

# BANK EFFICIENCY IN INDONESIA IN THE PERSPECTIVE OF PRODUCTION APPROACH

Ferry Ardiansyah

Student of Doctoral Program in Business School at Bogor Agricultural University, Bogor, Indonesia

Hermanto Siregar

Professor of Doctoral Program, Business School Bogor Agricultural University, Bogor, Indonesia

Dedi Budiman Hakim

Head of Departement of Economics, Bogor Agricultural University, Bogor, Indonesia

Mulya E. Siregar

Lecturer of Doctoral Program, Business School Bogor Agricultural University, Bogor, Indonesia

## Abstract

To be able to achieve the best level of efficiency, the bank must be able to manage the inputs owned and the outputs produced in between. In addition, banks must also be able to manage operational costs and operating income. In this analysis of efficiency is calculation of the ratio between input and output variables. This research is using non-parametric Data Envelopment Analysis (DEA) for bank in Indonesia in group level two (BUKU II) banks which registered at IDX with period of analysis in 2014 – 2018. To analyze its efficiency by using production approach. The sample analysis are taken from all population banks in BUKU II that already go public, which consist of two sharia banks, and sixteen conventional banks (four foreign banks, one state-owned bank and eleven national private banks). The results of the study indicate that there are several banks that are able to achieve a level of efficiency both using the production approach. In 2014, there were four banks that were able to achieve efficiency levels. In 2015 and 2016, only one bank was able to achieve efficiency levels. However, in 2017 none of the banks was able to reach the level of efficiency. In 2018 there were three banks that were able to achieve a level of efficiency using the production approach. The results of this study are expected to be useful for evaluating the level of efficiency that occurs in banks in Indonesia

**Keywords :** Data Envelopment Analysis, Banking Efficiency, Go Public, Production Approach

## I. INTRODUCTION

### 1.1. Background

The development of regional and global dynamics, and to support Indonesia's economic growth in an optimal and sustainable manner, it is necessary to increase the resilience, competitiveness and efficiency of the national banking industry. In order to increase the resilience, competitiveness, and efficiency of national banks, it is necessary to arrange the scope of business activities and open office networks that are adjusted to the bank's capital capacity. This condition is considered by Bank Indonesia by issuing Bank Indonesia Regulation No.14 / 26 / PBI / 2012 concerning Business Activities and Office Networks Based on Bank Core Capital. Article 1 paragraph 4 states that Commercial Banks are based on Business Activities, hereinafter referred to as BOOKS, are groups of Banks based on Business Activities that are adjusted to their core capital.

Until June 2019, of the fifty-nine BUKU 2 banks, there are eighteen BUKU 2 banks that have gone public or listed their shares on the Indonesia Stock Exchange.

Trend performance of Bank BUKU II Go Public can be seen in Figure 1.

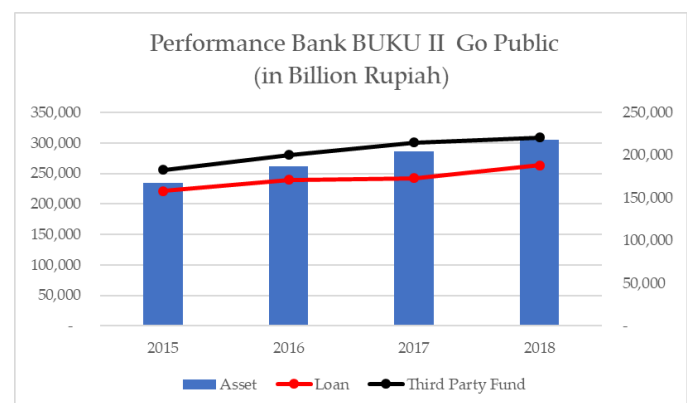


Figure 1. Performance Bank BUKU UU Go Public (Source: Indonesian Banking Statistics - Financial Services Authority)

Assets at the BUKU II banks go public during 2015 to 2018 continued to show positive growth. In 2016, the assets of BUKU II banks going public grew by 11.67%, in 2017 and 2018 each grew by 9.35% and 6.62%. As for lending provided by BUKU II banks going public during 2015 to

2018 showed positive growth. In 2016 the credit provided by BUKU II banks go public was able to grow by 8.13%, and in 2017 it experienced a decline with loans that were able to grow only 1.09%. In 2018, BUKU II banks go public to be able to increase the growth of lending to 8.81%. Positive growth also occurred in the collection of third party funds made by BUKU II banks going public during the period 2015 to 2018. In 2016 third party fund raising grew by 9.60%, then in 2017 the growth of third party funds fell to 7, 20%. In 2018 the growth of third party funds will decrease to 2.64%.

Furthermore, for the development of assets, loans and third party funds that occurred at the BUKU II bank going public, operating income and operating expenses at the BUKU II bank going public had growth that was not in line with the development of loans and third party funds over a certain period of time (see figure 1). In 2017, BUKU II bank went public, third party fund raising was able to grow by 7.20%, but the operating expenses incurred in 2017 showed a decrease of -2.30%. Likewise, lending in 2017 was still able to grow by 1.09%, but operating income decreased by -0.29%. In 2018 there was also a condition where the collection of third party funds grew by only 2.64%, but the operational burden on BUKU II banks grew by 6.56%.

Table 1. Income dan Expenses Bank BUKU II Go Public  
(in Rp Billion)

No	Information	2015	2016	2017	2018
1	Interest Income	23,593	26,203	25,815	26,961
2	Interest Expense	13,781	14,609	12,713	12,298
3	Net Interest Income	9,811	11,594	13,101	14,663
4	Non Interest Income	2,401	2,925	3,229	5,612
5	Non Interest Expense	10,769	13,609	14,855	17,078
6	Operational Income	25,993	29,129	29,044	32,573
7	Operational Expense	24,550	28,218	27,568	29,376
8	Operational Profit	1,443	911	1,476	3,197

(Source: Indonesian Banking Statistics - Financial Services Authority)

The developments that shown in table 1, BUKU II bank go public require a more in-depth analysis of how operational management affected the revenues and operational costs of the positions in 2014 to 2018 from each of the banks in the BUKU II bank group. The diversity of performance results occurring at banks in the BUKU II group cannot be separated from the results of business and operational processes carried out by each bank. In running a business and its operations, banks are required to be able to run it efficiently. To be able to achieve the best level of efficiency, banks must be able to manage their inputs, including third-party funds that have been successfully collected and the resulting output including loans. In addition, banks must also be able to manage operational costs and operating income. This certainly becomes its own challenge how efficient the efforts made both by banks in the BUKU II

group, especially those who go public to be able to manage their operations in order to be able to do efficiency.

## 1.2. Problem Formulation

The developments that took place at the BUKU II bank go public as stated, demanding that banks in general, and especially banks at BUKU II, are required to be able to manage existing inputs to produce maximum output and optimize existing inputs for the output produced. This then raises questions related to how to manage efficiency, namely how the level of efficiency in banks in the BUKU II group goes public based on the production approach ?

## 1.3. Research Objectives

The research objective is to measure and analyze the level of efficiency of banks in the BUKU II go public based on the production approaches.

## II. LITERATURE REVIEW

According to Farrell (1957) the efficiency of a company consists of two components, namely technical efficiency and allocative efficiency. Technical efficiency reflects the ability of the company to produce output with a number of available inputs. Whereas allocative efficiency reflects the company's ability to optimize the use of its inputs, with its price structure and production technology. These two measures are then combined into economic efficiency. A company can be said to be economically efficient if the company can minimize production costs to produce certain outputs with a level of technology that is generally used and prevailing market prices.

The parametric approach makes measurements using stochastic econometrics and seeks to eliminate interference from the effects of inefficiency. There are three econometric parametric approaches, namely: 1) Stochastic Frontier Approach (SFA); 2) Thick Frontier Approach (TFA); and 3) Distribution-free Approach (DFA). Meanwhile, the nonparametric approach with a linear program (Nonparametric Linear Programming Approach) performs nonparametric measurements using an approach that is not stochastic and tends to "combine" disturbances and inefficiencies. It builds on the findings and observations of the population and evaluates the relative efficiency of the units being observed. This approach is known as Data Envelopment Analysis (DEA). DEA is a mathematical programming technique that measures the level of efficiency of a Decision-Making Unit (UPK) or decision-making unit relative to a similar UPK when all of these units are on or below the frontier's efficient "curve".

This approach was first introduced by Charnes, Cooper, and Rhodes in 1978. Since then the application of this approach has increasingly developed (Denizer and Dinc, 2000). Linear programming is very dependent on the population sampled so it tends to be far from specification errors (Kumbhaker and Lovel 2000). Furthermore, the

performance of one UPK is very relative to other UPKs, especially those that cause inefficiency. This approach can also see how a UPK can improve its own financial performance so that it becomes efficient. The advantage of using DEA is that this approach does not require explicit specifications of the shape of the function and only requires a little structure to form its efficiency frontier. Weaknesses that may arise are "self identifier" and "near self identifier".

Efficiency measurements using the frontier approach have been used for over 40 years (Coelli, Rao and Battese, 1996). The main methods that use linear programming and econometrics methods are: 1) Data Envelopment Analysis; and 2) Stochastic Frontier. This measurement of modern efficiency was first pioneered by Farrell (1957), in collaboration with Debreu and Koopmans, by defining a simple measure to measure the efficiency of a company that could account for large inputs. The efficiency intended by Farrell consists of technical efficiency (technical efficiency) which reflects the ability of a company to maximize output with certain inputs, and allocative efficiency which reflects the ability of a company that utilizes inputs optimally with a predetermined price level. These two efficiency measures are then combined to produce economic (total) efficiency.

### III. ANALYSIS METHOD

The research design was carried out using Data Envelopment Analysis (DEA) to determine the efficiency values of the eighteen banks. In this paper using the production approach. The input and output variables for the two approaches are:

#### A. Input Variables - Production Approval

- 1) Operating Costs
- 2) Labor Costs
- 3) Other Operating Costs

#### B. Output Variables - Production Approval

- 1) Operating Income
- 2) Other Operating Income

This research was conducted in June 2019 until December 2019 at commercial banks which are included in the BUKU II go public bank group in Indonesia. The study was conducted in Jakarta using secondary data with a span of January 2014 to December 2018. Secondary data is data from the publication of financial statements of each bank in the BUKU II bank group going public and other information. This report will be used for efficiency analysis with production. Secondary data is obtained through data access to the internal website of each bank that is the object of research as well as data sourced from external parties or third parties such as the Financial Services Authority (FSA) and or Bank Indonesia (BI) and the Indonesia Stock Exchange or other sources.

Efficiency analysis using Data Envelopment Analysis techniques. Data Envelopment Analysis (DEA) is a method of optimizing a mathematical program that measures the efficiency of a Decision-Making Unit (DMU), and compares it relative to other DMUs. DEA analysis techniques are specifically designed to measure the relative efficiency of a DMU under conditions of many inputs and outputs. The relative efficiency of a DMU is the efficiency of a DMU compared to other DMUs in a sample that uses the same type of input and output. DEA formulates DMU as a fractional linear program to find solutions, defining this model to be transformed into a linear program with the weighting values of inputs and outputs.

DEA assumes that each DMU will have a weight that maximizes its efficiency ratio (maximizing total weighted output / total weighted input). This assumption of efficiency ratio maximization makes this DEA study use output orientation in calculating engineering efficiency. Another orientation is to minimize input, but both assumptions will get the same results. A DMU is said to be relatively efficient if its dual value is equal to 1 (one) (100 percent efficiency value), conversely if the dual value is less than 1 (one) then the DMU is considered to be relatively inefficient or inefficient. The modeling found in DEA is as follows:

#### 1. CRS Model (Constant Return to Scale)

The constant return to scale model was developed by Charnes, Cooper and Rhodes (CCR Model) in 1978. This model assumes that the ratio between the addition of inputs and outputs is the same (constant return to scale). That is, if there is an additional input of x times, the output will increase by x times too. Another assumption used in this model is that each company or Decision Making Unit (DMU) operates at an optimal scale. The model of constant return to scale for each approach to measuring efficiency can be written as follows:

Production Approach:

$$\text{Max } h_o = \frac{\sum_{r=1}^s u_r y_{ro}}{\sum_{i=1}^m v_i x_{io}}$$

Limitation or constraint function:

$$\frac{\sum_{r=1}^s u_r y_{rj}}{\sum_{i=1}^m v_i x_{ij}} \leq 1; j = 1, \dots, n; u_r, v_i \geq 0; r = 1, \dots, s; i = 1, \dots, m$$

Where :

ho = technical efficiency (CRS)

yrj = output variables of 18 banks, namely: operating income and other operating income

xij = input variable from 18 banks, namely operational costs, labor costs work and other operational costs

ur = output variable weights from 18 banks

vi = the weight of input variables from 18 banks

j = number of DMUs, in this case 18 banks

r = number of outputs, in this case there are 2

i = number of inputs, in this case there are 3

Efficiency values are always less or equal to 1 (one). A DMU whose efficiency value is less than 1 (one) means inefficiency while a DMU whose efficiency value is equal to 1 (one) means that the DMU is efficient.

## 2. VRS Model (Variable Return to Scale)

This model was developed by Banker, Charnes, and Cooper (BCC model) in 1984 and is a development of the CCR model. This model assumes that the company does not or has not yet operated at an optimal scale. The assumption of this model is that the ratio between the addition of input and output is not the same (variable return to scale). This means that the addition of input x times will not cause output to increase x times, it can be smaller or bigger than x times. Increasing the proportion can be increasing return to scale (IRS) or can also be decreasing return to scale (DRS). Furthermore, the BCC model for each approach to measuring efficiency can be written as follows:

Production Approach:

$$\text{Max ho} = \sum_{i=1}^s u_r y_{rj} - U_o$$

Limitation or constraint function:

$$\sum_{r=1}^s u_r y_{rj} - \sum_{i=1}^m v_i x_{ij} - U_o \leq 0; j = 1, \dots, n; \sum_{i=1}^m v_i x_{io} = 1; u_r, v_i \geq 0$$

Where :

ho = allocative efficiency (VRS)

yrj = output variables of 18 banks, namely: operating income and other operating income

xij = input variable from 18 banks, namely: operational costs, labor costs work and other operational costs

ur = output variable weights from 18 banks

vi = the weight of input variables from 18 banks

j = number of DMUs, in this case 18 banks

r = number of outputs, in this case there are 2

i = number of inputs, in this case there are 3

## IV. RESULTS & DISCUSSION

The results of the efficiency analysis for banks in the BUKU II bank group go public with the production approach give different results from the intermediation approach. In the production approach the calculation of efficiency is based on the comparison between costs as input and income as output.

In 2014, the BUKU II banking group go public, which was able to achieve efficiency totaling four banks. It consists of two foreign banks (Foreign Banks 1 and 4), two national private banks (Private Banks 7 and 11). The conditions experienced were in line with the growth in costs and income that occurred at the national and foreign exchange and non-foreign exchange private banks. Where in the group the ratio of operating costs to operating income by 85% and 92%. As for the group of foreign banks and joint venture banks, the ratio of operating costs to operating income was 79% and 80%, respectively.

Table 1. Efficiency Score in 2014

NO	DMU	CCR		Production Approach		CRS/VRS	
		CCR-I	CCR-O	BCC-I	BCC-O	SE-I	SE-O
1	2014-Private Bank 1	0.774976818	0.774976818	0.877089536	0.906710693	0.884	0.855
2	2014-State Owned Bank 1	0.793324767	0.793324767	0.794098244	0.8158922	0.999	0.972
3	2014-Syariah Bank 1	0.69688289	0.69688289	0.705821462	0.743265313	0.987	0.938
4	2014-Syariah Bank 2	0.705697233	0.705697233	0.751340957	0.727244555	0.939	0.970
5	2014-Private Bank 2	0.816708478	0.816708478	0.825297545	0.827554518	0.990	0.987
6	2014-Private Bank 3	0.834496854	0.834496854	0.919153906	0.928358998	0.908	0.899
7	2014-Private Bank 4	0.68275755	0.68275755	0.905912566	0.81284984	0.754	0.840
8	2014-Private Bank 5	0.811239721	0.811239721	1	1	0.811	0.811
9	2014-Foreign Bank 1	1	1	1	1	1.000	1.000
10	2014-Foreign Bank 2	0.497687482	0.497687482	0.552179882	0.581492942	0.901	0.856
11	2014-Private Bank 6	0.754492061	0.754492061	0.7882058	0.759541859	0.957	0.993
12	2014-Private Bank 7	1	1	1	1	1.000	1.000
13	2014-Private Bank 8	0.635681276	0.635681276	0.649920421	0.672047437	0.978	0.946
14	2014-Private Bank 9	0.755779137	0.755779137	0.796606233	0.767214076	0.949	0.985
15	2014-Foreign Bank 3	0.769683745	0.769683745	0.864366837	0.875509305	0.890	0.879
16	2014-Private Bank 10	0.81620505	0.81620505	0.967464781	0.972445084	0.844	0.839
17	2014-Private Bank 11	1	1	1	1	1.000	1.000
18	2014-Foreign Bank 4	1	1	1	1	1.000	1.000

To achieve efficiency with the production approach in 2015 there was only one foreign bank, namely Foreign Bank 1. This condition is generally in accordance with the development of banks in Indonesia in the period 2015. Where in that year general banking showed a decrease in operating profit of Rp. 143,761 Billion in 2014 to Rp 133,198 Billion.

Table 2. Efficiency Score in 2015



NO	DMU	Production Approach					
		CRS		VRS		CRS/VRS	
		CCR-I	CCR-O	BCC-I	BCC-O	SE-I	SE-O
		Score	Score	Score	Score	Score	Score
19	2015-Private Bank 1	0.733202794	0.733202794	0.802859523	0.847270296	0.913	0.865
20	2015-State Owned Bank 1	0.803432367	0.803432367	0.804281454	0.810799235	0.999	0.991
21	2015-Syariah Bank 1	0.741165608	0.741165608	0.742153462	0.793947603	0.999	0.934
22	2015-Syariah Bank 2	0.732818503	0.732818503	0.761347156	0.74467936	0.963	0.984
23	2015-Private Bank 2	0.804593992	0.804593992	0.820075813	0.836271418	0.981	0.962
24	2015-Private Bank 3	0.836237181	0.836237181	0.906843215	0.913270601	0.922	0.916
25	2015-Private Bank 4	0.681401778	0.681401778	0.868164712	0.79681424	0.785	0.855
26	2015-Private Bank 5	0.821114717	0.821114717	0.99660763	0.989824439	0.824	0.830
27	2015-Private Bank 1	1	1	1	1	1.000	1.000
28	2015-Private Bank 2	0.44708019	0.44708019	0.542612936	0.568292749	0.824	0.787
29	2015-Private Bank 6	0.78192159	0.78192159	0.786455097	0.791985881	0.994	0.987
30	2015-Private Bank 7	0.976473494	0.976473494	0.977470623	0.977269016	0.999	0.999
31	2015-Private Bank 8	0.701464885	0.701464885	0.751502219	0.764784609	0.933	0.917
32	2015-Private Bank 9	0.74799585	0.74799585	0.76603581	0.754013182	0.976	0.992
33	2015-Private Bank 3	0.763813309	0.763813309	0.852497443	0.887136379	0.896	0.861
34	2015-Private Bank 10	0.827778213	0.827778213	1	1	0.828	0.828
35	2015-Private Bank 11	0.971004755	0.971004755	1	1	0.971	0.971
36	2015-Private Bank 4	0.832079628	0.832079628	0.903436043	0.911865393	0.921	0.913

The same thing happened in 2016, where there was one bank that achieved the value of efficiency, but was achieved by Private Bank 11. Seeing the condition of banks in Indonesia in 2016, then it has a match. Where the national private foreign exchange commercial bank group has a fairly high operating profit growth.

Table 3. Efficiency Score in 2016

NO	DMU	Production Approach					
		CRS		VRS		CRS/VRS	
		CCR-I	CCR-O	BCC-I	BCC-O	SE-I	SE-O
		Score	Score	Score	Score	Score	Score
37	2016-Private Bank 1	0.721373305	0.721373305	0.770942352	0.821187686	0.936	0.878
38	2016-State Owned Bank 1	0.812018302	0.812018302	0.828207663	0.838602671	0.980	0.968
39	2016-Syariah Bank 1	0.768506546	0.768506546	0.791806204	0.837926215	0.971	0.917
40	2016-Syariah Bank 2	0.8320911	0.8320911	0.849045642	0.840686038	0.980	0.990
41	2016-Private Bank 2	0.825328914	0.825328914	0.839331673	0.852915982	0.983	0.968
42	2016-Private Bank 3	0.795923108	0.795923108	0.846430547	0.856407351	0.940	0.929
43	2016-Private Bank 4	0.808325255	0.808325255	0.93394764	0.917170253	0.865	0.881
44	2016-Private Bank 5	0.812632549	0.812632549	0.922115681	0.901171851	0.881	0.902
45	2016-Private Bank 1	0.915752802	0.915752802	0.95676484	0.916287895	0.957	0.999
46	2016-Private Bank 2	0.494758947	0.494758947	0.592488251	0.62035093	0.835	0.798
47	2016-Private Bank 6	0.821159512	0.821159512	0.831630852	0.825677634	0.987	0.995
48	2016-Private Bank 7	0.888118799	0.888118799	0.889613408	0.888755031	0.998	0.999
49	2016-Private Bank 8	0.71713205	0.71713205	0.772169605	0.783086116	0.929	0.916
50	2016-Private Bank 9	0.738067792	0.738067792	0.759977653	0.738479467	0.971	0.999
51	2016-Private Bank 3	0.551929646	0.551929646	0.588160571	0.660813023	0.938	0.835
52	2016-Private Bank 10	0.822243056	0.822243056	1	1	0.822	0.822
53	2016-Private Bank 11	1	1	1	1	1.000	1.000
54	2016-Private Bank 4	0.846073132	0.846073132	0.893036985	0.896845915	0.947	0.943

Furthermore, in 2017, none of the banks has been able to achieve efficiency values in both the input and output approaches. However, if based on the value of the efficiency of the input approach, then there is only one bank, namely Private Bank 2. In addition there are three banks whose values are nearly close to one (above 0.990) for the value of the output approach efficiency, namely Syariah Bank 2, Private Bank 6, Private Bank 11. This is in accordance with the condition of earnings growth that occurred in the national private bank group both foreign exchange and non-foreign exchange in 2017. The national private foreign exchange banking group experienced operating profit growth of 31.55%, while the national private non-foreign operating profit grew by 141.48%.

Table 4. Efficiency Score in 2017

NO	DMU	Production Approach					
		CRS		VRS		CRS/VRS	
		CCR-I	CCR-O	BCC-I	BCC-O	SE-I	SE-O
		Score	Score	Score	Score	Score	Score
55	2017-Private Bank 1	0.765879959	0.765879959	0.793643651	0.840040497	0.965	0.912
56	2017-State Owned Bank 1	0.845540324	0.845540324	0.913167454	0.918139645	0.926	0.921
57	2017-Syariah Bank 1	0.725949019	0.725949019	0.758460697	0.806641453	0.957	0.900
58	2017-Syariah Bank 2	0.908111076	0.908111076	0.913691535	0.909727785	0.994	0.998
59	2017-Private Bank 2	0.839286234	0.839286234	0.83956172	0.85392669	1.000	0.983
60	2017-Private Bank 3	0.776622247	0.776622247	0.799272847	0.809888017	0.972	0.959
61	2017-Private Bank 4	0.788426491	0.788426491	0.844453801	0.819578394	0.934	0.962
62	2017-Private Bank 5	0.81504889	0.81504889	0.928561965	0.909642107	0.878	0.896
63	2017-Private Bank 1	0.67907414	0.67907414	0.717343982	0.691791923	0.947	0.982
64	2017-Private Bank 2	0.731294839	0.731294839	0.873634154	0.882641204	0.837	0.829
65	2017-Private Bank 6	0.812121421	0.812121421	0.82225701	0.817563614	0.988	0.993
66	2017-Private Bank 7	0.926722931	0.926722931	0.946083885	0.94843461	0.980	0.977
67	2017-Private Bank 8	0.453673312	0.453673312	0.529378046	0.556953123	0.857	0.815
68	2017-Private Bank 9	0.697765779	0.697765779	0.716782745	0.701400854	0.973	0.995
69	2017-Private Bank 3	0.480860982	0.480860982	0.604135857	0.64232716	0.796	0.749
70	2017-Private Bank 10	0.754348439	0.754348439	0.981730101	0.985416294	0.768	0.766
71	2017-Private Bank 11	0.990686397	0.990686397	1	1	0.991	0.991
72	2017-Private Bank 4	0.921345831	0.921345831	0.974894942	0.975794908	0.945	0.944

To be determined in 2018, BUKU II banks go public, capable of achieving efficiency totaling three, namely two foreign banks (Foreign Banks 3 and 4) and one syariah bank (Syariah Bank 2). This shows that the development of sharia banking is able to show the level of efficiency in line with non-sharia banking starting in 2018.

Table 5. Efficiency Score in 2018

NO	DMU	Production Approach					
		CRS		VRS		CRS/VRS	
		CCR-I	CCR-O	BCC-I	BCC-O	SE-I	SE-O
		Score	Score	Score	Score	Score	Score
73	2018-Private Bank 1	0.751938109	0.751938109	0.783732646	0.831174864	0.959	0.905
74	2018-State Owned Bank 1	0.912904126	0.912904126	1	1	0.913	0.913
75	2018-Syariah Bank 1	0.722977762	0.722977762	0.890510247	0.912678947	0.812	0.792
76	2018-Syariah Bank 2	1	1	1	1	1.000	1.000
77	2018-Private Bank 2	0.842736152	0.842736152	0.848122944	0.851782715	0.994	0.989
78	2018-Private Bank 3	0.773757965	0.773757965	0.842271597	0.852112929	0.919	0.908
79	2018-Private Bank 4	0.648242861	0.648242861	0.692123383	0.652311052	0.937	0.994
80	2018-Private Bank 5	0.786309981	0.786309981	0.87729767	0.850500626	0.896	0.925
81	2018-Private Bank 1	0.752772074	0.752772074	0.800332119	0.765666828	0.941	0.983
82	2018-Private Bank 2	0.588462917	0.588462917	0.729872865	0.746333963	0.806	0.788
83	2018-Private Bank 6	0.77696662	0.77696662	0.796633465	0.778852394	0.975	0.998
84	2018-Private Bank 7	0.953376086	0.953376086	0.96981824	0.971180816	0.983	0.982
85	2018-Private Bank 8	0.687909322	0.687909322	0.775151412	0.798216067	0.887	0.862
86	2018-Private Bank 9	0.675355826	0.675355826	0.67563021	0.689655735	1.000	0.979
87	2018-Private Bank 3	1	1	1	1	1.000	1.000
88	2018-Private Bank 10	0.695832252	0.695832252	1	1	0.696	0.696
89	2018-Private Bank 11	0.932633109	0.932633109	1	1	0.933	0.933
90	2018-Private Bank 4	1	1	1	1	1.000	1.000

## V. SUMMARY & CONCLUSION

Efficiency is an inseparable part of the bank in carrying out its operations. For banks, especially the BUKU II group of banks went public, it was also a matter that was sought. Efficiency assessment in the production approach, during 2014-2018 there were two national private banks (Private Bank 7, Private Bank 11), three foreign banks (Foreign Bank 1, Foreign Bank 3, Foreign Bank 4) and one syariah bank (Syariah Bank 2).

## REFERENCES

- Berger, Allen N and DeYoung, Robert. 1997. Problem Loans and Cost Efficiency in Commercial Banks. *Journal of Banking & Finance*, 21 (6), pp.849-870.
- Bonin, John P, Hasan, Iftekhar and Wachtel, Paul. 2005. Bank Performance, Efficiency and Ownership in Transition Countries. *Journal of Banking & Finance*, 29 (1), pp.31-53
- Charnes, A., Cooper, W.W., and Rhodes, E. 1978. Measuring the Efficiency of Decision Making Units. *European Journal of Operation Research*, 2, 6, 429-44.

- Coelli, T.J., Rao, D.S.P., and Battese, G.E. 1996. Introduction to Efficiency and Productivity Analysis, Kluwer Academic Publishers, Boston.
- Denizer, A. Cevdet A and Dinc Mustafa. 2000. Measuring Banking Efficiency in the Pre and Post Liberalization Environment: Evidence from the Turkish Banking System, World Bank.
- Farrell, M.J. 1957. The Measurement of Productive Efficiency. Journal of The Royal Statistical Society, 120, 253-81.
- Huri, M. D. Dan Indah Susilowati. 2004. "Measurement of Relative Efficiency of Banking Issuers with Data Envelopment Analysis (DEA) Method: Case Study: Banks Listed on the Jakarta Stock Exchange in 2002", Journal of Development Dynamics 12/2004; 1 (2): 95-107.
- Kumbhakar, Subal C., C.A. Knox Lovel. 2000. Stochastic Frontier Analysis, Cambridge University Press.
- Omar, Mohd Azmi, Rahman, Abdul Rahim Abdul, Yusof, Rosylin Mohd, Majid, M Shabri Abd and Rasid. 2006. MESM. Efficiency of Commercial Banks in Malaysia. Asian Academy of Management Journal of Accounting and Finance, 2 (2), pp.19-42.
- Ongore, Vincent Okoth and Kusa, Gemechu Berhanu. 2013. Determinants of Financial Performance of Commercial Banks in Kenya. International Journal of Economics and Financial Issues, 3 (1), pp.237-252.
- Sok-gee, Chan. 2011. Technical Efficiency of Commercial Banks in China: Decomposition into Pure Technical and Scale Efficiency. International Journal of China Studies, 2 (1), p.27.