ANALYSIS OF THE EFFICIENCY OF CONVENTIONAL AND SHARIA BANKING IN INDONESIA (BEFORE AND DURING COVID-19 PANDEMIC)

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Abstract *- This study aims to determine the level of efficiency of Conventional Banks and Sharia Banks in Indonesia before the Covid-19 pandemic and during the Covid-19 pandemic. The variables used in this study are profit, credit/financing, third party funds, total assets, labor costs and operating costs. The analytical tool used in this study is Data Envelopment Analysis (DEA) with a Constant Return to Scale (CRS) approach. The samples used in this study were 9 Conventional Commercial Banks (BUK) and 6 Sharia Commercial Banks (BUS). The results of this study show that before the Covid-19 pandemic in 2018 there were 3 BUK that experienced perfect efficiency, while at the beginning of the Covid-19 pandemic in 2019 there were 4 BUK that experienced perfect efficiency. Then during the Covid-19 pandemic in 2020-2021 there were 4 BUK and 1 BUS operating efficiently. Meanwhile, BUK that has a relatively stable efficiency value before and during the Covid-19 pandemic are BTN, BCA and BUK Central Java.*

Keyword: *BUK, BUS, Efficiency, DEA, Covid-19*

I. INTRODUCTION

The COVID-19 pandemic in 2020 was a major test for societies around the world, including Indonesia. Virtually no country escaped the impact of this pandemic. Indonesia, of course, was not exempt from the spread of the COVID-19 pandemic. Since March 2020, positive COVID cases started to be detected in Indonesia and continued to rise. In the midst of the widening pandemic, the government implemented the Large-Scale Social Restrictions (PSBB) policy, which limited the activities and mobility of the population. As a result, the national economy was significantly affected, reflected in Indonesia's economic growth contracting by 2.07% in 2020 (compared to 5.02% in 2019), indicating a considerable decline. This decline was primarily driven by a -2.63% decrease in household consumption and a -4.95% decrease in investment (Laporan Tahunan OJK, 2020). The economic downturn was also accompanied by a recession that led to a decline in performance across various sectors, including the banking sector (Pratomo & Ramdani, 2021).

Banking, as one of the financial institutions with a crucial role, is demanded to have good performance, and one of the indicators of this is efficiency. An indicator of banking efficiency, which signifies a bank's efficiency in its operational activities, still shows relatively high figures. The ratio reflecting the efficiency level of a bank's performance is indicated by the Operational Cost or Operational Expenses Ratio (BOPO). The ideal BOPO ratio ranges between 70% and 80% (Wardana, 2011). However, the banking BOPO ratio in Indonesia has actually increased during the COVID-19 pandemic, still showing figures above 80%, which means that banking in Indonesia has not yet achieved efficiency. This situation places efficiency as a crucial issue in the Indonesian banking industry.

Table 1. Performance of Commercial Banks on BOPO (%)

Bank Group	2018	2019	2020	2021
Bank Persero	71,24	76,39	86,62	81,66
Regional Development Bank	77,88	79,56	80,60	79,38
National Private Bank	81,12	81,39	84,66	80,92
Branch Offices of Banks Domiciled Outside	88,43	83,86	93,53	96,73
Commercial Bank	77,86	79,39	86,58	83,55

Source: BPS 2021 (excel data processing)

Table 1 shows the increase in BOPO occurred during the Covid-19 pandemic in 2020, the persero bank in 2019 had a BOPO ratio value of 76.39 rose to 86.62 in 2020, regional development banks in 2019 of 79.56 rose to 80.60 in 2020, national private banks in 2019 had a BOPO ratio value of 81.39 rose to 84.66 in 2020, Branch banks from banks domiciled outside have a BOPO ratio value in 2019 of 83.86, rising to 93.53 in 2020 and commercial banks in 2019 of 79.39, rising to 86.58 in 2020. An increase above 80% shows that banks in Indonesia have not operated efficiently. An increase above the 80% threshold indicates that the banking sector in Indonesia has not yet operated efficiently. Furthermore, the next banking decline indicator also occurs in the development of assets, both 'Gross' and 'Net', based on business activities, as shown in Table 2 below.

Table 2. Development of BUK & BUS Assets Based on Business Activities (Billion)

Bank Name	2018	2019	2020
BUK Book 1	71.280	61.798	19.009
BUK Book 2	823.832	905.190	897.206
BUK Book 3	2.741.984	2.616.734	2.684.606
BUS Book 1	15.896	17.479	8.241
BUS Book 2	202.212	220.588	132.812
BUS Book 3	98.583	112.297	256.019

Source: OJK 2020 (excel data processing)

The Table 2 above shows a decrease in assets from the year 2019 to 2020. This decline occurred in Books 1 and 2, whereas Book 3 experienced an increase. The distinction among Book 1, Book 2, and Book 3 lies in the amount of core capital. Commercial banks categorized as Book 1 have a core capital of up to less than IDR1 trillion. Book 2 comprises banks with core capital ranging from IDR1 trillion to less than IDR5 trillion. Book 3 encompasses banks with core capital ranging from IDR5 trillion to less than IDR30 trillion. Book 4 includes banks with core capital above IDR30 trillion.

Furthermore, in the effort to manage an unstable economic situation and facilitate the recovery of the public economy during or after the Covid-19 pandemic, banks must exhibit strong performance. Hence, each banking institution is required to adhere to the principle of efficiency, considering that efficiency reflects a bank's performance. Additionally, minimizing the inputs utilized by banks and maximizing the outputs generated would allow for optimal results. In doing so, banks can attain efficiency (Anggraeni et al., 2023). Fundamentally, the principle of efficiency teaches us to live more frugally and avoid all forms of wastefulness. In this regard, Islamic economics adheres firmly to a principle, wherein Allah SWT has stated:

وَءَاتِ ذَا ٱلْقُرْبَىٰ حَقَّهُۥ وَٱلْمِسْكِينَ وَٱبْنَ ٱلسَّبِيلِ وَلَا تُبَذِّرْ تَبْذِيرًا

"And give the relative his right, and [also] the poor and the traveler, and do not spend wastefully. (Al-Isra' 26)"

إِنَّ ٱلْمُبَذِّرِينَ كَانُوٓا۟ إِخْوَٰنَ ٱلشَّيَٰطِينِ ۖ وَكَانَ ٱلشَّيْطَٰنُ لِرَبِّهِۦ كَفُورًا

"Indeed, the wasteful are brothers of the devils, and ever has Satan been to his Lord ungrateful." (Al-Isra' 27) (Brier & lia dwi jayanti, 2020).

Efficiency serves as an indicator of performance, and based on theory, it encompasses the entire performance of a company. The ability to produce output based on available input is a parameter of performance. To measure efficiency, banks are

expected to generate optimal output at a specific level of input or provide the minimum level of input for a certain output. Further analysis of inefficiency involves mapping inputs and outputs to identify the underlying causes (Kaban et al., 2022). Efficiency is highly significant for companies. The concept of efficiency is often defined as doing things right. It typically pertains to how a company achieves its objectives. Thus, the concept of efficiency is often viewed in terms of costs as input and profits as output. Businesses continually strive to minimize costs to achieve maximum profitability in their production levels (Rusydiana, 2018).

A company can be considered efficient if: (1) It utilizes fewer units of input compared to other companies while producing the same amount of output, (2) It employs the same number of input units but generates a larger amount of output. One way to measure banking performance is through efficiency, where banking efficiency can be observed from the utilization of input and output in the bank's operational activities (Nugraha, 2013). Efficiency for the banking industry as a whole is the most crucial aspect considered to achieve a healthy and sustainable financial performance (Marsondang et al., 2019). According to (Puspitasari et al., 2018) The efficiency of the banking industry is a key indicator of whether a bank is eligible and competitive within the Indonesian banking sector.

Research on banking efficiency has been conducted by several researchers, yielding varying results. These differences arise from the use of various factors, including measurement methods, input and output variables, research subjects, and observation years. The research conducted by (Novandra, 2014) indicates that inefficiency in Sharia banks only occurred in 2009, whereas in conventional banks it was observed from 2009 to 2012. (Hidayah, 2016) found that Bank of China Limited, Bank Woori Indonesia, and Standard Chartered achieved 100 percent efficiency during the research period. (Kaban et al., 2022) indicates that the overall efficiency value of Islamic banking during the Covid pandemic era is 78.05%, falling into the moderate category, which is lower compared to the pre-pandemic period. (Riani & Hendrawan, 2020) shows a significant difference in the level of efficiency between Sharia banks and conventional banks based on the CRS production approach, with the mean rank indicating that sharia banks are more efficient than conventional banks. (Hadini & Wibowo, 2021) Indicates a significant difference between the efficiency levels of Conventional Commercial Banks and Sharia Commercial Banks. Conventional Banks exhibit higher efficiency values compared to Sharia Commercial Banks.

Numerous previous studies have examined the efficiency of both sharia and conventional banking sectors. However, there have been relatively few studies comparing the efficiency between Sharia and conventional banks before and during the COVID-19 pandemic. Thus, this research aims to analyze the efficiency difference between conventional and Sharia banks before and during the COVID-19 pandemic using Data Envelopment Analysis (DEA).

II. METHOD

Operational Variable Definition

This study employs 2 output variables and 4 input variables. The following are the operational definitions of the variables used in this research:

Table 3. Data types and sources

No	Variable Name	Variable Type	Unit	Data Source
1	Operating Profit	Output	Million Rupiah	OJK
2	Credit/ Financing	Output	Million Rupiah	OJK
3	Third-Party Funds	Input	Million Rupiah	OJK
4	Total Assets	Input	Million Rupiah	OJK
5	Labor Costs	Input	Million Rupiah	OJK
6	Operating Costs	Input	Million Rupiah	OJK

Data Source: OJK

1. Output Variable

   a. Operating Profit: According to the Financial Services Authority (OJK), profit is **the excess of income over the total costs incurred to generate that income** (in million rupiah).

   b. Credit/Financing: According to the Banking Law, credit refers to the provision of money or claims that can be equated to it, based on an agreement or loan agreement between a bank and another party, which obligates the borrower to repay the debt after a certain period with interest.

      Meanwhile, financing is **financial support for** specific needs or the acquisition of goods/assets/services, typically involving three parties: the funding provider, the provider of specific goods/assets/services, and the party utilizing the specific goods/assets/services (in million rupiah).

2. Input Variables

   a. Third-Party Funds (DPK): Bank's liabilities to residents and non-residents in Rupiah and foreign currency (in million rupiah).

   b. Total Assets: the aggregate fixed assets owned by both conventional and Sharia banks and having economic benefits (in million rupiah).

   c. Labor Costs: The total labor expenses incurred by Conventional Commercial Banks and Sharia Commercial Banks in Indonesia for each period. Labor costs can be found in the respective income statements of these two commercial banks (in million rupiah).

   d. Operating Costs: the expenses incurred for the operational activities of the bank, and these costs do not include interest in conventional banking and profit-sharing in Islamic banking (in million rupiah).

Population and Sample

The population in this study consists of Conventional Commercial Banks and Sharia Commercial Banks registered with Bank Indonesia from 2018 to 2021. The population used comprises 95 conventional commercial banks and 12 Sharia commercial banks. The sampling for this study was conducted using the Slovin's formula (Hidayah, 2016) namely:

$$n = \frac{N}{1 + Na^2}(1)$$

Note:

n = Sample size

N = Population

a = Significance Level

From the above formula, with a significance level of 30%, the obtained sample for this research is:

$$n = \frac{95}{1 + (95\ x\ 30\%^2)}(1) = 9{,}947$$

= 9 Conventional Commercial Banks

$$n = \frac{12}{1 + (12\ x\ 30\%^2}(1) = 5{,}7$$

= 6 Sharia Commercial Banks

Details of the banks selected as samples in this study are shown in the following table:

Table 4. Bank Sample

No	BUK Name	No	BUS Name
1	Bank BRI	1	Bank Muamalat Indo
2	Bank BNI	2	Bank Victoria Syariah
3	Bank BTN	3	Bank Jabar Banten Syariah
4	Bank Jawa Barat	4	Bank Mega Syariah
5	Bank DKI	5	Bank Aceh
6	Bank DIY	6	Bank NTB Syariah
7	Bank Jawa Tengah		
8	Bank Jawa Timur		
9	Bank BCA		

Source: OJK 2020 (excel data processing)

Data Envelopment Analysis (DEA)

Data Envelopment Analysis (DEA) was introduced by Charnes, Cooper and Rhodes in 1978. DEA was created as a tool or analytical tool to evaluate the performance of an activity in a unit, entity, or organization. Basically, the working principle of DEA is to compare input and output data from a data organization (decision making unit, DMU) with other input and output data in similar DMUs. This comparison is done to get an efficiency value. DEA is a formulation of a linear program. There are three benefits derived from measuring efficiency with DEA: First, as a benchmark for obtaining relative efficiency which is useful for easier comparison between the same economic units. Second, measure various efficiency information between units of economic activity to identify the causative factors. Third, determine policy implications so as to increase the level of efficiency (Nugraha, 2013).

Data Envelopment Analysis (DEA) is a non-parametic approach which is basically a linear programming-based technique. The DEA works by identifying the units to be evaluated for input and output of those units. It then calculates productivity values and identifies which units are not using inputs efficiently or not producing outputs effectively. Measured productivity is comparative or relative because it only compares between units of measurement from the same 1 data set (Rosyadi dan Fauzan dalam Naufal & Firdaus, 2018)**.** Data Envelopment Analysis is a non-parametric method used in measuring the level of efficiency of an Economic Activity Unit (UKE). In addition, DEA is a method used to evaluate the efficiency of a decision-making unit (work unit) that is responsible for using a number of inputs to obtain a targeted output. In particular, DEA is the development of linear programming techniques in which there are goal functions and constraint functions. Here is the general equation for the Data Envelopment Analysis (DEA) method (Firdaus & Hosen, 2014).

$$hs = \sum_{i=1}^{m} u_{is}\ y_{is} / \sum_{j=1}^{n} v_{js}\ \mathrm{x_{js}}$$

Information:

hs = Efficiency of Bank *s*

u_{is} = weight of output *i* produced by bank *s*

y_{is} = amount of output *i* produced by bank *s*

v_{js} = Weight of input j used by bank *s*

$\mathrm{x_{js}}$ = number of j inputs, provided by bank *s*

There are 2 models that are often used in the Data Envelopment Analysis (DEA) approach, namely: Charnes-Cooper-Rhodes (CCR), this model assumes the existence of Constant Return to Scale (CRS). And Banker-Charnes-Cooper (BCC), this model assumes the existence of a Variable Return to Scale (VRS), where the increase in input and output is not equal. The proportion of change can be increasing or decreasing, and this study uses the first approach model, namely Constant Return to Scale (CRS), with the following formula:

Maximize

$$hs = \sum_{i=1}^{m} u_i\ y_{ts} \ldots\ldots\ldots\ldots (2)$$

constraint or constraint function

$$\sum_{i-1}^{m} u_{is}\ y_{ir} - \sum_{j-1}^{n} v_j\ x_{jr} \leq 0\ ; r = 1, \ldots N$$

$$\sum_{j-1}^{M} = v_j\ x_{js} = 1$$

Where *ui* and *vi* ≥ 0

III. RESULTS AND DISCUSSION

Result

In this discussion, the efficiency level of 9 Conventional Commercial Banks (BUK) and 6 Sharia Commercial Banks (BUS) will be displayed, through the Data Envelopment Analysis (DEA) method during the 2018-2021 period as well as the average efficiency level

achieved by BUK and BUS during the research period. Data on input variables and output variables are obtained from the Annual Financial Statements of BUK and BUS at the Financial Services Authority. In DEA, if the measurement results that appear are 1 or 1,000, it shows that a BUK or BUS is able to optimize all resources owned, while if the score that appears further away from 1 or 1,000 indicates that the BUK or BUS has not been optimal in carrying out its role as an intermediary institution.

In previous research, it was known that inefficiency conditions in Islamic banks only occurred in 2009, while in conventional banks from 2009 to 2012 (Novandra, 2014). While in the same study also conducted in 2012-2013 there were three banks that experienced 100 percent efficiency continuously in the quarter 1-2012 to quarter 3-2013 and the only Islamic bank that had experienced 100 percent efficiency in the research period was Maybank Syariah (Hidayah, 2016), and in 2014-2018 there were 2 banks that achieved 100 percent efficiency both with the Intermediation and Production approaches of CRS and VRS assumptions during 2014 to 2018 were Bank Bukopi and Bank Victoria (Riani & Hendrawan, 2020).

Table 5. Results of Data Envelopment Analysis (DEA)

No	Bank name	Result	Predicate
1	Bank BRI	0.992	Not Efficient
2	Bank BNI	0.980	Not Efficient
3	Bank BTN	1.000	Efficiency
4	Bank Jawa Barat	0.982	Not Efficient
5	Bank DKI	0.823	Not Efficient
6	Bank DIY	0.881	Not Efficient
7	Bank Jawa Tengah	1.000	Efficiency
8	Bank Jawa Timur	0.755	Not Efficient
9	Bank BCA	1.000	Efficiency
10	Bank Muamalat Indo	0.447	Not Efficient
11	Bank Victoria Syariah	0.830	Not Efficient
12	Bank Jabar Banten Syariah	0.489	Not Efficient
13	Bank Mega Syariah	0.657	Not Efficient
14	Bank Aceh	0.517	Not Efficient
15	Bank NTB Syariah	0.757	Not Efficient

Source : DEA data processing results

Based on the results of the analysis of banking efficiency levels for BUK and BUS groups from 2018 to 2021 using the Data Envelopment Analysis (DEA) method, as shown in Table V, the data processing results indicate that there are 3 Conventional BUKs that achieve an efficiency score of 1.000 during the research period of 2018-2021, namely Bank BTN, Bank Jawa Tengah, and Bank BCA. Meanwhile, Bank BRI is very close to the efficient level with a score of 0.992. On the other hand, Bank Jawa Timur achieved the lowest rank. Furthermore, in the data processing results, there are no BUS that achieve perfect efficiency. However, Bank Victoria Syariah has the highest score among the 5 other Islamic banks, which is 0.830. Even though some BUK and BUS in the groups have not yet achieved efficiency, each sample from BUK and BUS has strived to attain relatively good figures.

Discussion

The following calculation results using the Data Envelopment Analysis (DEA) method during the 2018-2021 period can be seen the level of efficiency that has been achieved by Conventional Commercial Banks (BUK) and Sharia Commercial Banks (BUS) from Table 6 below:

Table 6. BUK & BUS Efficiency Rate in Indonesia

Bank name	2018	2019	2020	2021	Annually
BUK BRI	0.989	1.000	0.981	1.000	**0.992**
BUK BNI	0.953	0.992	1.000	0.976	**0.980**
BUK BTN	1.000	1.000	1.000	1.000	**1.000**
BUK Jawa Barat	0.941	0.988	1.000	1.000	**0.982**
BUK DKI	0.828	0.995	0.749	0.722	**0.823**
BUK DIY	0.852	0.906	0.893	0.874	**0.881**
BUK Jawa Tengah	1.000	1.000	1.000	1.000	**1.000**
BUK Jawa Timur	0.780	0.786	0.772	0.682	**0.755**
BUK BCA	1.000	1.000	1.000	1.000	**1.000**
BUS Muamalat Indo	0.422	0.453	0.539	0.375	**0.447**
BUS Victoria Syariah	0.667	0.816	0.840	1.000	**0.830**
BUS Jabar Banten Syariah	0.270	0.322	1.000	0.367	**0.489**
BUS Mega Syariah	0.257	0.373	1.000	1.000	**0.657**
BUS Aceh	0.618	0.566	0.530	0.356	**0.517**
BUS NTB Syariah	0.597	0.684	0.750	1.000	**0.757**
Annually	**0.745**	**0.792**	**0.870**	**0.824**	**0.807**

Source: OJK 2020 (excel data processing)

Based on the results of data processing using the Data Envelopment Analysis (DEA) method, it can be seen that from 9 samples of Conventional Commercial Banks (BUK) and 6 Sharia Commercial Banks (BUS), there are 3 Conventional Commercial Banks that experienced perfect efficiency in 2018 – 2021 and proved that the highest average efficiency level occurred in 2020 of 0.870 and the lowest average efficiency value occurred in 2018 of 0.745. The results of efficiency measurement against Conventional Commercial Banks (BUK) and Sharia Commercial Banks have not achieved perfect efficiency.

In the year 2018, with the lowest average compared to other years, namely 0.745, there were 6 Inefficient Conventional Commercial Banks (BUK), which are Bank BRI at 0.989, Bank BNI at 0.953, Bank Jawa Barat at 0.941, Bank DKI at 0.828, Bank DIY at 0.852, and Bank Jawa Timur at 0.780, as well as 6 inefficient Sharia Commercial Banks (BUS), which are Bank Muamalat at 0.442, Bank Victoria at 0.667, Bank Jabar Banten at 0.270, Bank Mega at 0.257, Bank Aceh at 0.618, and Bank NTB at 0.597. In the year 2019, with an average of 0.792, there were 5 Inefficient Conventional Commercial Banks (BUK), namely Bank BNI at 0.992, Bank Jawa Barat at 0.988, Bank DKI at 0.995, Bank DIY at 0.906, and Bank Jawa Timur at 0.786, as well as 6 inefficient Sharia Commercial Banks (BUS), namely Bank Muamalat at 0.453, Bank Victoria at 0.816, Bank Jabar Banten at 0.322, Bank Mega at 0.373, Bank Aceh at 0.566, and Bank NTB at 0.684.

In the year 2020, with the highest average of 0.870, there were 4 Inefficient Conventional Commercial Banks (BUK), namely Bank BRI at 0.981, Bank DKI at 0.749, Bank DIY at 0.893, and Bank Jawa Timur at 0.772, as well as 4 inefficient Sharia Commercial Banks (BUS), namely Bank Muamalat at 0.539, Bank Victoria at 0.840, Bank Aceh at 0.530, and Bank NTB at 0.750. And in the year 2021, with an average of 0.824, there were 4 Inefficient Conventional Commercial Banks (BUK), namely Bank BNI at 0.976, Bank DKI at 0.722, Bank DIY at 0.874, and Bank Jawa Timur at 0.682, as well as 3inefficient Sharia Commercial Banks (BUS), namely Bank Muamalat at 0.375, Bank Jabar Banten Syariah at 0.367, and Bank Aceh at 0.357.

The inefficiency in BUK and BUS is influenced by all output and input variables. The output variables include operating profit and credit/financing, while the input variables include third-party funds (DPK), total assets, labor costs, and operating costs. Although Conventional Commercial Banks (BUK) and Sharia Commercial Banks (BUS) have not achieved perfect efficiency levels, both types of banks have performed well in carrying out their roles as intermediaries.

The Impact of the Covid-19 Pandemic on the Efficiency of Conventional Commercial Banks (BUK) and Sharia Commercial Banks (BUS)

Based on the findings from the above research, we can observe the efficiency levels of Conventional Commercial Banks (BUK) and Sharia Commercial Banks (BUS) before and during the Covid-19 pandemic. The results obtained through the Data Envelopment Analysis (DEA) method show that the average efficiency of BUK in the year 2018 reached 0.927, and in 2019, it reached 0.963, which is close to the efficiency level. However, during the Covid-19 pandemic in the year 2020, it reached 0.932, and in 2021, it reached 0.917, indicating a decrease from the previous periods. If we look at Table VI above, in the year 2018, there were 3 BUKs that reached an efficiency level of 1.000, namely Bank BTN, Bank Jateng, and Bank BCA. In the year 2019, there were 4 BUKs that achieved an efficiency level of 1.000, namely Bank BRI, Bank BTN, Bank Jateng, and Bank BCA. In 2020, on average, BUK did not experience a significant impact from the Covid-19 pandemic, as there were 5 BUKs that managed to maintain an efficiency level of 1.000, namely Bank BNI, Bank BTN, Bank Jabar, Bank Jateng, and Bank BCA. In 2021, there were 5 BUKs that reached an efficiency level of 1.000, namely Bank BRI, Bank BTN, Bank Jabar, Bank Jateng, and Bank BCA. Additionally, there were 4 BUKs that maintained their efficiency consistently in the Covid years of 2020 and

2021, namely Bank BTN, Bank Jabar, Bank Jateng, and Bank BCA.

According to calculations using the Data Envelopment Analysis (DEA) method, the average efficiency of Sharia Commercial Banks (BUS) in the year 2018 reached 0.471, and in 2019, it reached 0.535. However, during the pandemic year of 2020, it reached 0.776, and in 2021, it reached 0.683. Thus, the pandemic period actually showed an increased average efficiency compared to the previous years. Looking at Table VI above, in the years 2018 and 2019, there were no BUS that reached an efficiency level of 1.000. However, in the year 2020, there were 2 BUS that achieved an efficiency level of 1.000, namely Bank Jabar Banten Syariah and Mega Syariah. In 2021, there were 3 BUS that achieved an efficiency level of 1.000, namely Bank Victoria Syariah, Mega Syariah, and NTB Syariah. This indicates that Sharia Commercial Banks (BUS) did not experience the impact of the Covid-19 pandemic and were able to maintain their efficiency levels.

Conventional Commercial Banks and Sharia Commercial Banks that have not been able to maximize their output and inputs, namely Conventional Commercial Banks and Sharia Commercial Banks that are inefficient, it can be concluded that the value of outputs and inputs achieved by Conventional Commercial Banks and Islamic Commercial Banks that are inefficient has not been able to achieve the targets to be achieved (Notalin et al., 2021).

Table 7. Reference Bank for Efficient BUK and BUS

No	Bank name	Year			
		2018	2019	2020	2021
1	BUK BRI	BTN, JATENG, BCA	Efficiency	BNI, BTN, JABAR, JATENG, BCA, BUS Jbs, BUS Ms	Efficiency
2	BUK BNI	BTN, JATENG, BCA	BRI, BTN, JATENG, BCA	Efficiency	BRI, BTN, JABAR, JATENG, BCA, BUS VS, BUS Ms, BUS NTBS
3	BUK BTN	Efficiency	Efficiency	Efficiency	Efficiency
4	BUK Jawa Barat	BTN, JATENG, BCA	BRI, BTN, JATENG, BCA	Efficiency	Efficiency
5	BUK DKI	BTN, JATENG, BCA	BRI, BTN, JATENG, BCA	BNI, BTN, JABAR, JATENG, BCA, BUS Jbs, BUS Ms	BRI, BTN, JABAR, JATENG, BCA, BUS VS, BUS Ms, BUS NTBS
6	BUK DIY	BTN, JATENG, BCA	BRI, BTN, JATENG, BCA	BNI, BTN, JABAR, JATENG, BCA, BUS Jbs, BUS Ms	BRI, BTN, JABAR, JATENG, BCA, BUS VS, BUS Ms, BUS NTBS
7	BUK Jawa Tengah	Efficiency	Efficiency	Efficiency	Efficiency
8	BUK Jawa Timur	BTN, JATENG, BCA	BRI, BTN, JATENG, BCA	BNI, BTN, JABAR, JATENG, BCA, BUS Jbs, BUS Ms	BRI, BTN, JABAR, JATENG, BCA, BUS VS, BUS Ms, BUS NTBS
9	BUK BCA	Efficiency	Efficiency	Efficiency	Efficiency
10	BUS Muamalat Indo	BTN, JATENG, BCA	BRI, BTN, JATENG, BCA	BNI, BTN, JABAR, JATENG, BCA, BUS Jbs, BUS Ms	BRI, BTN, JABAR, JATENG, BCA, BUS VS, BUS Ms, BUS NTBS
11	BUS Victoria Syariah	BTN, JATENG, BCA	BRI, BTN, JATENG, BCA	BNI, BTN, JABAR, JATENG, BCA, BUS Jbs, BUS Ms	Efficiency
12	BUS Jabar Banten Syariah	BTN, JATENG, BCA	BRI, BTN, JATENG, BCA	Efficiency	BRI, BTN, JABAR, JATENG, BCA, BUS VS, BUS Ms, BUS NTBS
13	BUS Mega Syariah	BTN, JATENG, BCA	BRI, BTN, JATENG, BCA	Efficiency	Efficiency
14	BUS Aceh	BTN, JATENG, BCA	BRI, BTN, JATENG, BCA	BNI, BTN, JABAR, JATENG, BCA, BUS Jbs, BUS Ms	BRI, BTN, JABAR, JATENG, BCA, BUS VS, BUS Ms, BUS NTBS
15	BUS NTB Syariah	BTN, JATENG, BCA	BRI, BTN, JATENG, BCA	BNI, BTN, JABAR, JATENG, BCA, BUS Jbs, BUS Ms	Efficiency

Source : DEA data processing results

Based on Table 7. In an effort to increase the value of efficiency in order to achieve perfect efficiency, the potential for improvement in input and output variables needs to look at the reference bank. Conventional Commercial Banks 2018-2021 have references to Bank BTN, Bank Jawatengah and Bank BCA, while Sharia Commercial Banks in 2018-2021 do not have references from their own BUS whose efficiency in 2018-2021 consecutively, so you can see these references from BUK, such as Bank BTN, Bank Jawatengah and Bank BCA.

IV. CONCLUSION

The results of this research indicate that prior to the Covid-19 pandemic in 2018, there were 3 Conventional Commercial Banks (BUK) that achieved perfect efficiency. However, at the onset of the Covid-19 pandemic in 2019, there were 4 BUK that achieved perfect efficiency. Furthermore, during the Covid-19 pandemic in the years 2020-2021, 4 BUK and 1 BUS operated efficiently. Meanwhile, BUK that maintained relatively stable efficiency values both before and during the Covid-19 pandemic were BTN, BCA, and BUK Jawa Tengah.

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