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Determinants Of Banking Efficiency For Commercial Banks In Indonesia: Two-Stage Data Envelopment Analysis

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Abstract

This study measured and analyzed the determinants of banking efficiency for commercial banks in Indonesia using the Two-Stage Data Envelopment Analysis approach within 2015-2019 period. The object in this study is commercial banks which are included in the group 4 banks category consisting of 7 conventional commercial banks. The first stage measured level of bank efficiency by Data Envelopment Analysis (DEA). BNI in 2015 and BCA during the period 2015 to 2019 shows inefficient on managing the resources. The second stage is analyzed the factors that have an influence in achieving the level of bank efficiency using the Tobit model which shows that Operational Cost and Operational Revenue (BOPO), Return on Equity (ROE), Return on Assets (ROA), and Non Performing Loans (NPL) have a significant effect on bank efficiency. Meanwhile, the Capital Adequacy Ratio (CAR) and the Loan to Deposit Ratio (LDR) have no significant impact on bank efficiency.

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1. Introduction

The current regional and global dynamics increasingly demanding that the government continue to increase economic growth from various sectors, one of them is from the banking industry which can trigger economic growth with its role as an intermediary institution, especially in productive businesses. Based on data in Figure 1, it shows that the share of the asset market in the banking industry 2019 which is still dominated by domestic banks is 73% with the public company at 43.19%, national private banks at 21.49% and BPD at 8.35%. Foreign banks controlled 27% of the asset market share with foreign ownership of 22.77% and KCBA 4.19%. This condition illustrates that the banking market share is still dominated by state-owned banks, thus efficiency is necessary to improve banking performance by optimizing market share.

Increasing efficiency in banking is needed because it will improve the management of savings funds, deposits and greater demand, thereby increasing economic growth (Karimzadeh, 2012). (Hassan et al., 2009) state that when a bank is efficient, it is expected that bank profits will increase. Rahim et al., (2013) argued that the intermediation approach is the best approach in evaluating the performance of financial institutions where in this approach it considers operational activities both input and output in analyzing the efficiency performance of financial institutions. There are two methods to measure a company's efficiency level, namely paremetic and non-parametric.

Financial performance factors that affect the efficiency of Islamic banking in various study literatures have mixed results between studies. Profitability ratios by comparing Operational Cost and Operational Revenue (BOPO) in financial institutions are often used in measuring the efficiency of a bank by measuring how well the bank is able to manage its operating expenses. So that BOPO has an influence in achieving the efficiency of a bank (Petria et al., 2015), (Iqbal et al., 2012), (Sufian & Akbar Noor Mohamad Noor, 2009), and (Fathony, 2012).

Capital Adequacy Ratio (CAR), namely the ratio of capital adequacy or the ability of banks to provide sources of funds to minimize the risk of loss. The CAR ratio in the study (Ar Royyan Ramly, 2017), (Sufian & Akbar Noor Mohamad Noor, 2009), and (Widiarti et al., 2015) results that there is an effect or probability in increasing efficiency in Islamic banks. In contrast to research from (Firdaus & Hosen, 2014) which explains that the CAR ratio has a negative effect on increasing bank efficiency. (Havidz & Setiawan, 2015) in the study showed that there was no significant effect of CAR on increasing bank efficiency Return On Asset (ROA) and Return on Equity (ROE) are ratios to measure a bank's ability to earn profits. Every increase in the performance ratio of a bank has an effect on increasing bank efficiency according to (Firdaus & Hosen, 2014), (Havidz & Setiawan, 2015), (Petria et al., 2015), and (Pambuko, 2016). In contrast from te research of (Naufal & Firdaus, 2018) which shows bank performance ratios have no significant effect on improving bank efficiency.

Loan to Deposit Ratio (LDR) is a ratio that measures a bank's ability to provide financing originating from public funds. Each increase in the LDR ratio has an effect on increasing bank efficiency according to (Sendyvia Candra, 2015), (Garza-García, 2012), (Sufian & Akbar Noor Mohamad Noor, 2009), and (Pambuko, 2016). In contrast to research from (Eyceyurt Batir et al., 2017) which explains that the LDR ratio has a negative effect in increasing bank efficiency. Research (Rosyiqoh Haida Lutfiana, 2015), (Havidz & Setiawan, 2015), and (Naufal & Firdaus, 2018) show that the LDR ratio has no significant effect on improving bank efficiency.

Non-Performing Loans (NPLs) are a way of looking at banking performance by measuring the ratio of non-performing loans to total loans. In research (Widiarti et al., 2015) and (Eyceyurt Batir et al., 2017) state that there is a negative effect of NPL on increasing bank efficiency. Meanwhile, in the study (Muazaroh et al., 2012) states that NPL has a negative relationship which has no significant effect on the efficiency of a bank. Based on the description above, this study aims to measure the level of bank efficiency and analyze the determinants of the factors that have a probability in achieving the efficiency level of conventional commercial banks using the Two Stage Data Envelopment Analysis approach during the period 2015 to 2019. The results of this study are expected to contribute to identify factors that have an influence on achieving efficiency in banking in Indonesia.

2. Literature Review

Signalling theory suggets that statistics asymmetry is the rule. Signalling principle states that company economic choices are alerts despatched through the company's managers to Investors with a purpose to shake up those asymmetries These signals are in the form of information about what management has done to realize the owner’s expectations and are the cornerstone of financial communications policy. Efficiency in banking is information that gives a signal in the performance of a bank, there are good and bad signal that can be seen from the precentage level of efficiency. Efficiency is a measure of the success of an activity which is assessed based on the amount of input used or issued to achieve the expected output or result. According to (S. Mulyadi, 2007) argues that efficiency is the accuracy of how to manage labor and costs. Most of the preceding studies looking at efficiency focused on cost efficiency (Kamarudin et al., 2014), while in research (Sufian & Kamarudin, 2014) and (Kamarudin et al., 2019) it shows that income which is inefficient also has an effect on the efficiency of financial institutions.

DEA is a mathematical program optimization method that measures the technical efficiency of a unit of economic activity and compares it relative to other units of economic activity (Charnes et al., 1978). The level of efficiency is expressed as a percentage when it reaches 100 percent, It manner that performance has been performed withinside the unit of economic activity. The value of technical efficiency ranges from 0 to 1, when unit of economic activity (UKE) is getting closer to the value of 1 or 100 percent, it means that UKE is more efficient. There are two assumptions of Constant Return to Scale (CRS) and Variable Return to Scale (VRS) in measuring the level of efficiency using DEA. The VRS model

assumes that a bank can produce less or more than one output (Elvira & Prasetiono, 2012). The performance of choice decision which may be divided into levels has been measured for the entire system in addition to for every level independently via way of means of the use of the data envelopment analysis (DEA) technique a good way to pick out the reasons of inefficiency (Kao & Hwang, 2008).

3. Research Methods

Based on the objectives of this study, namely to measure the level of efficiency of conventional banks by looking at financial ratio factors that can influence the achievement of bank efficiency levels, the method used in this study is descriptive quantitative research method. Where quantitative research is research to test the truth of the hypothesis between variables (M. Mulyadi, 2013). The descriptive approach is an approach that provides a general description of the conclusions of the research object that has been studied (Sugiyono, 2017). Descriptive analysis in this study is to describe the value of the level of efficiency of the banking system and show the factors that have a role in influencing the value of the level of efficiency of the banking system. The type of data in this study is secondary data obtained from banking financial reports published on the Financial Services Authority (OJK) website. The sample chosen in this study used purposive sampling, which is based on certain considerations (Sugiyono, 2017).

The purposive sampling method, additionally referred to as judgment sampling, is the planned preference of a participant because of the characteristics of the participant possesses. It is a nonrandom method that doesn't want underlying theories or a hard and fast wide variety of participants (Bernard, 2017). The sample of banks studied was conventional commercial banks included in the BUKU 4 group, namely banks that had the highest capital compared to other bank groups, and had a minimum core capital of thirty trillion rupiah.

The analysis technique in this study uses two analyzes, namely first analyzing the level of efficiency in conventional banks using the Data Envelopment Analysis intermediation approach. The second stage analyzes the factors of financial ratios that have an influence or probability on the level of bank efficiency using the tobit regression model. The variables used in analyzing the degree of financial institution efficiency consist of output variables, namely total credit and total income. And the input variables are capital, savings, and labor costs. Independent variables in analyzing The elements that have an effect on the extent of financial institution efficiency are Operational Costs and Operating Income (BOPO), Capital Adequacy Ratio (CAR), Return On Equity (ROE), Return On Asset (ROA), Non Performing Loans (NPL), and Loan to Deposit Ratio (LDR).

4. Result

Based on the sampling criteria described, a sample of 7 conventional commercial banks was obtained, namely BRI, BNI, Mandiri, BCA, CIMB NIAGA, Panin and Danamon.

First stage: Measuring the value of Islamic Bank Efficiency with Data Envelopment Analysis. The table below illustrates the measurement results of conventional commercial bank technical efficiency which were analyzed using Data Envelopment Analysis.

Table 1. Efficiency of DEA

Bank	2015	2016	2017	2018	2019
BNI	97.40%	100.00%	100.00%	100.00%	100.00%
Mandiri	100.00%	100.00%	100.00%	100.00%	100.00%
BCA	92.80%	90.60%	91.00%	90.70%	92.70%
BRI	100.00%	100.00%	100.00%	100.00%	100.00%
Panin	100.00%	100.00%	100.00%	100.00%	100.00%
Danamon	100.00%	100.00%	100.00%	100.00%	100.00%
CIMB NIAGA	100.00%	100.00%	100.00%	100.00%	100.00%
Average Income	98.60%	98.66%	98.71%	98.67%	98.96%

Source: Data Processed (2021)

The effects of the efficiency of the Data Envelopment Analysis Intermediation Approach show that during 2015 to 2019 conventional commercial banks that achieved 100 percent technical efficiency were Mandiri, BRI, Panin, Danamon, and CIMB Niaga. Meanwhile, BNI and BCA did not achieve 100 percent efficiency in a row during the 2015 to 2019 period. The common fulfillment of technical efficiency from 7 conventional banks has fluctuated during the period 2014 to 2018. In testing efficiency with the DEA, it can be seen from the summary of slack which illustrates that inefficiencies occur due to inoptimal allocations of savings and capital. Which means that it is still not optimal in providing financing from savings sources, and capital on a bank account that has not been used optimally.

Two stage: Measuring the determinant effect on DEA efficiency with Tobit regression. The next step after measuring the cost of performance in banking is to research the determinants of financial institution performance by testing financial ratio factors to see if there is a probability of influence from BOPO, CAR, ROE, ROA, NPL, and LDR on achieving 100 percent efficiency levels in commercial banks.

Table 2 Tobit Regression Analysis

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-15,328	14,102	-1,087	0,277
BOPO	0,320	0,182	1,757	0,079**
CAR	-0,459	0,360	-1,275	0,202
ROE	-0,659	0,304	-2,166	0,0303*
ROA	6,030	3,097	1,947	0,0515**
NPL	-1,450	0,710	-2,041	0,0412*
LDR	-0,025	0,058	-0,423	0,673

Source: Data Processed (2021)

It can be seen from the table of the results of tobit regression analysis that it shows that NPL and ROE have a significant effect with a significant level of 5%, which means that NPL and ROE have a probability in achieving the efficiency of a bank. BOPO and ROA have an influence or probability in achieving bank efficiency with a significant level of 10%. Meanwhile, CAR and LDR don't have any massive effect or probability on achieving bank efficiency. BOPO in this study illustrates a positive effect. This shows that there is a probability of any increase in BOPO in increasing bank efficiency. These results support the theory that BOPO can be used in measuring the performance of a financial institution and supports previous research (Petria et al., 2015), (Iqbal et al., 2012), (Sufian & Akbar Noor Mohamad Noor, 2009), and (Fathony, 2012).

From the results of tobit analysis in this study, it shows that ROE and ROA have an influence or probability in achieving bank efficiency. Where ROE has a negative relationship, which means that any increase in ROE will reduce the efficiency of a bank. This shows that large capital does not guarantee a bank to run efficiently which can occur due to the lack of good management of a bank. Meanwhile, ROA has a positive relationship, meaning that each increase in ROA will growth the performance of a bank. The outcomes of this study support previous research (Firdaus & Hosen, 2014), (Havidz & Setiawan, 2015), (Petria et al., 2015), and (Pambuko, 2016). NPL in this study shows a negative effect on bank efficiency. Which means that the smaller non-performing loans or bad credit quality will increase the efficiency of a bank (Widiarti et al., 2015) and (Eyceyurt Batir et al., 2017).

In this study, it shows that CAR and LDR do not have a significant effect in achieving the efficiency of a bank. The results of this study support previous research from (Rosyiqoh Haida Lutfiana, 2015), (Havidz & Setiawan, 2015), and (Naufal & Firdaus, 2018) which revealed that CAR and LDR have no probability in achieving bank efficiency.

5. Conclusion and Suggestion

Conclusion

The efficiency of the Data Envelopment Analysis Intermediation Approach show that during 2015 to 2019 commercial banks that achieved 100 percent technical efficiency were Mandiri, BRI, Panin, Danamon, and CIMB Niaga. Inefficiencies in bank occur due to inoptimal allocations of savings and capital. Which means that it is still not optimal in providing financing from savings sources, and capital on a bank account that has not been used optimally.

Tobit regression analysis that it shows that NPL and ROE have a significant effect with a significant level of 5%, which means that NPL and ROE have a probability in achieving the efficiency of a bank. BOPO and ROA have an influence or probability in achieving bank efficiency with a significant level of 10%. Meanwhile, CAR and LDR don't have any effect or probability on achieving bank efficiency.

Suggestion
From the conclusion in this study, the number of research objects not only based on group 4 banks and add Islamic bank research objects.

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