



THE INFLUENCE OF NIM, BOPO, LDR, AND SIZE TOWARD RETURN ON ASSETS (ROA) AND ITS RELATIONS WITH TECHNICAL EFFICIENCY ON BANKS (BUKU 4) IN INDONESIA

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ABSTRACT

This study aims to know the influence of NIM, BOPO, LDR, and Size toward Return on Assets (ROA) and its relations with technical efficiency. Data Envelopment Analysis (DEA) approach is used to measure technical efficiency. This study also uses multiple regression analysis methods. It takes banks BUKU 4 in Indonesia from the first quarter of 2018 to the fourth quarter of 2020 as the sample. The finding also reveals that there is a weak correlation between technical efficiency and ROA. Meanwhile, NIM and Size have a significant positive impact on ROA. BOPO has a significant negative impact on ROA. Meanwhile, LDR has an insignificant positive impact on ROA. Simultaneously, those independent variables have a significant effect on ROA. Among the independent variables, NIM is the most significant towards ROA.

Keywords: *return on assets, net interest margin, loan to deposit, size, efficiency, data envelopment analysis.*

1. Introduction

Background

A company engaged in services that provide financial services to all levels of society is known as a bank. In essence, a bank functions as an intermediary between parties with excess funds (surplus) who save their excess funds in financial institutions and those who lack funds (deficits) who borrow funds from financial institutions. Therefore, trust in financial institutions is crucial so that the intermediation function can run as expected (Wahab, Hosen, & Muhari, 2014). If the intermediation function is achieved, the use of funds will be more optimal and efficient. It will impact increasing the productive activities of the loaned funds so that the output of production activities will increase, and new jobs that emerge will increase the level of prosperity and welfare of the community. The function of the bank is no longer limited to savings and loans. Banks also play an essential role in the country's economy by contributing to the business world (Fernando & Dewi, 2017). The Coronavirus Disease 2019 (COVID-19) pandemic will significantly affect the world economy in 2020. Starting from health problems to impact on social problems and the global economic crisis. During 2020, the global economy continued to be depressed due to the decline in population (human) mobility business activities in line with the increase in the number of infected cases, causing an economic crisis in most countries.

In the fourth quarter of 2020, the global economy gradually improved, as reflected in the economic growth of several countries, which, although still contracting, was better than the previous quarter. Figure 1.2. shows on an annual basis, the economic development of most countries contracted due to the COVID-19 pandemic, except for Tiongkok (China), which grew positively due to more effective handling of COVID-19 so that economic recovery was also faster. The growth of the Tiongkok (China) economy has also contributed to the increase in export demand which has supported the economic recovery of other countries. As a result of the pandemic, global economic growth throughout 2020 contracted after the last time the global economy experienced negative growth in 2009 due to the Global Financial Crisis.

According to the fourth quarter of the OJK Banking Industry Profile Report 2020 (OJK, 2020), it shows that ROA levels have continued to decline in value from the fourth quarter of 2019 - the third quarter of 2020 - the fourth quarter of 2020. This phenomenon certainly needs to be considered because profitability is one of the ratios used to assess the condition of a bank (Yuniari & Badjra, 2019). The health crisis due to the Covid-19 pandemic has significantly affected almost all sectors, including banking. The banks with core capital above IDR 30 trillion or BUKU IV banks could not do much. Its published semester 2020 financial reports show that all of them are experiencing pressure on financial performance. Research on the financial performance of banks BUKU IV can be a reference / representative overview of the state of financial performance for banks with less core capital than banks BUKU IV.

This study focuses on the factors that affect ROA during the observation year. One way to determine the health level of a bank's financial performance is to measure the bank's profitability performance. There are several indicators to measure a bank's profitability, such as the Return on Assets (ROA), Return on Equity (ROE), and Net Profit Margin (NPM). This study focuses on Return on Assets (ROA) because, according to, Bank Indonesia also prioritizes the value of a bank's profitability as measured by ROA, which measures assets whose funds mostly come from public savings so that ROA is more representative in measuring the level of profitability (Putrianiingsih & Yulianto, 2016). ROA focuses more on the company's ability to earn revenue in its operations as a whole so that the greater the ROA, the better because it shows a greater rate of return (Avrita & Pangestuti, 2016).

One way to measure the performance of another business unit is efficiency if there is a rapid change in financial structure, it is essential to identify cost efficiency and income (Wahab, Hosen, & Muhari, 2014). An efficient bank is expected to get optimal profits. In other words, the level of profitability will increase, which can be used to increase retained earnings, improve service to customers by increasing the skills of its employees and increase the quality and quantity of its facilities and infrastructure. Two general approaches are often used to measure efficiency performance in the banking industry, namely the traditional approach and the frontier approach. From the conventional process measured by financial ratios and for the frontier approach using a combination of input-output (Hosen & Rahmawati, 2016).

Research Gap

The researcher found the bank's role is essential in a country from the background. So, it is necessary to keep the banking sector stable and healthy and could be challenging if they experience an unexpected event such as the COVID-19 pandemic. The COVID-2019 outbreak, which began to expand at the beginning of 2020, has hit the joints of the global economy. Economic growth in all countries has slowed down, and many have even contracted due to reduced economic activity and consumption due to the social distancing and lockdown policies implemented to mitigate the spread of COVID-19 (Otoritas Jasa Keuangan (OJK), 2020). To maintain the banking industry's resilience during the COVID-19 pandemic, OJK seeks to improve risk mitigation by improving the quality of supervision and strengthening regulations while maintaining the security and quality of services in the financial services sector to consumers. In the reporting period, OJK issued three banking regulations. One of them is POJK No.11/POJK.03/2020 concerning National Economic Stimulus as a Countercyclical Policy on the Impact of the Spread of Coronavirus Disease 2019.

Meanwhile, banking capital resilience was recorded solid during the reporting period despite mounting pressure on global and domestic financial markets. Capital resilience is considered strong enough to mitigate potential risks faced by banks (Otoritas Jasa Keuangan (OJK), 2020). However, because the peak of the COVID-19 pandemic is unknown, it is necessary to be aware of the potential for increased risk in the future due to the low demand for

credit and the possibility of low consumer purchasing power accompanied by a decrease in the ability to pay debtors.

The existence of an empirical phenomenon, namely regarding bank financial ratios that fluctuate and the discovery of research gaps based on the results of previous studies which are still unable to provide satisfactory and inconsistent results, differences in financial ratios and different sampling years are the basis for the need to re-conduct research on factors affecting profitability (Avrita & Pangestuti, 2016). This study took banks in the BUKU 4 category as an object of research to whether NIM, BOPO, LDR, and Size of banks with classes like this had a significant effect on profitability. The profitability itself will be presented as Return on Asset (ROA).

Theoretical Framework

This research aims to find the impact between the Net Interest Margin (NIM), Operational Efficiency Ratio (BOPO), Loan-To-Deposit Ratio (LDR), Size (SIZE) toward Return on Asset (ROA). This theoretical was formed by 4 independent and 1 dependent variables. The following figure shows the diagram of theoretical framework.

Return on Assets is one of the indicators used to assess management performance. Return On Assets consists of comparing the Net Income generated by the company compared to the assets managed by the company. The thing that drives Net Income is mainly the ability of banks to collect third party funds and lend them and the efficiency of bank operations (Choiriyah et al., 2020). The ability to collect third party funds is measured using the Net Interest Margin and Loan to Deposit Ratio and Size variables. In contrast, operational efficiency is measured using operational efficiency variables (Nugraha et al., 2020). Based on the existing theory, a framework is made in Figure 1.

According to the study conducted by Yudha, Chabachib, and Demi (2017), NIM had a positive influential significant on ROA in domestic banks and foreign banks. The same result showed by the study conducted by Sari, Anshori, and Primasari (2018), which found that there is a strong positive correlation between the NIM and the ROA (profitability). Contrary, a different result was found by Stephani, Adenan, Hanim (2017), which found that NIM had a positive influence and was not significant on ROA.

Kusmayadi (2018) found that BOPO had a negative effect and significant toward ROA. This finding was also supported by Stanley, Hutahaeen, Sinaga, Vita, and Sonia (2020), which showed the same result. The same conclusion conducted by Nahar & Prawoto (2017) found that BOPO has a negative sign and is statistically significant to the bank's profitability (ROA). Contrary, a different result showed by the finding conducted by Zulvia (2020), which found BOPO had a positive and not significant effect on ROA.

Yudha, Chabachib, and Demi (2017) found that LDR had a negative influence and was not significant on ROA in domestic banks; however, in foreign banks, LDR had a negative impact but was essential toward ROA. Contrary, a different result was found by Kusmayadi (2018) and Stanley, Hutahaeen, Sinaga, Vita, and Sonia (2020), which found that LDR had a positive effect and was not significant toward ROA. A different result showed by Sari, Anshori, and Primasari (2018) study found that LDR had a significant positive effect on ROA. On the other hand, Nahar & Prawoto (2017) found that FDR or LDR had a negative sign and was statistically significant to bank profitability (ROA).

Based on the previous study from Kusmayadi (2018), there is an adverse effect and significant relations between Size and ROA. On the other hand, Irawati and Maksum (2017) found a positive and significant impact of Firm size on a bank's ROA.

There is various research related to this study. However, different results appear in each study. Based on the previous research from Setiawan and Kodratillah (2017), there is no significant relationship between technical efficiency and ROA. The same result showed by the study conducted by Kusmayadi, Badruzaman, and Firmansyah (2017) and Kristianto and Hendrawan (2020), which found technical efficiency does not affect ROA. A different result showed by the study conducted by Soetanto and Ricky (2011) found that technical efficiency is negatively correlated with the bank's profitability (ROA).

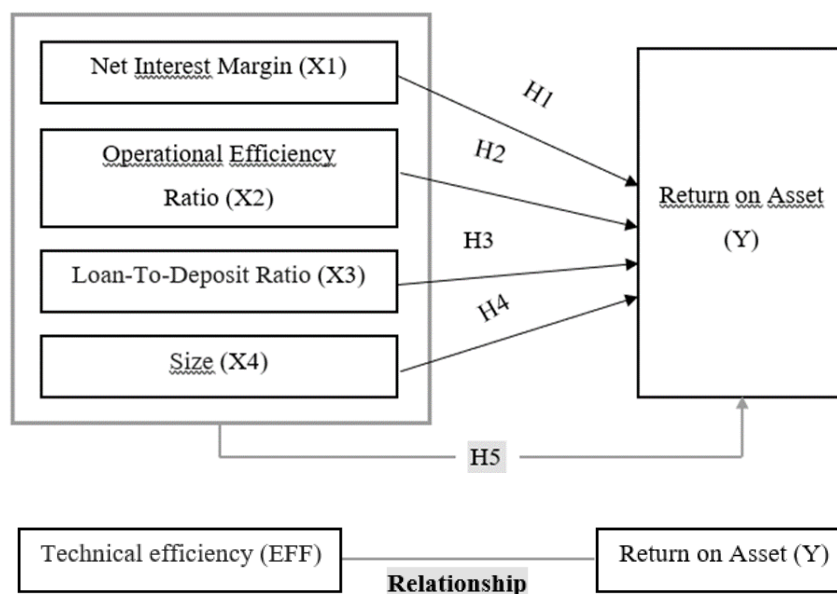


Figure 1. Theoretical Framework

(Source: Constructed by Researcher, 2021)

Hypotheses

The hypothesis is a temporary presumption relating to this research and needs to be proven. Based on the problem and theoretical framework, here are the hypotheses that can be the answer for this study.

1. Ha1: There is a partial significant influence of NIM towards ROA of Banks BUKU 4 during 2018Q1-2020Q4.
2. Ha2: There is a partial significant influence of BOPO towards ROA of Banks BUKU 4 during 2018Q1-2020Q4.
3. Ha3: There is a partial significant influence of LDR towards ROA of Banks BUKU 4 during 2018Q1-2020Q4.
4. Ha4: There is a partial significant influence of Size towards ROA of Banks BUKU 4 during 2018Q1-2020Q4.
5. Ha5: There is a simultaneous significant influence of NIM, BOPO, LDR, and Size towards ROA of Banks BUKU 4 during 2018Q1-2020Q4.

Relationship between technical efficiency and ROA

6. Ha6: There is a relationship between technical efficiency and ROA of Banks BUKU 4 during 2018Q1-2020Q4.

2. Method

Research Flow

The research methodology consists of three types of research, namely research using qualitative methods, quantitative methods, and mixed methods containing both quantitative and qualitative approaches. This study uses quantitative methods by specifically using statistical tools. The steps that will be used in this study are illustrated in figure 2.1. The first step is the background of this research. Based on the existing background, the research departs from the existing theory and is used today. Ideally, this research can contribute to the existing theory. In the case of this research, the hope of this research is the application of theory to conditions in the field and to see how a financial theory can explain phenomena in the field.

The first step in researching a phenomenon is to collect existing data. The data used is secondary data, namely data reported by the company in its financial statements. The company's financial statements have been audited by a public accountant so that the researcher assumes that the data is reliable and valid to be used as a data source.

The data processing uses the statistical method of panel data regression. Panel data regression is a form of regression that combines time-series data and cross-section data, namely comparison data between several companies. Furthermore, the model will be tested for suitability using the F test, and each variable in the model will be tested using the t-test.

In addition to looking at the suitability of the model and the relationship between variables, another thing that needs to be seen is the measurement of the efficiency of the object of research, in this case, the bank under study. The DEA method or Data Envelopment Analysis is used, which is a non-parameter method to see the level of efficiency.

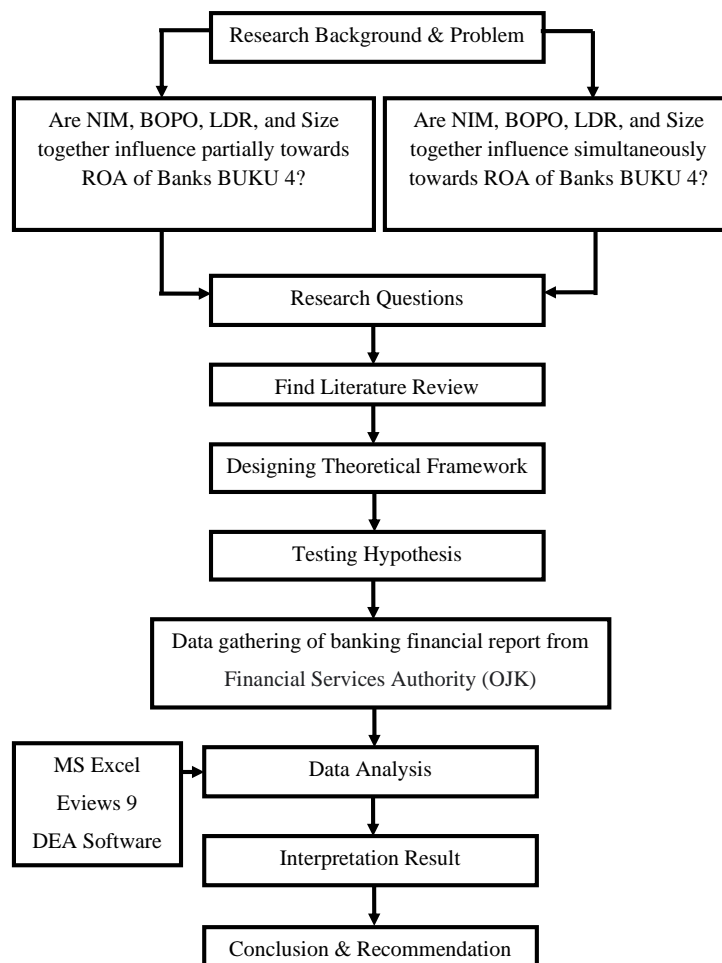


Figure 2. Research Framework
(Source: adjusted by researcher, 2021)

Data Gathering Procedures

According to Sugiyono (2005), a population is a generalization area consisting of objects or subjects with specific qualities and characteristics determined by researchers to study and then draw conclusions (Pradana & Reventiary, 2016). The population in this study are all 7 commercial banks BUKU 4 operate during the first quarter of 2018 to the fourth quarter of 2020.

Purposive sampling is a type of sampling technique commonly used in scientific research. According to Sugiyono (2008), purposive sampling is a sampling technique by determining specific criteria (Mukhsin, Mappigau, & Tenriawaru, 2017). The sample determination process is as follows:

1. Commercial bank in Indonesia includes Bank BUKU 4, which operated in Indonesia from January 2018 to December 2020.
2. Commercial bank in Indonesia that includes Bank BUKU 4 listed in Indonesia from January 2018 to December 2020.
3. Commercial banks in Indonesia, including Bank BUKU 4, provide a complete and transparent financial report continuously with no out layer data amid the research period and are also used for the technical efficiency analysis.
4. Commercial bank in Indonesia that include as Bank BUKU 4 which no negative value of each variable calculation as a rule settled by DEA and eviews.

From the above criteria, there are 7 banks of BUKU 4 selected as the research sample in the study will then be used to calculate each variable with a total panel observation of 84. Here are 7 commercial banks BUKU 4 that the researcher in this research will use:

1. PT Bank Central Asia Tbk (BBCA)
2. PT Bank Rakyat Indonesia Tbk (BBRI)
3. PT. Bank Negara Indonesia Tbk (BBNI)
4. PT. Bank Danamon Indonesia Tbk (BDMN)
5. PT. Bank Mandiri Tbk (BMRI)
6. PT. Bank Pan Indonesia Tbk (PNBN)
7. PT. Bank CIMB Niaga Tbk (BNGA)

The definition of each input variable and research output for the technical efficiency of 7 commercial banks BUKU 4 with a non-parametric DEA approach are as follows:

Table 1. Definition of Input and Output Variables

Variable	Operational Definition	Scale	Source
Input			
Fixed Asset	Fixed Asset and Inventories	Nominal	Kristianto and Hendrawan (2020)
Deposit	Deposit	Nominal	Kristianto and Hendrawan (2020)
Interest Expense	Total Interest Expense	Nominal	TITKO, STANKEVIČIENĖ, and LĀCE (2014)
Output			
Interest Income	Total Interest Income	Nominal	TITKO, STANKEVIČIENĖ, and LĀCE (2014)
Operating Income	Net Operating Income	Nominal	Kusmayadi, Badruzaman, and Firmansyah (2017)

Source: Adjusted by Researcher, 2021

The operational definition of the factors is as follows:

Table 2. Definition of Independent and Dependent Variables

Variable	Definition	Formula	Scale
Dependent			
ROA	A ratio used to measure the ability of bank management to obtain profitability and manage the overall efficiency level of the bank's business.	Profit Before Tax to Average Total Assets	Ratio
Independent			
NIM	A ratio used to measure the ability of bank management to manage its productive assets to generate net interest income.	Net Interest Income to Average Productive Assets	Ratio

Variable	Definition	Formula	Scale
BOPO	A ratio used to measure the level of efficiency and also the ability of a bank to carry out its operational activities.	Total Operational Cost to Total Operating Income	Ratio
LDR	As an indicator of bank liquidity assessment, namely the competence to repay bank obligations to customers.	Credit to Third-Party Funds	Ratio
Size	A scale where the size of the company can be classified as measured by total assets, total sales, share value and so on.	Ln (Total Asset)	Percentage

Source: Adjusted by Researcher, 2021

Estimation of Technical Efficiency

Efficiency for a bank is a measurement of the inputs used by the bank and the outputs that the bank can produce. The nature of efficiency is relative, meaning that the measure of efficiency is only meaningful when viewed in the context of comparison. Efficiency between banks can be compared so that it can be seen which bank is relatively more efficient and which bank is relatively less efficient (Puspitasari, Purnomo, & Triyono, 2017).

3. Results and Discussion

Company Profile

1. PT Bank Central Asia Tbk (BBCA)

PT Bank Central Asia Tbk or BCA is engaged in banking and other financial services. BCA operates as a commercial bank. The company started operating in banking since 12 October 1956. Its head office is located in Jakarta, Indonesia with Jahja Setiaatmadja as the President Director and Vera Eve Lim as the Director.

2. PT Bank Rakyat Indonesia Tbk (BBRI)

PT Bank Rakyat Indonesia Tbk or BRI is the oldest commercial bank in Indonesia, founded on December 16, 1895, in Purwokerto, Central Java. The scope of BRI's activities is conducting business in the banking sector. BRI is owned by the Government of the Republic of Indonesia as the majority shareholder. Its head office is located in Jakarta, Indonesia with Sunarso as the President Director and Handayani as the Director.

3. PT. Bank Negara Indonesia Tbk (BBNI)

PT. Bank Negara Indonesia Tbk or BNI is a state-owned commercial bank. BNI was founded on July 5, 1946. The scope of BNI's activities is to conduct business in the general banking sector. Its head office is located in Jakarta, Indonesia with Roykee Tumilaar as the President Director and Novita Widya Anggraini as the Managing Director - Finance.

4. PT. Bank Danamon Indonesia Tbk (BDMN)

PT. Bank Danamon Indonesia Tbk or Danamon is engaged in general banking services which was established on July 16, 1956. Its head office is located in Jakarta, Indonesia with Yasushi Itagaki as the President Director and Moljono Tjandra as the Director.

5. PT. Bank Mandiri Tbk (BMRI)

PT. Bank Mandiri Tbk or Mandiri operates in commercial banking services. The company was founded on October 2, 1998, as part of the Indonesian government's bank restructuring program. Its head office is located in Jakarta, Indonesia with Darmawan Junaidi as the President Director and Sigit Prastowo as the Director.

6. PT. Bank Pan Indonesia Tbk (PNBN)

PT. Bank Pan Indonesia Tbk or Panin is engaged in general banking both in Indonesia and abroad which was founded on August 14, 1971. Its head office is located in Jakarta, Indonesia with Herwidayatmo as the President Director and Hendrawan Danusaputra as the Vice President Director.

7. PT. Bank CIMB Niaga Tbk (BNGA)

PT. Bank CIMB Niaga Tbk or CIMB is engaged in general banking services and conducts other banking activities based on sharia principles, was established on 26 September 1955 under the name Bank Niaga. Its head office is located in Jakarta, Indonesia with Tigor M. Siahaan as the President Director and Vera Handajani as the Director.

Descriptive Statistics
After proceed all the data, the researcher found the results for the descriptive statistic as follow, with the number of data is 84.

Table 3. Descriptive Statistics Result

	ROA	NIM	BOPO	LDR	SIZE
Mean	0.0247	0.0523	0.7024	0.8491	20.026
Median	0.0266	0.0531	0.7190	0.9071	20.443
Maximum	0.0402	0.0764	0.9331	1.0792	21.075
Minimum	0.0002	0.0005	0.0081	0.0088	18.841
Std. Dev.	0.0099	0.0143	0.1739	0.2151	0.8024
Observations	84	84	84	84	84

Source: Calculated by Researcher, 2021

Refers to Table 3 the description value of the mean, median, maximum, minimum data, and standard deviation of each variable which are ROA (Y), NIM (X1), BOPO (X2), LDR (X3), and SIZE (X4) which rounded to 4 decimals points and the result is interpreted as follows:

The average or mean of ROA is 0.0247. Bank Central Asia contributes the highest point in the fourth quarter of 2019, which is 0.0402, followed by the lowest point from Bank CIMB Niaga in the first and second quarter of 2019 and 2020, which is 0.0002, and the standard deviation value is 0.0099.

The average or mean of NIM is 0.0523. Bank Rakyat Indonesia contributes the highest point in the second quarter of 2018, which is 0.0764, followed by the lowest point from Bank CIMB Niaga in the first and second quarter of 2019 and 2020, which is 0.0005, and the standard deviation value is 0.0143.

The average or mean of BOPO is 0.7024. Bank Negara Indonesia contributes the highest point in the fourth quarter of 2020, which is 0.9331, followed by the lowest point from Bank CIMB Niaga in the second quarter of 2019, which is 0.0081, and the standard deviation value is 0.1739. The average or means of LDR is 0.8491. Bank Pan Indonesia contributes the highest point in the fourth quarter of 2019, which is 1.0792, followed by the lowest point from Bank CIMB Niaga in the second quarter of 2020, which is 0.0088, and the standard deviation value is 0.2151.

The average or mean Size is 20.026. Bank Rakyat Indonesia contributes the highest point in the fourth quarter of 2020, which is 21.075, followed by the lowest from Bank Danamon in the third quarter of 2018, which is 18.841, and the standard deviation value is 0.8024.

Based on data from descriptive statistics, it can be seen that the bank with the best performance and the bank with the worst performance can be seen. In order to maximize its performance, ideally, the bank maximizes the value of Return On Assets, Net Interest Margin, and Loan to Deposit Ratio and minimizes its operational costs. Based on the data above, banks have advantages in each variable. Bank BRI, for example, managed to raise large amounts of funds and get the highest profit from these funds. Meanwhile, Panin Bank is a bank that has succeeded in channeling third party funds, meaning that this bank has achieved a level of efficiency in the use of third-party funds.

Meanwhile, Bank Niaga has succeeded in streamlining operational costs in terms of operational costs. However, in total, the bank managed to provide the highest return on the assets under its management as Bank Central Asia. At the same time, the standard deviation is an indicator to measure the spread of data, whether there are data far

beyond the other data or are called outliers. This data will affect when the data are used to analyze the relationship between variables using multiple linear regression. Based on the standard deviation, there is no outlier data, and this means that the existing data can be used for the multiple linear regression process.

Multiple Regressions

Table 4. Multiple Regression Results

Variable	Coefficient	t-Statistic	Prob.
C	-0.2897	-2.1046	0.0388
NIM	0.8870	9.2782	0.0000
BOPO	-0.0450	-6.5422	0.0000
LDR	0.0087	1.7840	0.0786
SIZE	0.0146	2.1303	0.0365
Adjusted R-squared	0.9233		
F-statistic	100.8780		
Prob (F-statistic)	0.000000		

Source: Calculated by Researcher, 2021

The table result shows the relationship between independent and dependent variables, the form of the multiple regression equation will be formed as follow:

$$Y = -0.2897 + 0.8870X_1 - 0.0450X_2 + 0.0087X_3 + 0.0146X_4 + e$$

The equation will be explained as follows:

The equation above shows how much influence the independent variable has on the dependent variable. This research model consists of four independent variables. There is a match between the relationship between the variables and the theory. The first variable, namely Net Interest Margin, has a positive relationship with Return On Assets. This relationship means that the higher the profit margin from the bank, the higher the return on assets. Operating Costs have a negative relationship with Return On Assets because the higher the cost, the lower the profit and lower the return on assets. The third variable, the Loan to Deposit Ratio, is an indicator of liquidity. Liquidity is an essential indicator for banks. The higher the liquidity, the more secure the bank will be, and it means that reducing costs such as Non-Performing Loan fees will be lower, and ultimately the returns will be higher. The fifth variable is the size variable. When the bank has more assets under management, the potential returns will be higher.

T-test

The T-test is a test to measure the relationship between variables. When the t-test shows a significant number, then the variable is significant. In contrast to the F test, which shows the relationship between variables in a model, the T-test shows a partial relationship between the independent variable and the dependent variable individually. Of the four independent variables in the model, one independent variable does not have a significant relationship with the dependent variable. The variable is the Loan to Deposit Ratio variable. At the same time, the other three variables have a significant relationship with the dependent variable, namely the variables of Net Interest Margin, Operating Costs and Operating Income, and Bank Size.

F-Test

In the table 4, the result of the probability F-test value is 0.0000. It means, it is lower than 0.05. Therefore, it makes the researcher rejects H_{05} and accepts H_{a5} . Hence, the independent variables of NIM, BOPO, LDR, and Size have a significant influence toward ROA simultaneously.

Adjusted Coefficient Determination (Adjusted R²)

From the table 4. before, the Adjusted R² value is equal to 0.9233 or 92.33%. It shows that the variables of NIM, BOPO, LDR, and Size are the factors that influencing the dependent for 92.33%, and the remaining of 7.67% is affected by the other variables/factors that are not included in this research as the variables.

Nonparametric Approach by DEA

This research uses quarterly data during period 2018Q1-2020Q4 of 7 banks BUKU 4 to find the technical efficiency score through the Data Envelopment Analysis (DEA) with DEA software. Appendix 8 shows that the mean value of technical efficiency of banks BUKU 4 in Indonesia period 2018Q1 – 2020Q4. The result shows that BNI's mean value is 0.7579 or 75.79%, CIMB's mean value is 0.9734 or 97.34%, Mandiri's mean value 0.8726 or 87.26%, and Panin's mean value is 0.7532 or 75.32%. Meanwhile, BCA; BRI; and Danamon have 1 or 100% for the mean value and are categorized as efficient. BNI, CIMB, Mandiri, and Panin are categorized as inefficient. The total mean of banks BUKU 4 in Indonesia period 2018Q1 – 2020Q4 is 0.9082 or 90.82%. It already shows that the average value for some banks BUKU 4 period 2018Q1 – 2020Q4 is inefficient because below than 1 or 100%.

Data Technical Efficiency for Each Banks:

1. PT Bank Central Asia Tbk

Based on Appendix 8, BCA value indicates fully efficient during period 2018Q1 – 2020Q4. The mean score efficiency of BCA is 1 or 100%. It means that BCA already maintains its technical efficiency by managing and organizing 100% of its inputs to produce the maximum outputs. The result of the efficiency value also reflects that the bank in organizing the inputs are already well managed. Therefore, BCA should maintain this performance in managing and do other improvements to keep being efficient for the future period.

2. PT Bank Rakyat Indonesia Tbk

Based on Appendix 8, BRI value indicates fully efficient during period 2018Q1 – 2020Q4. The mean score efficiency of BRI is 1 or 100%. It means that BRI already maintain its technical efficiency to be optimum by managing and organizing 100% of its inputs to produce the maximum outputs. The result of the efficiency value also reflects that the bank in organizing the inputs are already well managed. Therefore, BRI should maintain this performance in managing and do other improvements to keep being efficient for the future period.

3. PT. Bank Negara Indonesia Tbk

Based on Appendix 8, the efficiency score of the BNI period 2018Q2 – 2020Q4 shows that the bank never reaches the optimum efficiency score. BNI experiences the inefficiencies in technical efficiency for the whole project period. The mean score efficiency of BNI is 0.7579 or 75.79%. Averagely, the bank still used 75.79% of its inputs to produce the maximum outputs. The result reflects that BNI still cannot obtain the technical efficiency to be optimum. Therefore, the bank could reduce the inputs; fixed assets, deposit, and interest expense averagely at 24.21% to produce outputs; interest income and operating income on the same level.

4. PT. Bank Danamon Indonesia Tbk

Based on Appendix 8, Danamon value indicates fully efficient during period 2018Q1 – 2020Q4. The mean score efficiency of Danamon is 1 or 100%. It means that BCA already maintains its technical efficiency by managing and organizing 100% of its inputs to produce the maximum outputs. The result of the efficiency value also reflects that the bank in organizing the inputs are already well managed. Therefore, Danamon should maintain this performance in managing and do other improvements to keep being efficient for the future period.

5. PT. Bank Mandiri Tbk

Based on Appendix 8, the optimum efficiency score of Mandiri has reached in the first quarter of 2018, 2019, and 2020. Meanwhile, for the rest period is showing inefficiency in technical efficiency. The mean score efficiency of Mandiri is 0.8726 or 87.26%. Averagely, the bank still used 87.26% of its inputs to produce the maximum outputs. The result reflects that Mandiri is still not capable to use the set of input to generate the highest attainable output. Therefore, the bank could reduce the inputs averagely at 12.74% to produce outputs on the same level.

6. PT. Bank Pan Indonesia Tbk

Based on Appendix 8, Bank Pan Indonesia is the most inefficient bank compare to the other sample banks in this study. The efficiency score of Panin Bank period 2018Q2 – 2020Q4 shows that the bank never reach optimum efficiency score. The bank experiences the inefficiencies in technical efficiency for the whole project period. The mean score efficiency of Panin Bank is 0.7532 or 75.32%. Averagely, the bank still used 75.32% of its inputs to produce the maximum outputs. The result reflects that Panin Bank still cannot obtain the technical efficiency to be optimum. Therefore, the bank could reduce the inputs; fixed assets, deposit, and interest expense averagely at 24.68% to produce outputs; interest income and operating income on the same level.

7. PT. Bank CIMB Niaga Tbk

Based on Appendix 8, the optimum efficiency score of CIMB has reached in the first quarter of 2019 to the second quarter of 2020. Meanwhile, in 2018, the third, and fourth quarter of 2020 are showing inefficiency in technical efficiency. The mean score efficiency of CIMB is 0.9734 or 97.34%. Averagely, the bank still used 97.34% of its inputs to produce the maximum outputs. The result reflects that CIMB can still not use the set of input to generate the highest attainable output. Therefore, the bank could reduce the inputs averagely at 2.66% to produce outputs on the same level.

Technical Efficiency Relations with Return on Assets

Table 5. Technical Efficiency Relations with Return On Assets

	EFF	ROA
Mean	0.9082	0.0247
Median	1.0000	0.0266
Maximum	1.0000	0.0402
Minimum	0.6273	0.0002
Std. Dev.	0.1140	0.0099
Observations	84	84

Source: Calculated by Author

1. The average or mean of EFF is 0.9082. The highest value is 1.000, followed by the lowest value from Bank Pan Indonesia in the first quarter of 2018 which is 0.6273, and the standard deviation value is 0.1140.
2. The average or mean of ROA is 0.0247. The highest value is contributed by Bank Central Asia in the fourth quarter of 2019 which is 0.0402, followed by the lowest value from Bank CIMB Niaga in the first and second quarter of 2019 and 2020 which is 0.0002, and the standard deviation value is 0.0099.

Interpretation of Results

Based on Hypothesis Testing, here are the result interpretations related to the influence of each independent variables toward dependent variable.

1. The influence interpretation of NIM towards ROA

According to Table 4, the NIM has a positive coefficient equal to 0.8870 and a significant value of 0.000. It means, Ha1, "there is a significant partial influence of NIM towards ROA" is accepted. The positive coefficient implies that the increase of NIM will result from a better impact on ROA performance. In other words, the positive sign shows that net interest margin plays an essential role in determining more significant banks' (BUKU 4) financial performance. The same result showed by the study conducted by Lartey, Antwi, and Boadi (2013); Sari, Anshori, and Primasari (2018); and Yudha, Chabachib, and Demi (2017), which found that there is a strong positive correlation between the NIM and the ROA (profitability). NIM (Net Interest Margin) is a ratio that shows the ability of bank management to manage its productive assets to generate net interest income. Thus, the greater the NIM will show, the more influential the bank is in placing company assets in the form of credit, which will impact increasing ROA as well. Therefore, supervising the NIM will also assist banks in maintaining banking financial performance because NIM can have a significant effect on ROA.

2. The influence interpretation of BOPO towards ROA

According to Table 4, the BOPO has a negative coefficient equal to -0.0450 and a significant value of 0.000. It means, Ha2, "there is a significant partial influence of BOPO towards ROA" is accepted. The negative coefficient implies that the decrease of BOPO will increase ROA's bank performance. In other words, the greater the BOPO, the bank's profitability or ROA will decrease. This result is supported by the previous research done by Stanley, Hutahaean, Sinaga, Vita, and Sonia (2020); Nahar & Prawoto (2017); and Kusmayadi (2018), which found BOPO have a negative sign and is statistically significant to bank's profitability (ROA). According to Wibowo and Syaichu (2013) cited in NI PUTU (2019), the higher the level of bank financing expenses, the more profit the

bank will decrease. The smaller the BOPO, the more efficient a bank is. Therefore, banks need to reduce the bank financing expenses to produce a trim BOPO level, which shows that the bank's operating costs are smaller than its operating income. The profits earned by the company will also increase.

3. The influence interpretation of LDR towards ROA

According to Table 4, the LDR has a positive coefficient equal to 0.0087 and a significant value of 0.0786. It means, Ha3, "there is the significant partial influence of LDR towards ROA" is rejected. The positive coefficient implies that the increase of loan-to-deposit ratio will better impact ROA performance. This result is supported by the previous research done by Kusmayadi (2018) and Stanley, Hutahaeon, Sinaga, Vita, and Sonia (2020). The liquidity variable as measured by the LDR has a positive correlation. When the LDR ratio is high, the credit extended by banks is greater than the funds collected by the bank. The bank is expected to optimize its lending. However, this distribution certainly has a risk of non-performing loans. Banks can use Bank Indonesia regulations regarding the upper limit of the LDR ratio to control non-performing loans. Large lending is allowed as long as the bank does not use interbank funds and the bank also has GWM (*giro wajib minimum*) deposited with Bank Indonesia.

4. The influence interpretation of Size towards ROA

According to Table 4, the size has a positive coefficient equal to 0.0146 and a significant value of 0.0365. It means, Ha4, "there is a significant partial influence of Size towards ROA" is accepted. The positive coefficient implies that the increase in size will result from a better impact on ROA performance. This result has the same result as the research Irawati and Maksum (2017), which found a positive and significant effect of firm size on bank's ROA. The larger the size of the bank, the greater the level of bank profitability. In this study, the size of the bank is measured by the total assets owned by the bank. Significant total bank assets can generate substantial profits as well. With the total assets owned by the bank, both current assets and fixed assets, the bank will meet its short-term and long-term liabilities. A bank that can meet these obligations is considered that the bank is healthy. A healthy bank with good performance will increase public trust in using the bank's services so that the banks could create more products and services, which leads to earning more profits..

5. As shown by the results of the F-test which is smaller than the significance level, all independent variables (NIM, BOPO, LDR, and Size) affect ROA simultaneously.

This research concluded that the independent variables explain the return on an asset in performing the intermediary role. The regression test result shows that the adjusted R2 for this study was 0.9233. It indicates that the variation of independent variables can explain the interpretation of the dependent variable by 92.33% and the remaining 7.67% explained by other variables/factors not included in this study.

4. Conclusion and Implications

Conclusions

This study shows that several banks BUKU 4 period 2018Q1-2020Q4 are still not fully efficient since the technical efficiency mean's value is 90.82%. However, Bank BCA, Bank BNI, and Bank Danamon have reached the optimum efficiency level for the whole project period. Therefore, they should maintain the performance to be efficient for the future period.

The correlation coefficient between technical efficiency and return on assets is 0.252, which means that the relationship between the two variables has a weak correlation. Differences can influence the weak correlation results in input and output variables for each study. Therefore, BUKU 4 banks need to pay attention to the input and output sides so that the technical efficiency and ROA relationship becomes more robust.

Recommendations

Based on this research and conclusions, several recommendations can be suggested, such as:

1. For Management of Banking Sectors

This study shows that the NIM variable is the most significant towards ROA. Therefore, supervising the NIM will assist banks in maintaining banking financial performance because NIM can have a substantial effect on ROA. On the other hand, the management should follow the lending procedures to increase the company's LDR. The customers who will be given credit must be selected according to methods to avoid any high lousy credit.

2. For the Investor

In this research, the researcher found that the size variable effect in Bank's profitability suggests that the investor put the decision to invest should be made in a large Bank rather than in a small one. This study already shows that size has a significant influence on bank profitability.

3. For the Future Research

This research uses the Bank BUKU 4 as the sample. In the future, it can be done on the other sample, such as BUKU 1,2, and 3. The efficiency variables are included for the subsequent research to expect different results from this study. Future research suggests considering the different factors outside this study, such as GDP Growth Rate, Market Power, and Exchange Rate or other variance of factors that may affect banking performance.

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