	492	1,781	0.024	0.142	0.006
Average	**1,988**	**1,870**	**0.825**	**0.210**	**0.157**

Source: Processed data (2023)

According to Table 4, the average cost efficiency value for BPRs in West Java, East Java, and Bali is 1,870. East Java has the highest average value of 1,913, indicating relatively higher cost efficiency. On the other hand, Bali has the lowest average value of 1,781, suggesting lower cost efficiency compared to the other regions. The results indicate that BPRs in Bali are less efficient in terms of cost compared to those in West Java and East Java.

Regarding profit efficiency, the table displays an average value of 0.210 for BPRs in the three regions. East Java has the highest average value of 0.257, indicating relatively higher profit efficiency. In contrast, Bali has the lowest average value of 0.142, suggesting lower profit efficiency compared to the other regions. These findings indicate that BPRs in East Java are more efficient in terms of profit compared to those in West Java and Bali.

Cost Efficiency Results

The SFA test results on cost efficiency are presented in Table 5, which includes the determination of input and output variables using an intermediation approach. The input variables considered are total fixed assets (X1), third-party funds (X2), and total operational expenses (X3), while the output is Credit Granted. The efficiency testing is conducted using a cost-function approach.

Table 5. SFA Results for Cost Efficiency

Variables	Parameter	Coef.	Std. Error	T-ratio
Constant	β0	1,747	0.261	6,696*
Ln(X1)	β1	0.017	0.007	2,279*
Ln(X2)	β2	0.832	0.016	51,250*
Ln(X3)	β3	0.029	0.012	2,481*
σ2		0.646	0.043	14,906*
gamma		0.737	0.022	34,126*
eta		0.004	0.012	0.309*
LR test		510,886*		

Source: Processed data (2023)

The results of the SFA analysis using Frontier 4.1 software yield the following cost efficiency equation model:

$$\ln Q1 = 1.747 + 0.017 \ln X1 + 0.832 \ln X2 + 0.029 \ln X3 + 0.646 - 0.737$$

From the regression equation above, the constant is 1.747. This implies that, when the input variables are held constant, the BPR will distribute credit at a certain level, specifically 5 million units of the total input (ex 1.747 = 5.7374). Additionally, the table below provides information on the 5 BPRs with the highest and lowest cost efficiency levels from 2019 to 2022.

Table 6. SFA Results for Cost Efficiency for 5 BPRs 2019 – 2022 (in units)

Name of BPR	Region	Year			
		2019	2020	2021	2022
Highest:					
PT. BPR Jelita Arta	Bandung Reg.	12.9420	12.8155	12.6908	12.5677
PT. BPR Dana Karunia Sejahtera	Bekasi Reg.	6.0752	6.0332	5.9916	5.9505
Perumda BPR Bangkalan	Bangkalan Reg.	5.9679	5.9270	5.8866	5.8466
PT. BPR Putra Arta Dewata	Malang City	5.1449	5.1126	5.0805	5.0488
PT. BPR Mojoagung Pahalapakto	Jombang Reg.	4.7165	4.6884	4.6606	4.6330
Lowest:					
PT. BPR Surya Kencana	Bogor Reg.	1.0417	1.0416	1.0414	1.0412
PT. BPR Berfasi Raharja	Bogor Reg.	1.0369	1.0367	1.0366	1.0364
PT. BPR Bhapertim Persada	Jombang Reg.	1.0316	1.0315	1.0313	1.0312
PT. BPR Bina Sono Artha	Bandung Reg.	1.0309	1.0308	1.0307	1.0305
PT. BPR Andalan Daerah	Sidoarjo Reg.	1,0000	1,0000	1,0000	1,0000

Source: Processed data (2023)

Based on Table 4, the most efficient BPR with the lowest average cost efficiency value of 1,781 is located in Bali. On the other hand, based on Table 6, the 5 BPRs with the highest cost efficiency values or the most efficient ones are found in East Java. Specifically, PT. BPR Andalan Daerah in Sidoarjo Regency achieved a perfect efficiency score of 1. In contrast, based on the average values from Table 4, East Java has the highest cost efficiency value of 1,913. However, when looking at the efficiency values of the 5 BPRs with the highest or least efficient values, PT. BPR Jelita Arta in Bandung Regency, West Java stands out as the least efficient.

Profit Efficiency Results

The results of the SFA test on profit efficiency are presented in Table 7, which involves the determination of input and output variables using a production approach. The input variables considered are total fixed assets (X1), third-party funds (X2), and total operational expenses (X3), while the output variable is current profit (loss). The efficiency testing is conducted using a production function approach.

Table 7. SFA Results for Profit Efficiency

Variables	Parameter	Coef.	Std Error	T-ratio
Constant	β0	6,640	1,076	6,174*
Ln(X1)	β1	0.156	0.043	3,658*
Ln(X2)	β2	0.155	0.049	3,169*
Ln(X3)	β3	0.293	0.066	4,402*
σ2		27,962	1,864	15,001*
gamma		0.764	0.017	43,965*
eta		-0.072	0.013	-5,475*
LR test		745,902*		

Source: Processed data (2023)

Based on the results of the SFA analysis using Frontier 4.1 software, the profit efficiency equation model is as follows:

ln**π**= 6.640 + 0.156 lnX1 + 0.155 lnX2 + 0.293 lnX3 + 27.962 – 0.764

From the regression equation above, the constant **π** is 6,640. This implies that, when the input variables are held constant, the BPR profits for a certain level amount to 765 million units of the total input (ex 6,640 = 765,095). Additionally, the table below provides information on the 5 BPRs with the highest and lowest profit efficiency levels from 2019 to 2022.

According to Table 4, East Java has the highest average profit efficiency value of 0.257, which is consistent with the findings in Table 8 that PT. BPR Mentari Terang in Tuban Regency has the highest profit efficiency value. Conversely, Bali has the lowest average profit efficiency value of 0.142, and PT. BPR Kanaya in Buleleng Regency, Bali, has the lowest profit efficiency value.

Table 8. SFA Results for Profit Efficiency for 5 BPRs 2019 – 2022 (in units)

Name of BPR	Region	Year			
		2019	2020	2021	2022
Highest:					
PT. BPR Mentari Terang	Tuban Reg.	0.6066	0.5883	0.5698	0.5510
PT. BPR Jelita Arta	Bandung Reg.	0.5669	0.5479	0.5287	0.5093
PT. BPR Tunas Artha Jaya Abadi	Kediri Reg.	0.5648	0.5458	0.5265	0.5072
PT. BPR Andalan Daerah	Sidoarjo Reg.	0.5549	0.5357	0.5163	0.4969
PD. BPR Bank Daerah Bojonegoro	Bojonegoro Reg.	0.5333	0.5138	0.4941	0.4745
Lowest:					
PT. BPR Karunia Kanaka	Bogor Reg.	0.0001	0.0001	0.0000	0.0000
PT. BPR Karyajatnika Sadaya	Bandung City	0.0001	0.0001	0.0000	0.0000
PT. BPR Sinar Terang	Bekasi City	0.0001	0.0001	0.0000	0.0000
PT. BPR Ashi	Badung Reg.	0.0001	0.0001	0.0000	0.0000
PT. BPR Kanaya	Buleleng Reg.	0.0001	0.0000	0.0000	0.0000

Source: Processed data (2023)

T-Test

The t-test is conducted to determine whether the regression model's independent variables have a significant effect on the dependent variable. The results of the t-value significance test are presented in Table 9.

Table 9. T-Test Results

Variable	Cost Efficiency	Results	Profit Efficiency	Results
Total Fixed Assets	2,279	> 1,961. So total fixed assets have a significant effect on the credit granted	3,658	> 1,961. So total fixed assets have a significant effect on the credit granted
Total Third-Party Funds	51,250	> 1,961. So Total DPK has a significant effect on the credit granted	3,169	> 1,961. So Total DPK has a significant effect on the credit granted
Operating Expenses	2,481	> 1,961. So Operational Expenses have a significant effect on the credit granted	4,402	> 1,961. So Operational Expenses have a significant effect on the credit granted

Source: Table 5 and Table 7 (T ratio)

Based on the t-ratio results provided in the table, it is observed that the calculated t-value is greater than the t-table value. This indicates a significant influence of the independent variables on both cost efficiency and profit efficiency.

Hypothesis Testing Results

In this research, Tobit regression analysis was conducted using STATA software to test the hypotheses. The process involved an SFA analysis to obtain BPR cost efficiency values. The efficiency value was then regressed as the dependent variable with the independent variables NPL, LDR, and CAR, along with total assets (bank size) as the control variable. The estimation results of the Tobit regression model, which tested the effects of NPL, LDR, CAR, and Total Assets on Cost Efficiency, are presented in Table 10.

Based on the analysis results, the Tobit regression equation model for Cost Efficiency is as follows:

Cost Efficiency = -0.474 - 0.010 NPL - 0.000 LDR + 0.006 CAR + 0.121 Ln Size

Testing the hypothesis on the influence of NPL yields a calculated t-value of -5.63 with a p-value of 0.000 and a coefficient value of -0.009687. The test results indicate that the p-value (0.000) is less than the significance level (α=0.05). Therefore, this test demonstrates that NPL has a negative and significant effect on cost efficiency. On the other hand, the LDR produces a calculated t-value of -0.66

with a p-value of 0.510 and a coefficient value of -0.0002485. The test results reveal that the p-value (0.510) is greater than the significance level (α=0.05), indicating that LDR does not have a significant influence on cost efficiency. Regarding the influence of CAR and total assets (size), the test results show that the p-value (0.000) is less than the significance level (α=0.05). This indicates that there is a significant positive effect of CAR and total assets (size) on cost efficiency.

Table 10. Tobit Regression Results for Cost Efficiency

Variable	Coefficient	t-Statistics	*p-value*	Hypothesis Results
Constant	-0.4744917	-1.37	0.170	
NPLs	-0.009687	-5.63	0.000	Ha Accepted
LDR	-0.0002485	-0.66	0.510	Ha Rejected
CAR	0.0062077	12.71	0.000	Ha Accepted
size	0.121562	6.31	0.000	Ha Accepted
σ_e^2	0.0246596	-	-	
		Log-likelihood =	-2358.8646	
		LR chi2 (4) =	165.03	
		P value =	0.0000	

Source: Processed data (2023)

Chi-Square Test

The chi-square test is conducted to determine whether the independent variables in the regression model have a significant effect on the dependent variable. The results in Table 5.10 above indicate that the Log Ratio Chi-Square value is 165.03 with a p-value of 0.000. Since the p-value (0.000) is less than the significance level (α=0.05), it can be concluded that there is a significant simultaneous (together) influence of the variables NPL, LDR, CAR, and total assets (Size) on the cost efficiency value.

Discussion of Research Results

The research results, as presented in Tables 3 and 4, indicate that the average cost efficiency and profit efficiency of BPRs in West Java, East Java, and Bali from 2019 to 2022 fall into the inefficient category. These findings align with previous studies conducted by Wasiaturrahma et al. (2020) and Kusumawardani et al. (2008), which also highlight the inefficiency of BPR in Indonesia.

Cost Efficiency

Table 3 demonstrates a trend of increasing BPR cost efficiency from 2019 to 2022, as indicated by the efficiency values approaching 1. This increase can be attributed to the rise in the number of credits granted during the same period, as shown in Table 11. Additionally, there was an increase in third-party funds from 2019 to 2022.

According to the research findings, BPRs in Bali emerged as the most efficient from 2019 to 2022. However, based on Table 6, it is revealed that the BPRs in East Java achieved perfect efficiency, while BPRs in West Java ranked second in terms of efficiency. Table 11 provides insights into the credit distribution and third-party funds of different regions. It indicates that East Java disbursed a higher amount of credit compared to its third-party funds from 2019 to 2022. This suggests that East Java efficiently manages its third-party funds, allocating them effectively as credit. On the other hand, West Java and Bali had lower credit distribution relative to their third-party funds.

Among the input variables, third-party funds were found to have the most significant influence on the credit provided. This is evident from the coefficient results presented in Table 5, where third-party funds exhibit the highest coefficient value compared to total fixed assets and total operational expenses. This implies that third-party funds play a crucial role in determining cost efficiency. In line with these findings, the BPRs in East Java stand out as the most efficient due to their ability to efficiently allocate credit at a higher value than its third-party funds. This highlights the effective management and utilization of resources in East Java.

Table 11. Amount of Third-Party Funds and Credits Provided from 2019 to 2022 (in million rupiah)

Note	West Java		East Java		Bali		Amount	
	DPK	KYD	DPK	KYD	DPK	KYD	DPK	KYD
2019	13,665	13,848	10,144	10,797	12,568	11,287	36,377	35,932
2020	13,847	13,223	10,787	10,841	11,920	11,522	36,554	35,586
2021	15,114	13,961	11,852	11,554	13,460	11,894	40,426	37,409
2022	14,478	15,834	12,530	12,774	15,770	12,274	42,778	40,882
Amount	**57,104**	**56,866**	**45,313**	**45,966**	**53,718**	**46,977**	**156,135**	**149,809**

Source: Indonesian Banking Statistics (OJK, 2023)

Profit Efficiency

According to Table 3, the research findings indicate a decrease in profit efficiency from 2019 to 2022. This decline aligns with the decrease in current profit and loss, as shown in Table 12, where the profit decreased from 1,063 in 2019 to 524 in 2022. Additionally, there is an increase in operational expenses in 2022, which contributes to the profit efficiency results being closer to 0 or increasingly inefficient.

The most efficient BPRs from 2019 to 2022 are those in East Java, as indicated in Table 4, while the least efficient are those in Bali. This finding is consistent with the results presented in Table 8, which show that the BPRs in East Java have the highest efficiency value, approaching 1. On the other hand, Bali has a profit efficiency value of 0. Table 12 further illustrates that East Java experienced a relatively insignificant decline in profits compared to West Java and Bali. Additionally, East Java generated the highest profit amount, reaching 1,423, compared to West Java and Bali. The BPRs in Bali are deemed the most inefficient due to significant profit declines and the anticipated losses in 2022.

Among the input variables, operational expenses were found to have the most significant influence on profit efficiency. This is evident from the coefficient results presented in Table 7, where operational expenses exhibit the highest coefficient value compared to total fixed assets and third-party funds. This suggests that operational expenses play a crucial role in determining profit efficiency. In line with these findings, the BPRs in East Java stand out as the most efficient due to their ability to generate high profits with lower operational costs.

Table 12. Total Operating Expenses and Current Profit and Loss from 2019 to 2022 (in million rupiah)

Note	West Java		East Java		Bali		Amount	
	B. Ops	LR	B. Ops	LR	B. Ops	LR	B. Ops	LR
2019	3,237	400	2,016	373	1,928	290	7,181	1,063
2020	3,235	240	1,999	355	1,830	196	7,064	791
2021	3,153	226	2,013	333	1,763	125	6,929	684
2022	3,415	202	2,112	362	1,789	-40	7,316	524
Amount	**13,040**	**1,068**	**8,140**	**1,423**	**7,310**	**571**	**28,490**	**3,062**

Source: Processed Data (2023)

Effect of Financial Performance Measures on Cost Efficiency

The research findings indicate that financial performance measures have an impact on cost efficiency. Financial performance, which reflects a bank's achievements in its operations and its financial condition, is typically measured using indicators such as capital adequacy, liquidity, and profitability. The better the financial performance, the more efficient or appropriate the results in terms of input and output relationship (Ikhwan & Riani, 2022; Kusumo & Karim, 2014; Rithamaya & Anggraeni, 2021).

The chi-square results support the influence of the variables NPL, LDR, CAR, and total assets on cost efficiency, indicating that financial performance measures play a role in influencing cost efficiency. This finding aligns with the stewardship theory, which emphasizes improving company performance to achieve efficiency. According to the theory, stewards, such as bank administrators and

employees, prioritize the company's interests and strive to maximize performance in the functions of collecting and distributing funds (Keuangan, 1998). In today's competitive environment, banking services play a crucial role in achieving efficiency and enhancing performance (Nugraha et al., 2018). Efficiency, in this context, is focused on optimizing profits by increasing income and reducing operational costs (Tan, 2016).

However, the t-test results reveal some differences. The LDR variable does not show a significant effect on cost efficiency. On the other hand, the variables CAR and total assets, which represent the company's size, exhibit a positive influence on cost efficiency. Additionally, the NPL variable has a negative effect on cost efficiency.

NPL has a negative effect on Cost Efficiency

The research findings indicate that the NPL ratio has a negative impact on cost efficiency. This finding is supported by studies conducted by Rithamaya and Anggraeni (2021), Mongid and Muazaroh (2017), Firdaus and Hosen (2013), Majdina et al. (2019), Rozzani and Rahman (2013), which also highlight the negative effect of NPLs on efficiency. The higher the NPL ratio, the more inefficient the bank becomes.

A higher NPL ratio affects the recognition of provisions for BPR losses. According to POJK 33/POJK.03/2018 (2018), which addresses the quality of productive assets and the formation of allowances for losses on productive assets of BPRs, provisions for credit losses are calculated based on collectability percentage multiplied by the productive assets after deducting the collateral value. As the collectability percentage increases, the burden of providing for losses also increases, leading to cost inefficiencies (Majdina et al., 2019; Mongid & Muazaroh, 2017). This is contrary to the concept of cost efficiency, which aims to minimize costs.

Additionally, a higher NPL ratio indicates an increase in credit risk, which further impacts the bank's efficiency (Rithamaya & Anggraeni, 2021). Credit risk can hinder a bank's ability to fulfill its obligations or can lead to liquidity risk, causing disruption in bank operations and resource utilization (Firdaus, 2013; Kadang et al., 2018; Kadang & Surayya, 2020). Moreover, high credit risk can result in losses as banks do not receive interest income from non-performing loans, further disrupting banking operations (Firdaus, 2013; Mongid & Muazaroh, 2017).

LDR has no effect on Cost Efficiency

The research findings indicate that the LDR variable does not have a significant impact on BPR cost efficiency. These results are consistent with the studies conducted by Hidayati et al. (2017) and Lutfiana and Yulianto (2015), which also demonstrate that LDR does not influence the level of cost efficiency in BPRs. The research findings suggest that the increase in efficiency levels is not attributed to changes in the LDR. Therefore, the LDR is not considered a factor that influences the level of efficiency.

CAR has a positive effect on Cost Efficiency

On the other hand, the research findings indicate that the CAR variable has a significant positive influence on cost efficiency. This finding aligns with the studies conducted by Mongid and Muazaroh (2017), Anwar (2016), Majdina et al. (2019), and Hidayati et al. (2017). The CAR is a ratio that measures the adequacy of a bank's capital to absorb potential losses arising from credit risk, interest rate risk, and liquidity risk. If the bank's capital is assumed to be constant and the RWA or the risk weight of the bank's productive assets increases, it will result in a decrease in the bank's CAR (Hidayati et al., 2017).

Determining the CAR is closely tied to the government's role, as outlined in POJK 5/ POJK.03/2015 (2015) regarding the Minimum Capital Requirements and Fulfillment of Minimum Core Capital for BPRs. According to this regulation, BPRs are required to maintain a minimum CAR of 8%. The CAR serves several purposes, including acting as reserve funds to mitigate financial and operational risks, as a source of funds to finance operations before other sources are collected, as a means to assure the public of the bank's sufficient capital as a financial institution, and as resources for service and facility development, as well as a growth driver to ensure the implementation of the going concern principle (Kadang et al., 2018; Kadang & Surayya, 2020). The CAR reflects the BPR's ability to provide funds to anticipate the possibility of default (Wasiaturrahma et al., 2020).

The positive influence of the CAR on cost efficiency indicates that higher CARs are associated with higher cost efficiency. Additionally, an increase in RWA has the potential to increase financial risks, and having sufficient capital is necessary for BPRs to absorb this potential risk (Hidayati et al., 2017). When BPRs have funding sources that come from higher capital, similar to liquidity risk, they can reduce the interest burden paid to third parties, leading to lower costs and increased cost efficiency. High capital serves as a low-cost source of funds for banks, making credit pricing more competitive. Moreover, these funds represent savings that are unlikely to be withdrawn by investors unless in cases of dispute or bankruptcy (Wasiaturrahma et al., 2020). Furthermore, a high capital ratio can enhance efficiency by enabling banks to better manage operations in terms of liquidity and operational management (Mongid & Muazaroh, 2017).

Total Assets has a positive effect on Cost Efficiency

The research findings indicate that the total assets variable has a significant positive influence on cost efficiency. This finding is consistent with the studies conducted by Anwar (2016), Majdina et al. (2019), and Rozzani & Rahman (2013). The positive influence suggests that as the total assets of a company increase, the level of cost efficiency also increases. Having a larger number of assets allows the company to carry out its operational activities more freely and efficiently. It provides the company with more resources to optimize and utilize effectively. Additionally, companies with larger assets are often better positioned to adopt new technologies, which can lead to increased profits and reduced management costs (Firdaus, 2013; Majdina et al., 2019).

CONCLUSION

In conclusion, this research focuses on analyzing the cost efficiency and profit efficiency of BPRs using the SFA method. The study examines BPRs in West Java, East Java, and Bali from 2019 to 2022. The findings reveal that BPRs in these three regions during the specified period are operating in an inefficient condition in terms of both cost efficiency and profit efficiency.

Regarding cost efficiency, BPRs in Bali are found to be the most efficient among the three regions. Meanwhile, in terms of profit efficiency, BPRs in East Java demonstrate the highest level of efficiency. However, when considering the five most efficient BPRs from 2019 to 2022, BPRs in East Java exhibit the highest efficiency in both cost efficiency and profit efficiency. These BPRs efficiently allocate credit and generate high profits while keeping operational expenses low.

The research findings, based on Tobit regression analysis, also indicate that certain financial performance measures significantly influence cost efficiency. The variables NPL, CAR, and total assets have a notable impact. NPL has a negative effect on cost efficiency, which means that higher NPL ratios lead to increased inefficiency. On the other hand, CAR and total assets have a positive effect on cost efficiency. Higher CAR and total assets ratios contribute to improved efficiency. However, the LDR does not have a significant effect on cost efficiency.

The research findings have important implications for BPR management in terms of improving cost efficiency and profit efficiency. BPR management should focus on increasing cost efficiency by enhancing credit distribution and reducing operational expenses. By increasing the distribution of credit efficiently, BPRs can optimize their resources and generate higher profits. Additionally, implementing policies that maximize the management of third-party funds and operational expenses can further enhance cost efficiency and profit efficiency.

However, it is important to acknowledge the limitations of this research, which may have influenced the results. Firstly, the BPR sample used in this study only represents a specific region, namely BPRs in West Java, East Java, and Bali. Other regions in Indonesia, such as Sumatra, Kalimantan, Sulawesi, Nusa Tenggara, and Papua, were not included. Future research should consider expanding the sample to include BPRs from a wider range of regions in Indonesia to obtain a more comprehensive understanding of efficiency across different areas. Secondly, the unavailability of data in the form of the 2018 Productive Asset Quality Report limited the research period to only 2019 to 2022. Additionally, some BPRs had financial ratio data with a value of 0.00, which could have influenced the research results. Future research should strive to access more comprehensive and accurate data to ensure the validity of the findings.

In light of these limitations, future research should consider the following suggestions. Firstly, expanding the BPR sample to include BPRs from other regions in Indonesia would provide a more representative and balanced distribution of data, allowing for a more accurate assessment of efficiency across different areas. Secondly, excluding BPRs with financial ratio data of 0.00 from the analysis would contribute to more valid research results.

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