

Analysis of Bank Efficiency Between Conventional Banks and Regional Development Banks in Indonesia

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Received: September 30, 2020 Revised: November 30, 2020 Accepted: December 14, 2020

Abstract

The research aims to analyze the level of efficiency by grouping banks during the period 2017 - 2018 into category 1 and category 2 banks and then dividing them as Regional Development Banks (BPD) and Non-BPD Conventional Commercial Banks (BUK) within each category. The research objects are banks within the categories BPD and BUK comprised 18 BPDs and 35 BUKs. The research methodology uses 3 stages, first, using Data Envelopment Analysis (DEA) we measure the level of bank efficiency; second, using the Tobit regression model we evaluate the effect of financial performance on DEA efficiency, and third, using the Mann-Whitney test we determine whether there is a difference in the efficiency of category 1 and 2 banks. The results showed that there was a decrease in the efficiency of category 1 and 2 banks but on average, the efficiency of category 1 banks is higher than category 2 banks. The estimation results of the Tobit regression model show that only the ROA variable affects the efficiency level of category 1 banks, while category 2 banks are influenced by NPL and ROA variables. In the Mann-Whitney test, it was proven that there were differences in efficiency between BUK and BPD in category 1 and 2 banks.

Keywords: Conventional Banks, Data Envelopment Analysis, Efficiency, Regional Development Banks, Tobit Regression

JEL Classification Code: G20, G21, C14

1. Introduction

ASEAN banking integration is called the ASEAN Banking Integration Framework (ABIF). In December 2014, the ASEAN Central Bank Governors endorsed the ASEAN Banking Integration Framework (ABIF) and its attendant Guidelines. ABIF is one of the concrete steps towards the ASEAN Economic Community (MEA) 2015. ABIF

guidelines serve as operational frameworks for ASEAN countries in the implementation of banking integration concepts and processes. With the integration of the financial sector, competition among banking institutions among ASEAN countries will increase. This makes banks especially small banks face increasing competition and they find it challenging to survive in the increasingly fierce and broader competition. In Indonesia, commercial banking is categorized into small banks (category 1 and category 2) and large banks (category 3 banks and category 4 banks). The category of small banks must have a capital of Rp 1 trillion, while large banks must have a minimum capital of Rp 5 trillion. The other commercial bank owned by Regional Government is namely as Regional Development Bank (BPD). BPD is one of the banks that exist in the national banking system and has a function and a significant role in the context of regional economic development. Although BPD is an intermediary institution helping in regional development in Indonesia, it must also be aware of the guidelines of ABIF. From the above policies, the regional BPD policy continues to be carried out to make the BPD a superior bank in the region where one of the pillars is to improve efficiency. One of the strategies of small banks in dealing with such competition is to improve

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efficiency in bank operations because with efficiency banks will be able to compete in an open and free market. Banks that are unable to maintain their level of efficiency will slowly exit the market because it will be difficult to compete with other banks. In this case, banks in Indonesia will not only have national bank competitors but will also compete with international banks.

Efficiency is a critical factor for determining competitive advantage. Various studies on bank efficiency show that more efficient banks have substantial cost advantages and competitive advantages compared to less efficient banks (Berger & Humphrey, 1997). Saqib (2013) concluded that efficiency in the financial sector has a positive influence on economic growth for developing countries. The efficiency of the banking system is quintessential for the growth of a country as only an efficient bank can promise healthy and sustainable growth for the country's financial sector (Kumar et al., 2020). The government's effort to improve banking efficiency is by issuing Bank Indonesia Regulation Number 14/26 / PBI / 2012 concerning business activities and office networks based on the bank's core capital. The government hopes that the restructuring of the scope of business activities and opening of office networks adjusted to the bank's capital capacity can increase resilience, competitiveness, and efficiency. This regulation stipulates that achieving the level of efficiency can be measured through the ratio of operating costs to operating income (BOPO) and the ratio of net interest margin (NIM).

According to Abidin and Cabanda (2011), there are three components of economic efficiency, namely technical efficiency, allocative efficiency, dynamic efficiency. Technical efficiency is achieved where individual firms produce goods and services that they offer to consumers at the least cost. Whereas, allocative efficiency is achieved where resources used to produce a set of goods and services are allocated to their highest value. Dynamic efficiency reflects the need for industries to make timely changes to technology and product in response to changes in consumer tastes and productive opportunities. The concept of efficiency in economics, in general, refers to the efficiency of a system that can produce maximum output from an input. The efficiency of a system is reflected if it is able to increase the output with the same input or if it can maintain the same output with a reduced input (Noor et al., 2020). There have been many studies on banking efficiency in Indonesia; however, research using 3 methods simultaneously and comparing non-BPD commercial banks (BUK) with BPD is very rare. The first research objective is to analyze the efficiency performance of category 1 and category 2 banks which includes Non-BPD Conventional Commercial Banks (BUK) and Regional Development Banks (BPD) during the period 2017 and 2018. Second, find out the financial performance factors that affect category 1 efficiency performance and

category 2 and third, analyse whether there are differences in the level of efficiency in both categories.

2. Literature Review

Much research has been done to evaluate the level of bank efficiency. Several approaches are carried out ranging from simple to complicated. Based on a comprehensive review conducted by Berger and Humphrey (1997) surveyed 130 studies that apply frontier efficiency analysis to financial institutions in 21 countries. The primary goals were to summarize and critically review empirical estimates of financial institution efficiency and to attempt to arrive at a consensus view. There are at least two approaches to measuring efficiency in banking institutions, namely the non-parametric approach and the parametric approach. The methods commonly used for non-parametric approaches are Data Envelopment Analysis (DEA) and Free Disposal Hull (FDH). The best-known efficiency measurement approach is to use the frontier function (Quaranta et al., 2018; Sharma et al., 2013), which includes parametric approaches (including Distribution Free Approach (DFA), Stochastic Frontier Analysis (SFA) and Thick Frontier Approach (TFA) models) and non-parametric approaches (including DEA and FDH models).

Henriques et al. (2018) examined bank efficiency in the period from 2012 to 2016 by applying Data Envelopment Analysis (DEA) in a dataset of 37 Brazilian banks provided by the Brazilian Central bank, finding that banks in Brazil had not reached the maximum efficiency level in the average 5 years of the study period. Another finding is that measurements using the CRS model produce lower levels of efficiency than the VRS model. However, although the two models have measurements with different criteria, there is still a positive correlation between the two models. Grmanová and Ivanová (2018) examined the efficiency of the 3 biggest banks in Slovakia by using the DEA method to assess the efficiency of the Slovak banking sector. The three largest banks in the Slovak national banking market were found to be efficient with different combinations of inputs and outputs in both analyzed years

Novickyte and Drożdż (2018) examined the efficiency of the banks in Lithuania by employing the DEA method and evaluate bank performance in a low-interest-rate environment. The efficiency scores were calculated with a non-parametric frontier input-oriented DEA technique with the variable returns to scale (VRS) and the constant returns to scale (CRS) assumptions. Five alternative models with different input-output combinations were developed, based on production, profitability, and intermediation dimensions. The main bank profitability measure—the return on assets (ROA) ratio—was employed to validate the results obtained using the DEA method. The Lithuanian bank's efficiency

analysis based on the VRS assumption shows that better results are demonstrated by the local banks. The technical efficiency analysis based on the CRS assumption shows other results: the banks owned by the Nordic parent group and the branches have higher pure efficiency than local banks and have success at working at the right scale. Based on this, it stated that during the 2012–2016 period the larger Lithuanian banks (subsidiaries) applied a more appropriate business model than smaller (local) banks operating in Lithuania.

Kamarudin et al. (2017) examined the efficiency of domestic and foreign Islamic banks from the selected Southeast Asian Countries. The sample encompassed 29 domestic and foreign Islamic banks from Malaysia, Indonesia, and Brunei for 2006–2014. The study employed the Data Envelopment Analysis (DEA) method to measure banks' efficiency. Besides, the parametric and non-parametric tests were also performed to examine the difference in the efficiency of the foreign and domestic Islamic banks. This study found that Sharia Banks with domestic ownership had a higher level of efficiency than foreign Sharia Banks for 3 measurement efficiency (technical efficiency, pure technical efficiency, and scale efficiency).

Research on the level of efficiency of banks or units of economic activity continues to develop in various countries, following the adoption of a two-stage data envelope study. In this process, two stages of analysis are carried out (the first stage and the second stage). In the first step, measurements are made at the level of efficiency using the Data Envelopment Analysis (DEA) process. Meanwhile, in the second stage, a study was conducted to determine the factors affecting the level of bank efficiency using the Tobit model. The two-stage analysis gives the overall results regarding the level of efficiency of a bank or Economic Activity Unit (Liao, 2020). Lutfi and Suyatno (2019) This study examines the technical efficiency level of regional development banks (RDBs) in Indonesia and then analyzes the influence of bank-specific factors on this efficiency. This study uses data from all 25 conventional RDBs in Indonesia for the period 2012–2017 and a two-stage procedure to examine bank efficiency. Data Envelopment Analysis (DEA) is used to estimate bank technical efficiency and panel data techniques, both fixed effects (FE) and random effects (RE), are used to assess the determinants of bank efficiency. The results of this study indicate that most Indonesian RDBs have yet to become efficient. The most important source of their inefficiency is non-interest income

Besides, bank efficiency is positively influenced by capital and the ratio of loans to deposits and negatively affected by non-performing loans and the proportion of time deposits. There is also evidence held by the size of the bank's U-shaped influence on efficiency. Jiménez-Hernández et al. (2019) conducted a Two-Stage Data Envelopment Analysis

study of the banking industry in Latin America from 2014–2016. In the first stage, Data Envelopment Analysis (DEA) and conditional efficiency analysis techniques were used to assess the relative efficiency level of 409 banks for the 2014–2016 period. The conditional efficiency approach considers environmental variables (that are beyond the manager's control), which could influence the shape and the level of the boundary of the attainable set. In the second stage, the resulting conditional efficiency scores are correlated with internal variables), which might affect the distribution of the inefficiencies. First stage scores reveal the heterogeneity of average efficiency within the region, ranging between 0.953 for Chile and 0.294 for Nicaragua in the case of radial efficiency, and between 0.798 and 0.270 in the case of conditional efficiency scores. These results show how bank industries in countries such as Chile, Brazil, Colombia, and Mexico are operating at high levels of technical efficiency relative to the region. Regarding the conditional efficiency scores, these results show how variables that are beyond managerial control have a greater effect on some countries' banking industries than on others. In this regard, banks in Brazil, Chile, Mexico, and Panama are the most affected by external variables.

In addition to banking, the measurement of efficiency using DEA is also applied to insurance companies such as the Abidin and Cabanda (2011) examined 23 insurance companies using two-stage DEA which showed that large insurance companies are more efficient than small insurance companies. In the Tobit Regression test, profitability ratios have a positive effect on efficiency except for ROA. Defung et al. (2016) examined the impact of regulatory changes on the efficiency of the Indonesian banking industry using DEA and Tobit Regression. One of the paper findings is that BPD had lower technical efficiency than both state-owned and private banks in Indonesia. Moreover, Almanza and Rodríguez (2018) analyzed the sources of bank efficiency using the VRS model and the intermediation approach on the DEA method for domestic and foreign banks in Colombia over the period 2000–2011. To perform this research, the authors propose a score of bank efficiency using the directional distance function, which was estimated using data envelopment analysis. Additionally, they use an ordered Tobit panel regression to explore the effects of some market-related and bank-specific factors on efficiency. The results show that the non-inclusion of non-performing loans (NPLs) leads to higher bank inefficiency indicators, which are significantly different from those obtained when NPLs are included.

Kumar et al. (2020) examined The study examines the efficiency of private sector banks in India with the help of Window DEA (Data Envelopment Analysis) for a period from 2005 to 2017. With a window of three years, the period was divided into 11 windows. The study outcomes show that

59.9% of all private sector banks in India operate at more than 0.9 level of efficiency, and there are only three occasions when banks were operating at the efficiency value between 0.6 to 0.7. Further, the consistency in the efficiency scores of the banks has also been analyzed using an efficiency mapping matrix, and the mean efficiency score of the bank in each window is studied. The score of standard deviation was interpreted accordingly for these banks that are showing the highest efficiency scores also have a higher variance of efficiency scores. There was no bank identified in the matrix that promises high-efficiency ratings with low variability. The study concludes that the analysis of the efficiency mapping matrix indicates that, as a DMU escalates in the efficiency scores, the standard deviation reflecting the risk in overall efficiency scores also tends to rise. The findings complement the concept of higher risk to higher return or greater efficiency.

3. Research Methodology

The study population was all conventional commercial banks, including Regional Development Banks (BPD), with category 1 and 2. Commercial Banks grouping, totaling to 18 BPD and 35 non-BPD (BUK) with a total of 53 banks. The secondary data used comes from the 2017 and 2018 publication report period contained in the Financial Services Authority (OJK). Banks that do not have complete financial statements during the observation period are not included in the research object. The first step in this research is to use the DEA method using the Banxia Frontier Analysis (BFA) software to determine the level of efficiency of category 1 and 2 banks during 2017-2018. The DEA method is a non-parametric frontier model using a linear model. The DEA method aims to measure the level of efficiency of the Decision-Making Unit (DMU) against a similar DMU when all units are below or on the frontier “curve” by calculating the ratio of input and output ratios of the population that serves as the benchmark the efficiency performance.

The DEA method measures technical efficiency for all DMUs. The level of efficiency has a relative score depending on the level of efficiency of other units in the sample population. The score of the efficiency level is 0 to 1. A unit is said to be relatively efficient if its value is equal to 1 (efficiency value = 100%). Conversely, if the value is less than 1, then the unit is considered relatively inefficient (Silkman, 1986). DEA method has two approach models namely the CCR model which is referred to as the CRS (Constant Return to Scale) model. CRS assumes CRS reflects the fact that output will change by the same proportion as inputs are changed which means that if there is an input increase of n times, the output will also increase by n times. Another assumption contained in this model is that each unit has operated at the optimum scale (optimum scale).

The second approach model is the Banker, Charnes, Cooper model, or BCC which assumes that the unit does or does not operate at an optimal scale. The addition of input and output is not the same which means that if there is an increase in input by n times will not cause the output to increase by n times. The output can increase or decrease from the value; the BCC model is also referred to as the Variable Returns to Scale (VRS) model. VRS reflects the fact that production technology may exhibit increasing, constant and decreasing returns to scale. The model used in this study is the BCC or VRS model because the sample of this study is a bank where various obstacles and financial competition can cause the company not to operate optimally and the BCC model is more appropriate to be used to analyze the efficiency of service companies.

Based on the input-output relationship between bank functions, the approach used in this study is the intermediation approach. The intermediation approach views banks as intermediaries where banks function to change and transfer financial assets from surplus units to deficit units. In this case, institutional inputs are payments of interest on deposits, with output measured in the form of loans and financial investments. The input component in this study is based on Abidin and Cabanda (2011), namely Third-Party Funds (I1), Overhead Costs (I2), Interest Expense (I3). While outputs used in the study are Loans (O1), Interest Income (O2), and Operating Income Other than Interest (O3).

The financial ratios used in this study are CAEL (Capital, Assets, Earnings, Liquidity). The reason CAEL does not use the management component is that there are differences in the assessment of financial factors and management factors in the CAMEL method used in Indonesia (Sugianto et al., 2020). The next step is to use the Tobit regression analysis method to determine the relationship between efficiency and financial performance. Tobit regression analysis is used because the data in this study is which has the meaning of an independent variable where there are zero values and certain value variations. The level of efficiency measured through DEA is censored data that has a restricted value and should only range from 0-100. Statistically, the model is formulated as follows:

$$Y^* = \beta x_i + \varepsilon_0, \\ y_0 = y^* \text{ if } y^* > 0 \\ y_0 = 0, \text{ otherwise}$$

Where:

- $-\varepsilon_0$: $\sim N(0, \sigma^2)^3$
- $-x_0 \text{ dan } \beta$: variable vectors and unknown parameters
- y_0 : score DEA
- $-y^*$: latent variable

Where regression Tobit model in this study is as follows:

$$Y_{it} = \beta_0 + \beta_1 \text{CAR}_{it} + \beta_2 \text{NPL}_{it} + \beta_3 \text{ROA}_{it} + \beta_4 \text{LDR}_{it} + \mu_{it}$$

Where:

Y_{it} : The efficiency of conventional domestic banks results from DEA scores

CAR_{it}: Capital Adequacy Ratio

NPL_{it}: Non- Performing Loan

ROA_{it}: Return on Asset

LDR_{it}: Loan to Deposit Ratio

μ_{it} : Random Error

The Tobit method is chosen because the data used in this research is a censored data which implies that the value from the independent variable is banking efficiency. Banking efficiency has a limited value for only 0-100. When the Ordinary least squares (OLS) method uses censored data, the results of the regression must be bias or inconsistent. Even Tobit analysis is one of regression analysis, but Tobit

regression does not need normality, heteroscedasticity, multicollinearity, and autocorrelation test (Sari & Saraswati, 2017).

4. Results and Discussion

In DEA, the result of efficiency has a value of zero to one where a value of 1 or 100% is the most efficient value. BUK and BPD which have a score of one are declared efficient, which means BUK and BPD can optimize all of its power sources. Conversely, if BUK and BPD have a score of zero to less than one, BUK and BPD are declared inefficient in optimizing the power sources they have and they have not been able to carry out their role as an intermediary institution optimally. Measurement of the value of efficiency in BUK and BPD in Indonesia involves 14 DMU samples. Tables 1 and 2 show the achievement of efficiency levels in each of the BUK and BPD in both categories (1&2) in the 2017-2018-time frame.

Table 1: Calculation Results of DEA Category 1 Banks

No	Banks	2017	2018
Banks - Non-BPD (BUK)			
1	PT Bank Dinar Indonesia	0,92	0,72
2	PT Bank Harda Internasional	0,94	0,83
3	PT Bank Kesejahteraan Ekonomi	0,98	0,96
4	PT Bank Mitraniaga	1,00	1,00
5	PT Bank Royal Indonesia	0,83	0,91
6	PT Bank Yudha Bhakti	0,96	1,00
7	PT Prima Master Bank	0,84	0,78
8	PT. Bank Agris	0,89	0,82
9	PT Bank Amar Indonesia	1,00	1,00
10	PT Bank Artos Indonesia	0,65	0,66
11	PT Bank Bisnis Internasional	1,00	1,00
12	PT Bank Fama Internasional	1,00	1,00
BPD			
13	PT Bank Pembangunan Daerah Banten, Tbk	0,90	0,90
14	PT BPD Bengkulu	1,00	1,00
15	PT BPD Lampung	0,98	1,00
16	PT BPD Sulawesi Tengah	0,98	0,91
17	PT BPD Maluku Dan Maluku Utara	1,00	1,00
18	PT BPD Sulawesi Tenggara	1,00	1,00
Average		0,94	0,92
The highest		1,00	1,00
The lowest		0,65	0,66

Table 2: Calculation Results of DEA Category 2 Banks

No	Banks	2017	2018
Banks - Non-BPD (BUK)			
1	PT Bank Artha Graha Internasional, Tbk	1,00	0,98
2	PT Bank Bumi Arta, Tbk	0,74	0,70
3	PT Bank Capital Indonesia, Tbk	0,55	0,54
4	PT Bank China Construction Bank Indonesia, Tbk	0,74	0,66
5	PT Bank Commonwealth	1,00	0,83
6	PT Bank Ctbk Indonesia	1,00	0,79
7	PT Bank Ganesha	0,91	0,98
8	PT Bank Ina Perdana	1,00	1,00
9	PT Bank Index Selindo	0,97	0,82
10	PT Bank Jasa Jakarta	0,74	0,72
11	PT Bank Jtrust Indonesia, Tbk	0,93	0,68
12	Pt Bank Mandiri Taspen Pos	0,93	0,89
13	PT Bank Maspion Indonesia	0,66	0,57
14	PT Bank Mayora	0,54	0,56
15	PT Bank Mestika Dharma	1,00	1,00
16	PT Bank MNC Internasional, Tbk	0,79	0,69
17	PT Bank Multiarta Sentosa	0,62	0,64
18	PT Bank Nationalnobu	0,53	0,59
19	PT Bank Nusantara Parahyangan, Tbk	0,79	0,78
20	PT Bank of India Indonesia, Tbk	1,00	1,00
21	PT Bank Oke Indonesia	1,00	1,00
22	PT Bank QNB Indonesia, Tbk	0,90	0,90
23	PT Bank Rabobank International Indonesia	0,83	0,79
24	PT Bank Resona Perdania	1,00	1,00
25	PT Bank Sahabat Sampoerna	0,95	0,83
26	PT Bank Sbi Indonesia	0,96	1,00
27	PT Bank Shinhan Indonesia	1,00	1,00
28	PT Bank Sinarmas, Tbk	1,00	1,00
29	PT Bank Victoria International, Tbk	0,99	0,82
30	PT Bank Woori Saudara Tbk	1,00	1,00
31	PT Bri Agroniaga, Tbk	0,75	0,71
BPD			
32	PT BPD Bali	1,00	1,00
33	PT BPD Daerah Istimewa Yogyakarta	0,94	1,00
34	PT BPD Jambi	1,00	1,00
35	PT BPD Kalimantan Barat	0,91	0,88
36	PT BPD Kalimantan Selatan	0,99	0,83
37	PT BPD Kalimantan Timur	1,00	0,89
38	PT BPD Kalteng	1,00	1,00
39	PT BPD Nusa Tenggara Timur	1,00	1,00
40	PT BPD Papua	1,00	1,00
41	PT BPD Riau Dan Kepulauan Riau	0,98	1,00
42	PT BPD Sulawesi Selatan Dan Sulawesi Barat	1,00	1,00
43	PT BPD Sulawesi Utara Gorontalo	1,00	1,00
44	PT BPD Sumatera Barat	0,94	0,90
45	PT BPD Sumatera Selatan Dan Bangka Belitung	0,89	0,89
46	PT BPD Sumatera Utara	1,00	1,00
Average		0,90	0,87
The highest		1,00	1,00
The lowest		0,53	0,54

From Table 1 (Bank Category 1) we can see that in 2017 there were 4 BUK (Mitraniaga, Amar Indonesia, International Business and International Fama) and 3 BPD (Bengkulu, Maluku, and North Maluku, and Southeast Sulawesi) which were included in the efficient category with a total of 38.9% efficient banks. The remaining 8 BUK and 3 BPD are included in the inefficient category or a total of 61.1% of banks are inefficient. In 2018 there were 5 BUK (Mitraniaga, Yudha Bakti, Amar Indonesia, International Business and International Fama) and 4 BPD (Bengkulu, Lampung, Maluku, and North Maluku, and Southeast Sulawesi) which were included in the efficient category with a total of 50% of banks efficient. As many as 7 BUK and 2 BPD experienced inefficiencies or 50% of banks were inefficient. This shows that the efficient level of both BUK and BPD banks has decreased in 2018. When viewed from the average BUK and BPD scores in category 1 banks, it can be concluded that there was a decrease in the efficiency level from 0.94 in 2017 to 0.92 in 2018. PT Bank Artos Indonesia experienced the lowest inefficiency among banks in category 1. The average BUK score for 2017 is 0.92 and in 2018 it is 0.89. While the average BPD score in 2017 is 0.98 and in 2018 it is 0.97.

From Table 2 (category bank 2) it can be concluded that in 2017 and 2018, there were 8 BUK experiencing efficient conditions. As is also the case with category banks, when seen from the average level of efficiency there was a decrease from 2017 by 0.90 to 0.87 in 2018. However, if we compare it with category 1 banks, the average value of Bank category 2 is lower than category 1 banks. The next stage in the two-stage DEA is analyzing the factors

that influence the efficiency of BUK and BPD for both category 1 and category 2 banks using the Tobit model. Tobit analysis results can be seen in Table 3 for category 1 banks and Table 4 for category 2 banks. From the results of the DEA above it can be concluded that the level of bank efficiency in category 1 and category 2 banks has not yet reached the maximum level of efficiency. If we look at the average BUK and BPD efficiency scores, the BPD efficiency level score is higher than the BUK in the study period. This is not in line with research by Defung et al. (2016) which revealed that state-owned banks (BUK) are more efficient than BPD banks in Indonesia. Research conducted by Lutfi and Suyatno (2019) about the efficiency of BPD in Indonesia by using the DEA method states that there are only 3 BPD are efficient in terms of production and 5 BPD are efficient in terms of operations. Inefficiency in production is due to lack of income other than government funds, optimal lending, investment placement not being optimal, high cost of human resources, and high-interest costs. Where the cause of inefficiency in operations is the high cost of human resources, high-interest costs, and administrative costs.

Table 3 shows that the significant variable (<0.05) is the ROA variable, which means that the ROA variable influences the level of BUK and category group 1. The CAR NPL and LDR variables are not significant (> 0.05) which meaning that it does not influence the level of efficiency of BUK and BPD category groups 1. The ROA variable has a regression coefficient of 0.0134, it indicates that if the ROA variable increases by one percent (1%), it will increase efficiency by 2.499 percent.

Table 3: Category 1 Tobit Regression Test Results

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.924910	0.046021	20.09776	0.0000
CAR	-0.000396	0.103136	-0.003839	0.9969
NPL	-0.215759	0.654559	-0.329625	0.7417
ROA	2.499288	1.011040	2.471998	0.0134
LDR	-0.008637	0.067258	-0.128421	0.8978

Table 4: Category 2 Tobit Regression Test Results

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.722149	0.039893	18.10218	0.0000
CAR	0.143364	0.128685	1.114069	0.2652
NPL	1.998823	0.676766	2.953493	0.0031
ROA	2.820548	0.802100	3.516452	0.0004
LDR	0.024685	0.020611	1.197689	0.2310

Table 5: Mann-Whitney Bank Difference Test Results in Category 1

Group	Mean Rank	Value of Mann-Whitney	Significance Value
Non BPD (BUK)	16,46	95,00	0,0000
BPD	22,58		

Table 6: Mann-Whitney Bank Difference Test Results in Category 2

Group	Mean Rank	Value of Mann-Whitney	Significance Value
Non-BPD (BUK)	39,61	503,00	0,0000
BPD	60,73		

The category 2 banks in Table 4 shows that the NPL and ROA variables are significant (<0.05) or have an influence on the level of bank efficiency. While the CAR and LDR variables are not significant (> 0.05) or do not affect the efficiency level of category 2 banks. From the test results of the Tobit regression analysis, the results show that the ROA variable has a significant effect on the level of bank efficiency in categories 1 and 2. This is in line with several studies, namely Garza-García (2012) and Tecles and Tabak (2010) which states that banks that generate greater profits are efficient. Prospective customers are also more confident when they know a good level of profitability to place their funds or apply for credit. This makes it more efficient. In category 2 banks, the NPL variable turns out to have a significant effect on the level of efficiency that is in line with the research of Sunaryo et al. (2020), Almanza and Rodríguez (2018), Partovi and Matousek (2019), Jiménez-Hernández et al. (2019), and Widiarti et al. (2015), where the lower the NPL the efficiency increases but this result is not in line with the study of Choudhry and Jayasekera (2012) who found that NPL as a proxy did not affect banking efficiency.

Furthermore, the Mann-Whitney test analyzes the presence and absence of differences between the BUK group and the BPD group in both category 1 and category 2. The results of the Mann-Whitney test are listed in Table 5 for the category 1 banks and Table 6 for the category 2 banks.

From the results of data processing for category 1 banks, it is known that BUK has an average value of 16.46, and BPD has an average value of 22.58. The value of Mann-Whitney obtained is 95 and the significance value is 0,000. From these results, it is known that the significance value is $0,000 < 0.05$. Therefore, it can be concluded that there are differences in the level of efficiency between the BUK and BPD in the category 1 banks.

From the results of data processing for category 2 banks, it is known that BUK has an average value of 39.61, and BPD has an average value of 60.73. The value of Mann-Whitney obtained is 503 and the significance value is 0,000. From these results, it is known that the significance value is $0,000 < 0.05$. Therefore, it can be concluded that there are differences in

the level of efficiency between BUK and BPD in category 2 banks. These results are consistent with the findings of Hutama and Prasetyo (2016) and Le (2020). However, the result of the Mann-Whitney test is not consistent with several researchers such as Hutama and Prasetyo (2016) and Naushad et al. (2020) who found out that there is no significant difference in the average level of efficiency between Islamic banks, state-owned banks, and foreign banks.

5. Conclusions

Overall category 1 and category 2 banks have a downward trend (from 2017 to 2018) with regard to the average level of efficiency. When viewed in terms of BUK, banks have a lower level of efficiency compared to BPD. The level of efficiency of category 2 is lower than category 1. The results of the Tobit regression analysis test found that the financial performance variable affecting category 1 banks was ROA while for category 2 it the variables were ROA and NPL. Banks that have higher ROA will have a better level of efficiency because banks that operate efficiently can generate higher returns. NPL can affect the level of efficiency because if the level of bad loans is high, the bank will incur additional costs to manage the decline in NPLs. After conducting the Mann-Whitney test, it can be seen that there are differences in the level of efficiency between the BUK and the BPD in category 1 and category 2. This study uses a non-parametric Data Envelopment Analysis (DEA). For further research, it is recommended to use a parametric approach, for example, Stochastic Frontier Analysis (SFA) or Thick Frontier Approach (TFA). While the inputs and outputs in this paper use an intermediation approach, further research can be developed with the asset approach or production approach.

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