

Efficiency Comparison between Conventional and Islamic Rural Banks in Sumatra during the COVID-19 Pandemic

Nashr Akbar^a, Ihsanul Ikhwan^b, Ririn Riani^c

^{a,c} Tazkia Islamic University College, Bogor, Indonesia

^b International Islamic University Malaysia, Kuala Lumpur, Malaysia

Keywords

Rural Banks, Efficiency, Indonesia, DEA, Tobit Regression

Abstract

This study aims to examine and compare the efficiency of conventional rural banks and Islamic rural banks in their roles as intermediary institutions during the COVID-19 pandemic in Sumatra, Indonesia. Furthermore, the efficiency determinants were further analysed to find some variables that affect rural banks' efficiency. Non-Parametric approach, Data Envelopment Analysis (DEA), and Tobit Regression are employed in this study. The results show that Islamic rural banks have better efficiency performance compared to conventional rural banks, but that there is a fluctuating efficiency trend experienced by both types of rural banks during the observation period. In addition, the potential improvement result indicates that financing and operating revenue variables are the main causes of rural bank inefficiency. Furthermore, the Tobit Regression result finds that capital and bank size significantly improve the efficiency level, but that risk significantly reduces bank efficiency.

Corresponding Author: n.akbar@tazkia.ac.id
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1. Introduction

The presence of COVID-19 in Indonesia since the first quarter of 2020 had a significant impact on national economic performance. According to the Central Bureau of Statistics (BPS) (2021), Indonesia's economic growth in 2020 contracted by 2.07% yoy. This is consistent with the fourth quarter's economic growth rate, which decreased by 2.19% from the fourth quarter of 2019 or by 0.42% from the third quarter (q to q. From the production side, the greatest growth contraction occurred in the transportation and warehousing business field, reaching 15.04%. Meanwhile, in terms of expenditure, almost all components contracted, with the export of goods and services sitting as the component with the greatest contraction (7.7%).

The crisis caused by the COVID-19 pandemic has taken a different form in Indonesia compared to the 1998 Asian financial crisis and 2008 global financial crisis. In the case of the previous crises, micro, small, and medium enterprises (MSMEs) were able to survive, even becoming some of the national economy's saviours. However, the COVID-19 crisis has had more impact on the real sector, as well as MSMEs' performance. Restrictions imposed by the Indonesian government disrupted global supply networks and forced many firms to reduce their production. Sumatra is Indonesia's second largest island in terms of distribution of MSMEs, after Java, representing 14.6% of the country's total MSMEs. According to BPS' latest survey, of 614,506 MSMEs in Sumatra, 74.67% were affected by the COVID-19 pandemic. Based on the classification of the impact felt by MSMEs, 94.4% of those affected experienced a decline in demand and sales (Central Bureau Statistics, 2020).

The impact of COVID-19 not only impacted demand and sales by MSMEs but also reduced MSMEs' ability to pay off financial loans, increasing credit risk. Another scenario involved customers who were unable to deposit or invest their money due to lower yields and interest rates. This condition also increased credit risk, especially in the rural bank industries where MSMEs are the primary debtors. The largest proportion of finance disbursed by rural banks was provided to MSMEs affected by the pandemic (Supeno & Hendarsih, 2020). Although credit to MSMEs is still dominated by commercial banks, the contribution of rural banks increased from 4.79% of funds distributed to MSMEs in 2013 to 7.21% in 2019. The total value of loans disbursed to MSMEs by rural banks increased from 30.65 trillion Indonesian rupiah (USD 1.967 Million) in 2013 to 75.26 trillion rupiah (USD 4.829 Million) in 2019 (Financial Services Authority, 2020).

Rural banks have specific functions in Indonesia. They are the main providers of financing for MSMEs, and, as rural banks operate at the local level, their roles are crucial for the development and growth of local economies (Berger & Humphrey, 2011). Rural banks have the specific objective to provide banking products and services for middle-low income borrowers and MSMEs in urban and rural areas (Khasanah et al., 2020 & Ramadhan et al., 2017). MSMEs require the presence of banks as intermediary institutions, to deal with the obstacles they experience such as capital constraints amid the COVID-19 pandemic, and as an effort to recover their financials.

The importance of rural banks' financing for the development and strengthening of the MSME sector requires a measurement of bank performance and health. The more efficient and healthier rural banks, the more financing they can provide to MSMEs without reducing their level of profitability. Furthermore, the tremendous development of rural banks needs to be balanced with efficient financial performance. This is important due to their small market share, as borrowers are mostly micro businesses with high default risk (Wasiaturrahma et al., 2020).

In addition, Article 2 of the Indonesian Financial Services Authority (OJK) Regulation No. 4 of 2015 (POJK No. 4/POJK.03/2015) on Governance for Rural Banks in Indonesia stipulates that all rural banks must comply with and use good governance standards when managing their operations. It means that the concepts of transparency, accountability, responsibility, independence, and justice must be applied to all activities, including the management of inputs for outputs in banking operations. By adhering to these requirements, it is expected that the rural banks' efficiency will increase, enhancing their potential to provide loans.

While numerous prior studies examine the impact of COVID-19 on the banking industry and its performance, there is limited literature that assesses the effect of COVID-19 on rural banks. Risfandy & Pratiwi (2022) examine the performance of Indonesian Islamic rural banks during the pandemic. However, to the best of the author's knowledge, there is no literature that compares the efficiency of conventional rural banks and Islamic rural banks during the COVID-19 pandemic and examine the determinants. This analysis is necessary to observe the performance trend of both types of rural banks during the pandemic, so that it can become a benchmark for banks when facing similar crises in the future. The analysis was carried out on all rural banks in Sumatera between quarter 1, 2020, and quarter 2, 2022. In addition, this study contributes to the body of knowledge by extending the analysis to find the determinants that affect rural banks' efficiency, based on their financial ratio. This analysis is important to identify factors that could potentially

be optimised to enhance efficiency.

The remainder of this article is organised into five sections, including a literature review and a previous study on the subject in Section 2. Section 3 presents the research methodology. Section 4 reports on the findings and discussions, and Section 5 suggests recommendations and policy implications to improve the future performance of rural banks.

2. Literature Review

Banks are the primary institution serving as financial intermediaries and funding sources, especially in developing countries (Fase & Abma, 2003). In Indonesia, banking serves as a collecting and distributing institution for social funds that support national development to improve national stability and equitable development, resulting in improvements in living standards (Financial Services Authority, 2022a). According to Law Number 10 of 1998, Indonesian banking is divided into commercial banks and rural banks. A rural bank is a bank that carries out its business activities conventionally or based on shariah principles without providing services for payment transfers (Law Number 7 of 1992 concerning Banking). According to their operational activities, rural banks are categorized as conventional rural banks (bank perkreditan rakyat or BPR) and Islamic rural banks (bank perkreditan rakyat syariah or BPRS). According to OJK (Financial Services Authority, 2022b), as of June 2021, there were 1,492 conventional rural banks and 163 Islamic rural banks in Indonesia.

The principles used in conventional and Islamic rural banks are fundamentally different. Islamic rural banks, like other shariah-based financial institutions, base their business processes on Islamic values and offer interest-free rates (Iqbal, 1998). This means that every financial transaction avoids the element of *riba* (interest). In contrast with Islamic rural banks, conventional rural banks use debt contracts with customers when they deposit funds in order to earn interest on the money saved, with funds being lent to customers, who are then charged interest on the loans they receive (Hidayat *et al.*, 2012).

Rural banks also have different characteristics from commercial banks. Rural banks have relatively smaller scales of operation in carrying out their intermediary function by providing banking products and services in rural and remote areas, including for MSMEs. Currently, rural banks are not only facing external challenges related to changes in the global ecosystem and the impact of the COVID-19 pandemic, but also structural challenges from the internal side, such as inadequate capital (especially for small-scale rural banks), implementation of good

governance, suboptimal management, IT infrastructure and human resources, and limited products & services. (Financial Services Authority, 2021).

For rural banks to continue to exist and not be liquidated, they must maintain financial efficiency. According to Muzaroh & Tandelilin (2014), bank efficiency can be measured by two approaches: the ratio approach and the frontier approach. The ratio approach is relatively easy to calculate, by comparing the operational cost and operational income. This approach is the most commonly used by banks to measure their efficiency. However, this approach has several limitations because it excludes banks' output, and is therefore unable to represent actual bank conditions (Piliang & Wakil, 2008; Qurniawati, 2014).

To overcome the ratio approach's shortcomings, the frontier approach was developed to measure a company's performance in terms of efficiency. This approach can capture the relation between input and output to analyse the efficiency value with various measurement methods. The frontier approach can be explained by the production frontier line (Figure 1), which describes the relationship between the production process's inputs and outputs (Bauer *et al.*, 1998), depicting the maximum output that can be obtained by utilising each input. Technical efficiency refers to the process of transforming inputs into outputs. This concept applies solely to the technical relationship between inputs and outputs.

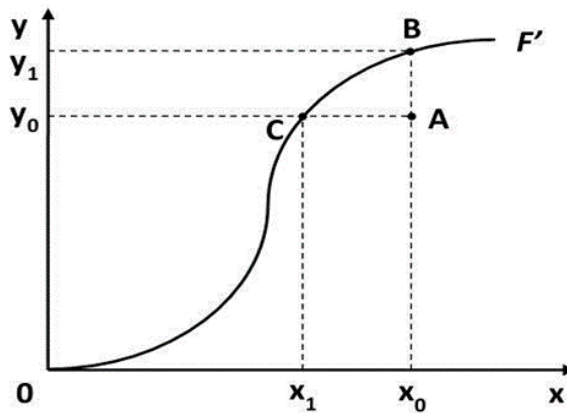


Figure 1. Production Frontier Curve

Bank efficiency can be evaluated in terms of operations, which explain the relationship between a bank's inputs and outputs. The production approach, the intermediation approach, and the asset approach are the three categories of activities that are commonly classified (Ascarya, *et.al* 2009). The production approach defines banking as the provision of services to depositors and borrowers

using all available resources, including labour and physical capital. Meanwhile, under the intermediation approach, banks are described as intermediary entities that convert money borrowed from depositors into money lent to borrowers. The third method – the asset approach – is a combination of the previous two methods, and incorporates certain features of banking activities, such as risk management, information processing, and other forms of agency problems, into a modified classical theory of the firm.

Several studies have been conducted to measure the efficiency of rural banks in Indonesia by applying the frontier approach. Hartono et al (2008), Mongid et al (2009), Berger & Humphrey (2011), Septianto & Widiharah (2010), and Welani et al (2016) analyse the efficiency of conventional rural banks, while Agustina et al. (2019), Muhari & Hosen (2014), Sadono (2017), and Defung et al. (2019) evaluate the Islamic rural banks' efficiency performance in Indonesia. Furthermore, rural bank efficiency has also been measured in other countries, including in the Philippines by Desrochers & Lamberte (2005), in Ghana by Iddrisu (2014), in China by Lingjuan *et al.* (2017), and several works in India (Ibrahim, 2010; Khankhoje & Sathye, 2009; Mohindra & Kaur, 2011)

However, understanding the financial performance of both types of rural banks is essential. Most existing studies analyse separately the performance of conventional and Islamic rural banks, although research that comprehensively analyses and compares both types of rural banks in terms of their efficiency and financial performance has recently been carried out by researches including Iswandari & Anan (2017) and Jatmiko (2017). Iswandari & Anan (2017) compared the financial performance of conventional and Islamic rural banks in Yogyakarta using a simple t-test. This study found that in general, on the aspect of rentability, liquidity, asset quality, and capital ratio, conventional rural banks have better financial performance than Islamic ones. Meanwhile Jatmiko (2017) examined the effect of ownership structure on the technical efficiency of both Islamic and conventional rural banks in Indonesia. He found the gap in efficiency level holds among Islamic rural banks, but is unobservable in the case of their conventional counterparts.

3. Methodology

3.1 Data Envelopment Analysis

Several parametric and nonparametric approaches have been employed in recent years to analyse bank efficiency. SFA and DFA are two commonly used parametric technique types. To assess the efficacy of rural banks, this study

applies a nonparametric DEA technique. DEA is preferred to SFA in this research for three key reasons. First, DEA does not need to describe a manufacturing function ahead of time. As a result, DEA is more user-friendly than SFA and requires fewer econometric parameters. Second, DEA neither requires nor imposes a set of limited technological hypotheses, making it ideal for small sample sizes. Third, because efficiency assessment is technical, DEA only considers the absolute value of a variable. The obtained values are relative. As a result, they only apply to the unit tested (Wasiaturrahma et al., 2020).

The DEA method is based on the mathematical programming model developed by Charnes *et al.*, (1978), so it is often known as the Charnes, Cooper, and Rhodes (CCR) Model, and has been utilized in several studies to evaluate the efficiency of banks (Anwar, 2016; Chowdhury *et al.*, 2022; Lestari & Mulazid, 2018; Loong *et al.*, 2017). By assuming constant returns to scale (CRS), the CCR model assumes that there is no significant relationship between the scale of operations and efficiency and is only valid when all decision-making units' function at the optimal scale. However, technological developments and regulatory changes may result in either economies or diseconomies of scale for banks of varying sizes (Masrizal et al., 2022). Banker *et al.* (1984) extend the CCR model by reducing the CRS assumption in order to address this issue. The Banker, Charnes, and Cooper (BCC) model is used to evaluate the performance of decision-making units with variable returns to scale (VRS).

Using the nonparametric DEA approach and the VRS model, the input-oriented Technical Efficiency (TE) of Islamic rural banks was determined. In this study, rural banks' efficiency was determined by measuring the ratio between output and input. This method generates a frontier set for effective rural banks and compares it to other ineffective rural banks. This is done to generate a score for efficiency. In addition, the bank efficiency score ranges between 0 and 1. If the score is below 1, the decision-making unit (DMU) is technically inefficient and not running efficiently. In contrast, the DMU will be deemed technically efficient if the TE score reflects its worth (Masrizal *et al.*, 2022).

The first step to using DEA is choosing the appropriate input and output variables. After determining the variables for a group of DMUs, we start to build the production possibility set within which the DMUs operate, including all input and output vectors. Let denote the production possibility set as Ω , so that:

$$\Omega = \{(x, y) \in \mathfrak{R}_+^{m+s} \mid x \text{ can produce } y\} \quad (1)$$

Then, input set $L(y)$ is the subset of all input vectors $x \in \mathfrak{R}_+^{m+s}$, and production set $P(x)$ is the subset of all output vectors $y \in \mathfrak{R}_+^{m+s}$, which are obtained from x . Suppose that n banks produce s outputs ($Y_i, i=1,2,\dots,s$) with m inputs ($X_i, i=1,2,\dots,m$). The shadow output and input prices are ($\mu_i, i=1,2,\dots,s$) and ($v_i, i=1,2,\dots,m$). So, for unit K , we use the input bundle $Xk = (Xk_1, Xk_2, \dots, Xk_m)$ to produce $Yk = (Yk_1, Yk_2, \dots, Yk_m)$. The linear “fractional” programming problems are set up as:

$$\max Ap_k = \frac{\mu Yk}{v Yk} = \frac{\sum_{i=1}^s \mu_{rk} v_{rk}}{\sum_{i=1}^m v_{ik} x_{ik}} \quad (2)$$

3.2 Tobit Regression

The second stage of the study utilises Tobit regression. James Tobin developed the approach in 1958 to analyse the relationship between a small number of dependent variables and independent factors (Gujarati, 2008). Hoff (2007) argues that the Tobit method as the second stage of DEA suffices in most circumstances. Initially, Tobit wished to assess the car-buying expenditures of American households. However, this complicates the ordinary least squares (OLS) estimation because some households may not purchase a car (zero expenditure). The estimation is likely to be close to zero and insignificant. If it is considerable, the value will be unreliable and biased. The estimation of the Tobit regression model is based on the Maximum Likelihood (ML) result. In comparison to OLS, the parameter estimation of the Tobit regression yields more accurate results. The Tobit regression is often referred to as a censored regression (Gujarati, 2008). Tobit is used in this study to examine the determinants of efficiency, as the score of efficiency (dependent variable) ranges from 0 to 1.

There are several variables considered as factors that may influence the level of efficiency. In this case, the bank's financial ratios – including capital adequacy ratio (CAR), credit risk (non-performing loans and financing, abbreviated as NPL/NPF), financial performance (return on assets/ROA), deposit ratio (loan-to-deposit ratio/LDR and financing-to-deposit ratio/FDR), and bank’s total asset (SIZE) – are evaluated for their effect on efficiency. Table 1 presents the definition and previous literature utilising these variables.

$$Yt = \beta_0 + \beta_1 CAR + \beta_1 Risk + \beta_3 ROA + \beta_4 DR + \beta_5 Size + \mu$$

Table 1. Definition of Variables

Tobit variable	Definition	References	Source of data
Efficiency (Y)	Relative efficiency scores obtained from DEA.		MaxDea 8
CAR	The ratio of risky capital to the risk-weighted asset	Nasution et al (2020), Devi & Firmansyah (2020), Hidayati et al. (2017), Muhammad et al., (2020)	Bank financial ratio (OJK website)
NPL/NPF	Non-performing loan/ financing ratio to the total financing	Sufian (2009), Řepková (2015), Jiménez-Hernandez et al (2019), Devi & Firmansyah (2020), Rozzani & Rahman (2013)	Bank financial ratio (OJK website)
ROA	The ratio of annualised earnings before taxes to average assets	Sufian (2009), Řepková (2015), Nasution et al (2020), Devi & Firmansyah (2020)	Bank financial ratio (OJK website)
Deposit ratio	The ratio of loan/financing to the third-party funds	Otaviya & Rani (2020), Řepková (2015), Nasution et al (2020), Hidayati et al. (2017)	Bank financial ratio (OJK website)
SIZE	Total assets	Devi & Firmansyah (2020), Nasution, et.al (2020), Hernandez, et.al (2019), Repkova (2015), Rozzani & Rahman (2013)	Bank financial statement (OJK website)

4. Result and Analysis

4.1 Statistical Description

An overview of the data used in this study is presented in Table 2, describing the comparison of statistical descriptive between conventional and Islamic rural banks in Sumatra during the observation period. Overall, the description shows that conventional rural banks have greater finances than Islamic rural banks in all input and output variables.

Table 2. Statistical Description of Input and Output Variables (in Indonesia Rupiah)

	Fixed Assets	Operational Costs	Third-Party Funds	Total Financing	Operational Income
Conventional Rural Banks					
Mean	3,152,115,024	6,623,079,317	64,617,241,048	73,275,300,765	7,456,624,132
Max	165,545,385,000	833,224,583,000	4,498,405,174,000	7,639,069,645,000	1,134,055,747,000
Min	44,493,000	81,051,000	26,610,000	176,754,000	13,461,000
Islamic Rural Banks					
Mean	2,215,529,011	2,515,832,568	31,089,649,911	29,662,710,800	4,851,152,139
Max	12,987,398,000	13,891,442,000	118,880,100,000	94,232,558,000	38,799,075,000
Min	38,033,000	41,478,000	1,945,932,000	2,107,034,000	105,419,000

4.2 Overall Efficiency Scores

Figure 2 summarises rural banks' efficiency scores from the first quarter of 2020 to the second quarter of 2022. It shows that, overall, Islamic rural banks have greater efficiency scores than conventional rural banks. This result is consistent with Wasiaturrahma *et al.* (2020), who found that Islamic rural banks are slightly more efficient than conventional rural banks when analysing financial performance. According to Figure 2, periodic fluctuations can be observed in the overall efficiency scores of both rural banks. The efficiency scores of rural banks in Sumatra decreased in Q2 of 2020 compared to Q1 of 2020. This is indicated by the spread of the COVID-19 pandemic in the second quarter of 2020, which had a domino effect on the Indonesian economy, including banking.

In addition, between Q2 2020 and Q1 2021, the efficiency scores of both conventional and Islamic rural banks grew substantially. This is expected, as the success of government stimulus initiatives successfully mitigated a fall in liquidity. Furthermore, both types of banks experienced a decrease in average efficiency scores in the second quarter in 2021, before increasing in Q1 2022 and declining again in Q2. This fluctuation indirectly illustrates the impact of various government COVID-19 countermeasures on the performance of rural banks, especially in the case of Sumatra. It also can be seen that rural banks perform better in the first quarter of every year, but they cannot maintain their performance in the following quarters .

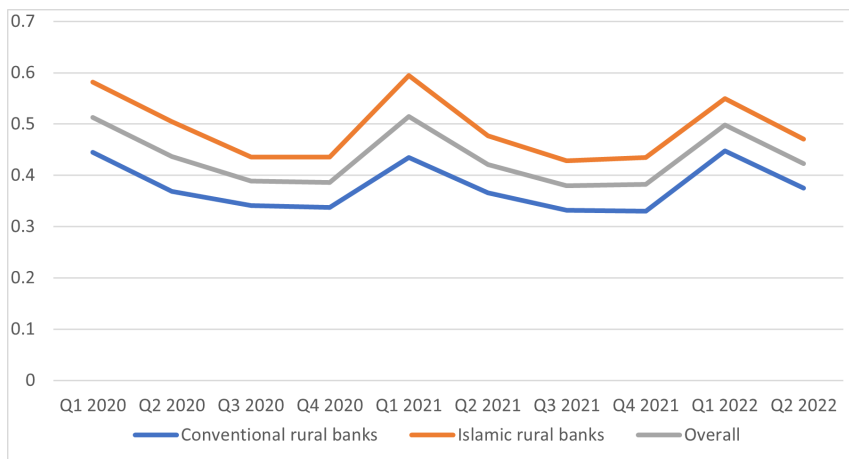


Figure 2. Overall Efficiency Trend

4.3 Regional Efficiency Scores

Some important findings can be drawn from figures 3 and 4. On average, Riau Islands is the province with the most efficient rural banks in Sumatra, both

conventional and Islamic. This is partly due to high growth in its lending/financing. The growth of rural banks' loans and financing in the Riau Islands was highest for the northern part of Sumatra, with an increase of 13.91% year-on-year. In terms of NPL/NPF, rural banks in the Riau Islands are classified as better performing than other provinces in the north of Sumatera, at 7.95%.

Secondly, rural banks in North Sumatra and West Sumatra have the lowest average efficiency scores when it comes to conventional rural banks but show better efficiency for Islamic rural banks. This finding indicates that the number of conventional rural banks affects the efficiency scores. West Sumatra and North Sumatra are the provinces with the largest number of conventional rural banks, with a total of 94 and 54 banks respectively. This results in a decrease in deposits made by customers due to high competition and density among rural banks. On the other hand, Islamic rural banks are fewer in number, leading to higher average efficiency scores in both provinces.

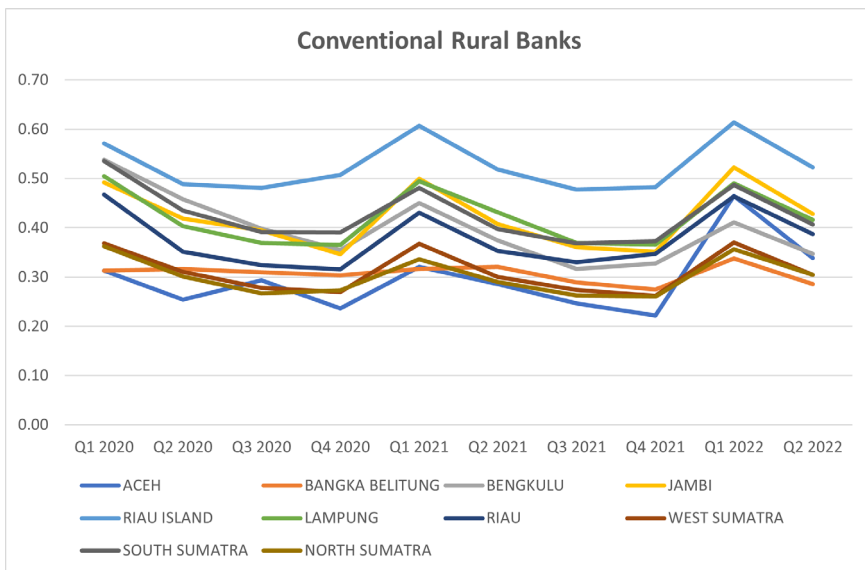


Figure 3. Efficiency of Conventional Rural Banks per Province in Sumatra

Conventional rural banks in Aceh Province have the lowest average efficiency scores after North Sumatra and West Sumatra, but Aceh's Islamic rural banks achieve the best efficiency scores of all Islamic rural banks across Sumatera. This contradictory result may be one of the consequences of the Qanun (Islamic regulation) on Shariah Financial Institutions in Aceh. At the end of 2018, the Aceh Provincial Government issued Aceh Qanun no. 11 of 2018, which stipulates that all financial institutions (including conventional rural banks) operating in Aceh must

implement their activities based on shariah principles within three years of the Qanun’s proclamation. This means that by 2022, all conventional rural banks must become Islamic rural banks if they want to continue operating in Aceh. This likely affects the performance of the conventional rural banks, because the conversion process requires several changes and adjustments in banking operations. Most conventional rural banks lowered their financing before the implementation of the Qanun. For instance, the financing of BPR Berlian Global in the second quarter of 2022 is 57.8% lower than the same quarter in 2020. Likewise, financing of BPR Aceh Utara in the second quarter of 2022 is 72.6% lower than the same quarter in 2020. Consequently, these banks experienced increased inefficiency.

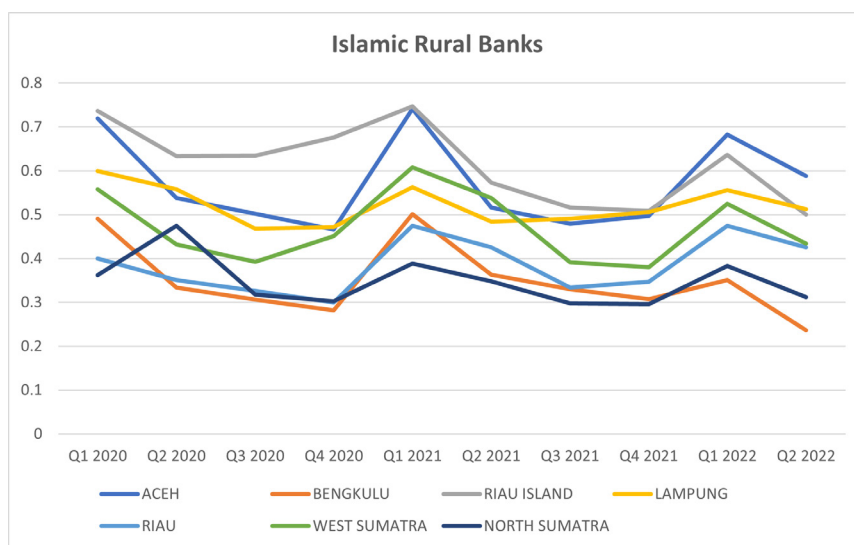


Figure 4. Efficiency of Islamic Rural Banks per Province in Sumatra

4.4 Potential Improvement

In addition to measuring efficiency scores, DEA can also measure the potential improvement analysis of each variable, enabling the identification of which variables require optimisation. The analysis only includes the last period of observation to capture the real value that needs to be improved. The potential improvement analysis compares the projected value to the real value (or at least, the most recent data available). The results of the measurement of potential improvement of rural banks in Sumatra can be seen in Figure 5.

The potential improvement result shows that financing and operating income are the main sources of inefficiency for both types of rural banks. Total financing contributes 57% to conventional rural banks’ inefficiency and 50% of Islamic rural banks’ inefficiency, whereas operational income contributes to the inefficiency

of conventional and Islamic rural banks by 38% and 45%, respectively. Hence all rural banks should pay more attention to improving the achievement of these two variables so that they can achieve efficient performance in the future. It should be noted that these two variables are interconnected: the more financing provided by rural banks, the more operational income they will receive through interest or profit sharing.

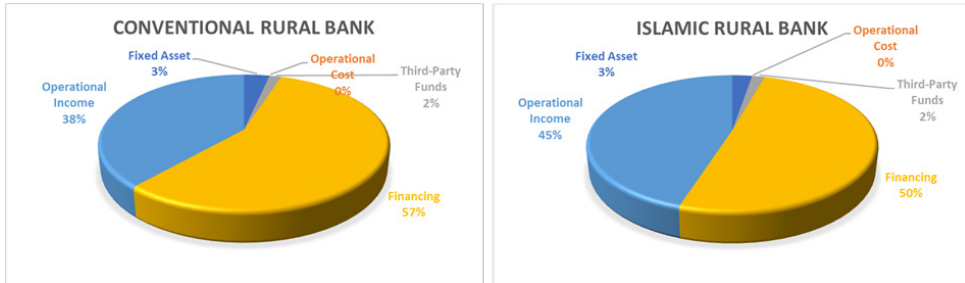


Figure 5. Potential Improvement

4.5 Tobit Regression

The data are then analysed using the Tobit model to identify which factors influence the level of technical efficiency while utilising intermediation procedures. Table 3 represents the overall findings of the Tobit regression in this investigation.

Table 3. Tobit Regression

Variable	Overall Model		Conventional Rural Bank Model		Islamic Rural Bank Model	
	Coefficient	Prob	Coefficient	Prob	Coefficient	Prob
CAR	0.000274	0.0000***	0.000317	0.0000***	0.003456	0.0002**
RISK	-0.002996	0.0001***	-0.002457	0.0000***	-0.003693	0.0206***
ROA	0.000252	0.2263	0.000250	0.2040	0.001344	0.4705
DR	6.8305	0.0009***	6.0005	0.0018***	-0.000351	0.4059
SIZE	0.046340	0.0000***	0.045294	0.0000***	-0.060527	0.0005***

Notes: ***significant at 1% significance level, **significant at 5% significance level, *significant at 10% significance level.

Based on the result analysis, it is evident that some variables have positive effects while others have negative effects. However, not all variables had a substantial affect, and other variables did not have any influence at all. Thus, by using this Tobit model, we could see that in the overall model, both the conventional and Islamic rural bank models, it is found that the CAR variable has a positive effect on efficiency, which is significant at the 5% level. Consequently, CAR has a considerable impact on the intermediation efficiency of both types of rural banks. The capital sufficiency

of the two institutions has a significant impact on their financial performances. The larger the capital, the greater the efficiency. CAR demonstrates the potential of rural banks to provide funds in anticipation of possible defaults. When CAR rises primarily as a result of increased capital, the possibility of achieving efficiency will also improve. High capital is essentially a source of inexpensive cash for banks; hence, the selling price of their credit will be lower. Obviously, this increases the bank's capacity for intermediation, as these deposited funds have a small possibility of being withdrawn by investors, preventing a dispute or insolvency (Priyadi *et al.*, 2021). This result is consistent with prior research by Aryati & Purwanto (2019), Zahra & Darwanto (2019), and Nidar *et al.* (2020).

The risk variables in all models were found to have a negative and significant relationship in influencing efficiency. This means that the credit risks faced by banks affect the level of banking efficiency. This could happen because banks which channel more financing to the public will face greater risks (Anwar *et al.*, 2021). Nevertheless, such banks can maintain their profitability and efficiency, supported by sufficient capital. On the other hand, a larger ratio of bad loans can disrupt bank operations, especially bank liquidity, decreasing the inefficiency with which banks utilise their resources. This result is in line with Nugrohowati (2019), Aryati & Purwanto (2019), and Wasiaturrahma *et al.* (2020).

In all three models, it is found that ROA has no effect on efficiency. In the subsequent period, the COVID-19 pandemic was the cause of a stagnation in operating profit as well as cash flow. Elnahass *et al.* (2021) observed that the pandemic had consequences on the financial performance of the banking industry across a variety of variables.

Furthermore, the deposit ratio has a significant impact only on the overall model and the conventional rural bank model. The ratio of loans to deposits has a significant positive impact on the level of conventional rural banks' production efficiency, whereby they succeed in maintaining the ratio and are quite active in distributing credit in an ideal position. However, in the Islamic rural bank model, it is found that the finance-to-deposit ratio (FDR) variable has no effect on efficiency.

Lastly, the findings indicate that the size of the bank has a favourable effect on the development of rural banks, as well as proactive expense management, hence, the size of the bank has a beneficial impact on efficiency levels. These results provide substantial support for the generally accepted hypothesis that large banks employ more efficient managers who are successful in their efforts to achieve economies of scale and scope (Antunes *et al.*, 2022).

5. Conclusion and Recommendation

The role of rural banks as intermediary institutions is crucial for MSMEs financing, especially during the COVID-19 pandemic period. Rural banks must maintain their performance in order to provide more financing as well as maintain profitability. This study – which set out to measure and compare the efficiency level of conventional and Islamic rural banks in Sumatra – identifies the determinants which affect achievement of efficiency. The result finds that Islamic rural banks have the highest efficiency levels compared to conventional rural banks. Furthermore, the average efficiency trend of both types of rural banks shows a fluctuating trend during the pandemic period.

Potential improvement analysis was conducted to observe the main source of inefficiency. The result reveals that total financing and operating income are the main sources of inefficiency in both types of rural banks. Hence, rural bank practitioners should develop more effective strategies to optimise both variables. Rural banks must be more selective and careful in providing loans, so that the expected returns become more optimal. In addition, innovation and optimisation of financial technology (fintech) should be carried out so that both types of rural banks can increase their financing levels and compete with commercial banks or peer-to-peer lending fintech. From the regulator's side, appropriate policies such as stimulus and restructuring also need to be continued to increase rural banks' financing. The regulator must also to provide a stable financial and economic ecosystem through the incorporation of fintech and the digital economy.

Further analysis from the Tobit regression finds that capital and bank size significantly improve efficiency, while risk significantly reduces bank efficiency. In addition, the loan/financing to deposit ratio has a significant positive impact only on the overall model and on conventional rural banks, and is insignificant for Islamic rural banks. Rural banks should utilise their capital to consider all the potential technologies which could improve their revenue efficiency levels. In addition, Islamic rural banks also can optimize waqf funds, as the latest UU P2SK (The Omnibus Law for Financial Sector) allows LKS to become nazhir waqf (Waqf institution/administrator). Evidence also highlights the importance of low impaired financing and loans to increase rural banks' profitability.

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