

The Effect of Indonesian Financial Services Authority Stimulus Due to Covid-19 Pandemic towards Indonesian Commercial Banks Group of Business Activities (BUKU) 4 Category Efficiency Score

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Abstract - The World Health Organization (WHO) announced the coronavirus disease 2019 (Covid-19) outbreak as a global pandemic on March 2020. The world is in serious harm not exclusively to the worldwide healthcare system yet to the world economy. The Covid-19 pandemic has the potential to increase credit risk, especially the MSME sector in paying its obligations to banks and non-bank financial industry. Financial Services Authority of Indonesia issued The National Economic Stimulus as a Countercyclical Policy on the Impact of Covid-19 is aimed at encouraging banking performance. This study aims to examine if there is difference in bank efficiency before and during the countercyclical policy using data envelopment analysis (DEA) output-oriented and variable return to scale (VRS) approach. The sample used are Commercial Banks Group of Business Activities (BUKU) 4. The inputs in this research are fixed assets and deposits. The output used are credit/financing. Then performed the Mann Whitney U-test to identify if there is any difference. Our findings indicate that there is no difference in bank efficiency before and during the implementation of the countercyclical policy.

Keywords - Bank Efficiency; Data Envelopment Analysis; DEA; Mann Whitney U-test; Commercial Banks Group of Business Activities (BUKU) 4

I. INTRODUCTION

World Health Organization (WHO) declared the Coronavirus Disease 2019 (Covid-19) epidemic a worldwide pandemic. As of September 2020, the Covid-19 epidemic had led to about 34 million confirmed cases and over one million passes globally. The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) or Coronavirus causes Covid-19, a respiratory illness. Corona may lead to mild respiratory issues, serious lung infections, and even death.

Coronavirus is a new form of coronavirus that is transmitted from one person to another by sputum droplets from the respiratory tract, which can be spread by being in a crowded closed area with poor air circulation or coming into direct contact with droplets. This virus affects the elderly, adults, children, and newborns, as well as pregnant women and nursing mothers.

The world is in serious harm not exclusively to the worldwide healthcare system yet additionally to the world economy. COVID-19 has wreaked havoc on economies all around the world. COVID-19 has caused economic turmoil

all over the world. In the first half of 2020, unemployment in the United States surged at an unprecedented rate.

Government rules restricting social and economic activity to work-from-home laws in order to prevent the virus's spread have resulted in a drop in worldwide economic development.

According to data gather by Financial Service Authority of Indonesia an increase in bank credit risk as a result of debtors' inability to meet credit or financing payment commitments has the potential to disrupt banking performance and financial system stability, affecting economic growth. A pandemic could potentially lead to an increase in Non-Performing Loans (NPL), liquidity problems, and capital pressure.^[1]

Forty-three Indonesian listed banks experienced significant differences in bank performance on indicators of capital adequacy, asset quality, profitability, as measured by CAR (Capital Adequacy Ratio), NPL (Non – Performing Loan), operational efficiency ratio before and during the pandemic.^[2]

Other than that average Financing to Deposit Ratio (FDR) of Bank Muamalat in the Covid-19 pandemic in 2020 was 74.13% lower than the average value in 2018 and 2019 which was 75.78%. This difference shows that in general the role of financing carried out by Bank Muamalat Indonesia in the pandemic period was lower than in previous years.^[3]

There was also findings that there are 2 Sharia Commercial Banks affected by the COVID-19 pandemic, which experienced an average decrease of 14.55% in the efficiency score.^[4]

As a precautionary measure, the Financial Services Authority of Indonesia adopted a rule on The National Economic Stimulus as a Countercyclical Policy on the Impact of Coronavirus Disease 2019 Spread number 11 /POJK.03/2020. From March 2020 to March 2021, countercyclical actions were implemented. These policies applied to BUK (Conventional Commercial Bank), BUS (Sharia Commercial Bank), UUS (Sharia Business Unit), BPR (Rural Bank), and BRPS (Sharia Rural Bank). Through the stimulus the Financial Services Authority of Indonesia issued a one-pillar collectability policy through credit restructuring which assesses the quality of credit/financing/other funds provision only based on the punctuality of principal and or interest payments for loans/financing up to Rp10 billion and prioritized for the

affected sector and MSMEs.^[5] In general, this stimulus aims to prevent country from disruption of banking performance and maintain financial system stability. Banking's primary job as a financial intermediary institution is collecting funds from the public in the form of deposits and distributes them as credit. The majority of the community's activities revolve around money, which ultimately involves banking in its operations.^[6] Thus, make bank is one of the drivers in economy. Especially the conventional banks, the effect of conventional bank credit on economic growth is greater than the effect of Islamic bank financing on economic growth. Conventional bank loans are relatively more elastic in encouraging economic growth compared to Islamic banks.^[7] Out of a total of IDR 139.9 trillion in credit/financing to MSMEs, BRI (IDR 87.9 trillion), Bank Mandiri (IDR 25 trillion), and BNI (IDR 17.7 trillion) had the greatest credit/financing to MSMEs in 2019. Those are the three banks that are part of Commercial Banks Group of Business Activities (BUKU) 4, which has core capital exceeding 30 trillion rupiahs. Meanwhile the contribution of MSMEs to the national Gross Domestic Product (GDP) is 61.1%^[8] this owning the fact that BUKU 4 banks has a big impact to the economic. Since banks play quite an important part in a country's economy, performance evaluation is required so that they may effectively implement strategies based on their capabilities, ensuring that all of the goals are met. The calculation of bank efficiency is useful for determining the health and growth of a bank. Especially during the application of countercyclical policy in which government try to prevent banking performance disruption and stabilize the financial system. The difference in financial scores before and during the application of countercyclical policy can be an appeal to the banking industry whether their performance is stable or not, this can also be an evaluation for the government regarding the implementation of countercyclical policy. Thus, this research aimed to determine and identify the difference of Commercial Banks Group of Business Activities (BUKU) 4 in Indonesia efficiency score before and after the implementation Financial Services Authority of Indonesia regulation on The National Economic Stimulus as a Countercyclical Policy on the Impact of Coronavirus Disease 2019 Spread. For this reason, the author develop the hypothesis as below:

H_0 H_0 = Efficiency score of Commercial Banks Group of Business Activities (BUKU) 4 banks in Indonesia before and during the implementation of Financial Services Authority of Indonesia regulation on The National Economic Stimulus as a Countercyclical Policy on the Impact of Coronavirus Disease 2019 Spread are the same.

H_1 H_1 = Difference on efficiency score of Commercial Banks Group of Business Activities (BUKU) 4 banks in Indonesia before and during the implementation of Financial Services Authority of Indonesia regulation on

The National Economic Stimulus as a Countercyclical Policy on the Impact of Coronavirus Disease 2019 Spread are significantly different.

Efficiency measurement can be done through three approaches, the ratio approach, regression approach, and frontier approach. This study will utilize frontier approach for efficiency measurement approach as its advantages can accommodate efficiency score calculations using many inputs and outputs^[9], The needs to accommodate many inputs and outputs also supported by study that there are so many factors influence bank efficiency, such as total assets, net interest margin (NIM), return on assets (ROA), NPL, and CAR.^[10]

The study found two types of frontier techniques for efficiency measurement: parametric and non-parametric frontier methods. To evaluate the parametric frontier approach, parametric statistical tests such as the Stochastic Frontier Analysis (SFA) and the Distribution Free Approach (DFA) can be utilized. The non-parametric frontier approach is evaluated using non-parametric statistical tests, such as the Data Envelopment Analysis (DEA) technique.^[9]

According to study, the main differences between the three approaches in measuring efficiency are in terms of the assumptions used in frontier approach, that are the treatment of random errors, and the distribution of random error inefficiencies.^[11]

This study uses a DEA approach. DEA is an efficiency performance measurement tool with a mechanism that involves a number of input variables to produce a number of outputs so that they can be used for decision making and efficiency improvements. DEA is a nonparametric approach, so it does not require initial assumptions of the production function. The assumption used is that there is no random error, so the deviation from the frontier is indicated as inefficiency. Meanwhile, efficiency performance with SFA and DFA approaches requires the assumption of the form of the production function so that it does not require the initial assumption of the production function.^[11]

II. METHODOLOGY

This type of research based on the level of explanation is event study. There are two models that are often used in the DEA approach, the Constant Return to Scale (CRS) model developed by Charnes, Cooper, and Rhodes in 1978, and the Variable Return to Scale (VRS) model developed by Banker, Charnes, and Cooper in 1978. 1984. Because of imperfect competition of banking industry, limited budgets, and other factors, VRS output-oriented model is utilized as below:

Objective function:

$$\text{efficiency} = \frac{\sum_{i=1}^m U_{is} Y_{is}}{\sum_{j=1}^n V_{js} X_{js}} \leq 1$$

Subject to:

$$\frac{\sum_{i=1}^m U_{is} Y_{is}}{\sum_{j=1}^n V_{js} X_{js}} \leq 1; j = 1, 2, \dots, n$$

Where:

Y_{is} : Total Output i produced by Bank s

X_{js} : The number of input j used by Bank s

U_i : Output weight i produced by Bank s

V_j : The input weight j given by bank s

Constraint function:

$$\sum_{j=1}^n \lambda_j = 1$$

In conducting DEA, it first starts by determining the output and input variables, the output and input are obtained through consideration using the approach used in frontier approach of efficiency measurement. There are 3 approaches that are commonly used in SFA, DFA, and DEA as frontier approach in efficiency measurement to define input and outputs relationships in the financial activities of a financial institution. They are production approach, intermediation approach, and assets approach. [12][13][14]

Some studies argue that the intermediation approach is a more appropriate way to evaluate the performance of financial institutions in general because financial institutions act as financial intermediaries, collecting funds from surplus units and distributing them to deficit units. It is also believed that by employing this intermediation approach, it will be able to explain the real bank function. [15][16] this study obtain the input of deposits and fixed assets. Meanwhile output of financing/credit. [17]

When utilizing DEA, several factors must be considered, including positivity, the amount of decision making unit (DMU), homogeneity, isotonicity, windows analysis, and weight. DEA requires that the input and output variables be positive (> 0) because it employs a linear program. This study used DEAP software to do DEA calculations, which can be downloaded for free from the Center for Efficiency and Productivity Analysis website.

The population used in this study are all banks listed on the Commercial Banks Group of Business Activities (BUKU) 4. Thus, this research object are 7 banks in BUKU 4, that are BRI, BNI, BCA, Mandiri, CIMB, Panin, and Danamon. After DEA score calculations, Kolmogorov–Smirnov test is applied to test the normality of the DEA results. This test is important to determine which statistical test is appropriate for the data. [18] If the DEA results are not normally distributed; therefore, the application of a non-parametric test is appropriate and the Mann–Whitney test will be conducted to identify if there any difference before and during the applicant of countercyclical policy. Otherwise, this study uses the t-test if the data normally distributed. The analysis of both normality test and difference test are using SPSS 17.0

III. RESULTS

The following is a summary of the input and output variables within the object of this research before and during the National Economic Stimulus as a Countercyclical Policy on the Impact of Coronavirus Disease Spread in 2019:

TABLE 1
 STATISTICAL SUMMARY BUKU 4 BANKS BEFORE THE IMPLEMENTATION OF THE NATIONAL ECONOMIC STIMULUS AS A COUNTERCYCLICAL POLICY ON THE IMPACT OF CORONAVIRUS DISEASE 2019 SPREAD (IN MILLION IDR)

Variables	Mean	Maximum	Minimum	Standard Deviation
Input 1 Deposits*	472,616,938	969,750,006	105,809,518	311,285,591
Input 2 Fixed assets*	18,491,828	31,345,189	1,529,303	12,533,649
Output 1 Credit*	435,577,510	880,685,363	99,801,751	281,879,589

TABLE 2
 STATISTICAL SUMMARY BUKU 4 BANKS DURING THE IMPLEMENTATION OF THE NATIONAL ECONOMIC STIMULUS AS A COUNTERCYCLICAL POLICY ON THE IMPACT OF CORONAVIRUS DISEASE 2019 SPREAD (IN MILLION IDR)

Variables	Mean	Maximum	Minimum	Standard Deviation
Input 1 Deposits*	547,835,371	1,062,702,079	112,586,150	362,571,794
Input 2 Fixed assets*	20,044,698	44,264,446	1,494,563	13,877,516
Output 1 Credit*	447,379,105	896,526,155	99,732,845	301,173,503

After that author starts to calculate the DEA VRS output oriented model using DEAP software and the result as below:

TABLE 3
 DEA RESULT BEFORE THE APPLICATION OF COUNTERCYCLICAL POLICY (IN %)

DMU	Q1 2019	Q2 2019	Q3 2019	Q4 2019	Average
BRI	1.000	1.000	1.000	1.000	1.000
BNI	0.967	0.947	1.000	0.959	0.968
BCA	0.919	0.892	1.000	0.980	0.948
MANDIRI	1.000	1.000	0.983	1.000	0.996
CIMB	1.000	0.955	0.979	0.972	0.977
PANIN	1.000	1.000	1.000	1.000	1.000
DANAMON	1.000	1.000	1.000	1.000	1.000
Grand Average					0.984

TABLE 4
 DEA RESULT DURING THE APPLICATION OF COUNTERCYCLICAL POLICY (IN %)

DMU	Q2 2020	Q3 2020	Q4 2020	Q1 2021	Average
BRI	1.000	1.000	1.000	1.000	1.000
BNI	0.998	0.993	1.000	0.993	0.996
BCA	0.974	0.930	0.913	0.912	0.932
MANDIRI	1.000	1.000	0.994	0.946	0.985
CIMB	0.942	0.799	0.796	0.806	0.836
PANIN	0.972	0.970	1.000	1.000	0.986
DANAMON	1.000	1.000	1.000	1.000	1.000
Grand Average					0.962

After obtaining efficiency score from both before and during the implementation of The National Economic Stimulus as a Countercyclical Policy on the Impact of Coronavirus Disease 2019 Spread, it is necessary to do statistical tests on the data from the DEA analysis, specifically the Kolmogorov Smirnov Normality Test, to determine if the data is normally distributed or not.

TABLE 5
 KOLMOGOROV-SMIRNOV TEST

		VRS result before the implementation of The National Economic Stimulus as a Countercyclical Policy on the Impact of Coronavirus Disease 2019 Spread	VRS result during the implementation of The National Economic Stimulus as a Countercyclical Policy on the Impact of Coronavirus Disease 2019 Spread
N		28	28
Normal Parameters	98404	.96232	.99
	.027626	.063492	.032
Most Extreme Differences	.361	.293	.489
	.282	.276	.382
	-.361	-.293	-.489
Test Statistic		.361	.293
Asymp. Sig. (2-tailed)		.000 ^a	.000 ^a

According to table 5, the test statistics results are 0.361 and 0.293 and the corresponding asymp sig are both below 0.000 respectively before and during the implementation of The National Economic Stimulus as a Countercyclical Policy on the Impact of Coronavirus Disease 2019 Spread. Since the asymp sig is less than $\alpha = 0.05$, reject the null hypothesis. Thus, we have sufficient evidence to say that the sample data does not come from a normal distribution.

Based on the normality test of the previous section, the Mann Whitney U-Test was used to test the statistical significance of the difference. The results of processing using the SPSS 17.0 program obtained the results of data analysis as follows:

TABLE 6
 MANN WHITNEY U-TEST

Test Statistics	VRS Result
Mann-Whitney U	323.500
Wilcoxon W	729.500
Z	-1.245
Asymp. Sig. (2-tailed)	.213

Based on table 6, it can be seen that the efficiency value has a significance value of 0.889 or more than the value of $\alpha = 0.05$ which means it fails to reject H0.

IV. DISCUSSION

Table 1 and 2 provide a statistical summary of the input and output variables prior to and during the implementation of The National Economic Stimulus as a Countercyclical Policy on the Impact of Coronavirus Disease Spread in 2019. According to Table 1 and Table 2, average deposits increased by IDR 472,616,938 to IDR 547,83,371 in million between before and during The National Economic Stimulus as a Countercyclical Policy on the Impact of Coronavirus Disease 2019 Spread. The same goes for average fixed assets and average credit it also increased. Fixed assets increased from IDR 18,491,828 to IDR 20,044,698 and credit increased from IDR 435,577,510 to IDR 547,835,371 in million.

The maximum and minimum values are another way to implement the two tables above. Maximum value

on deposits, fixed assets, and credit/financing during the implementation are greater than before the implementation of The National Economic Stimulus as a Countercyclical Policy on the Impact of Coronavirus Disease 2019 Spread. In the meantime, during the countercyclical policy implementation, the minimum value for deposit is greater than the minimum value before the implementation. Meanwhile, the fixed assets and credit decreased in value throughout the regulation's implementation.

At last, there is the standard deviation, which indicates the variability of each variable. The bigger the standard deviation, the larger the variability, and hence the data are more spread out.^[19] According to Table 1 and Table 2, the standard deviation of all variables increases when The National Economic Stimulus as a Countercyclical Policy is implemented on the Impact of Coronavirus Disease 2019 Spread.

Move to the next table, according to Table 3, it can be concluded that 3 banks, BRI, Panin, dan Danamon were achieved an average efficiency score of 1. The other 4 banks' average relative efficiency score that did not achieve maximum relative efficiency were BNI, BCA, Mandiri, and CIMB respectively at the level of 0.969, 0.948, 0.996 and 0.977. This indicates the efficient use of inputs in each bank to produce output in the period before the implementation of the countercyclical policy.

According to Table 4, 2 banks, BRI and Danamon were achieved an average relative efficiency score of 100. The other 5 banks' average relative efficiency score that did not achieve maximum relative efficiency were BNI, BCA, Mandiri, CIMB, and Panin respectively at the level 0.996, 0.932, 0.985, 0.836, and 0.986. This indicates the efficient use of inputs in each bank to produce output in the period prior to the implementation of the countercyclical policy.

For the final result on testing the hypothesis, using the Mann Whitney U-test, it fails to reject H0, so it can be concluded that there is no significant difference in the efficiency score before and during the implementation of The National Economic Stimulus as a Countercyclical Policy on the Impact of Coronavirus Disease 2019 Spread.

V. CONCLUSION

This study aims to compare the efficiency score of BUKU 4 banks before and during the implementation of The National Economic Stimulus as a Countercyclical Policy on the Impact of Coronavirus Disease 2019 Spread period before being extended which ends in March 2021. This study uses the Data Envelopment Analysis method based on the VRS assumption and using sample of 7 banks included in BUKU 4 based on the amount of core capital owned. Based on the results of the research discussed in chapter IV, several conclusions were found in this study, as follows:

1. The average relative score of efficiency of BUKU 4 banks using DEA based on the VRS assumption before the

implementation of The National Economic Stimulus as a Countercyclical Policy on the Impact of Coronavirus Disease 2019 Spread is 0.984 with BNI at 0.969, BCA at 0.948, Mandiri at 0.996, CIMB at 0.977, and BRI, Panin, and Danamon were all at 1.

2. The average score of efficiency of BUKU 4 banks using DEA based on the VRS assumption during the implementation of The National Economic Stimulus as a Countercyclical Policy on the Impact of Coronavirus Disease 2019 Spread is 0.962 with BNI at 0.996, BCA at 0.932, Mandiri at 0.985, CIMB at 0.836, Panin at 0.986, BRI, and Danamon were all at 1.

3. Based on the research results, there is a range of 0.022 in efficiency score of BUKU 4 before and during the implementation of The National Economic Stimulus as a Countercyclical Policy on the Impact of Coronavirus Disease 2019 Spread. However, there is no significant difference in the efficiency score of BUKU 4 banks before and during the implementation of The National Economic Stimulus as a Countercyclical Policy on the Impact of Coronavirus Disease 2019 Spread.

As the conclusion this research result can identify less relative efficient bank and provide references to BUKU 4 banks, so that the months or years ahead can work more efficiently in terms of the analyzed references. One of the advantages of the DEA method is that management can focus on further performance improvements.

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