EFFICIENCY ANALYSIS OF INDONESIAN SHARIA BANKS

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Abstract

The development of Islamic banking in Indonesia is still not optimal, so it requires performance improvement. It is necessary to measure efficiency and productivity to achieve predetermined targets. This study measures the level of efficiency of 12 Islamic commercial banks in Indonesia for the 2016-2018 period using DEA (Data Envelopment Analysis), method with the assumption of CRS (Constant Return to Scale) and maximizing output. Furthermore, the malmquist index analysis is to see the productivity level of Islamic commercial banks. The results show that the overall efficiency of Islamic commercial banks in Indonesia has decreased. In 2016, the average efficiency of Islamic commercial banks was 100 percent. In 2017 the average efficiency was 99.93 percent with 3 Islamic commercial banks that were not efficient. In 2018 the average efficiency was 98.4 percent with 2 Islamic commercial banks that were not efficient. The results of the malmquist index analysis in 2017, there were 8 Islamic commercial banks increasing returns to scale, while 4 Islamic commercial banks decreasing returns to scale. In 2018, 11 Islamic commercial banks increasing returns to scale and 1 Islamic commercial banks decreasing returns to scale.

Keywords: *Efficiency, productivity, DEA, Islamic Bank.*

1. INTRODUCTION

The development of the Islamic Financial Institutions (IFI) industry in Indonesia, especially Islamic banking, has progressed both in terms of institutional aspects and business performance. The development of Islamic banking from the institutional aspect can be seen by the number of Islamic Commercial Banks (ICBs) and Sharia Business Units (SBUs). The Otoritas Jasa Keuangan (OJK) or the Financial Services Authority noted that until 2018, the number of Islamic banks was 14 ICBs, 20 SBUs and 167 BPRS. There was an increase in the number of 1 ICB and a decrease in 1 SBU in 2018 compared to 2017 as shown in Table 1.

Table 1. Development of National Sharia Banking and Banking Offices 2016-2018 (unit)

Sharia Banks	2016		2017		2018	
	Bank	Office	Bank	Office	Bank	Office
Sharia Commercial Bank	13	1.869	13	1.825	14	1.875
Sharia Business Unit	21	332	21	344	20	354
BPRS	166	453	167	441	167	495

Source: Sharia Banking Statistics 2018

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The development of Islamic banking from the aspect of business performance can be seen from the development of assets, third party funds (TPF) and financing which experienced significant development as shown in Table 2.

Table 2. Development of Indonesian Islamic Banking 2016-2018 (billion rupiah)

Year	Asset	Funding	TPF
2016	356,503	248,007	279,335
2017	424,181	285,695	334,888
2018	477,327	320,193	371,828

Source: Sharia Banking Statistics 2018

Although Islamic banking has experienced quite rapid development in terms of institutional and performance aspects, the market share of Islamic banking in Indonesia is still relatively small. The following is a comparison of the development of Islamic banking assets and market share.

Table 3. Development of Islamic Banking Assets and Market Share in Indonesia

Indicator	2016	2017	2018
Asset (Trillion Rupiah)	Rp 365,6	Rp 435,02	Rp 489,69
Market Share (percent)	5,33 %	5,55%	5,96 %

Source: Sharia Banking Statistics 2018

In this case, there is a gap phenomenon due the fact that Indonesia is a country with the largest muslim population in the world as shown by the Indonesia Central Statistics Board (BPS) in 2010 as many as 207.17 million people or about 87.18 of the total population of Indonesia adheres to Islam and assessment of the Global Islamic Financial Report in 2016, where Indonesia ranks sixth in the countries that have the potential and conduciveness in developing the Islamic finance industry. However, in reality, the Islamic banking market share is still relatively small compared to the national banking market share, which is only 5.96 percent of total banking assets nationally at the end of 2018.

Research conducted by (Putri, 2015) on the efficiency of Islamic Commercial Banks in Indonesia in 2013-2015 using a data envelopment analysis (DEA) approach concluded that overall Islamic Commercial Banks in Indonesia have not yet reached 100 percent efficiency. In 2013, the average overall efficiency level of ICBs was 97.15 percent, then increased in 2014 to 97.58 percent. However, in 2015, the average ICBs efficiency decreased by 2.02 percent to 95.56 percent. It was necessary to conduct further research to measure the level of efficiency of Islamic banking in the following year, namely 2016-2018 and find the best solution so that Islamic banking can achieve 100 percent efficiency.

On the other hand, every business including banks needs to know the return-on-investment to measure efficiency in converting the money used (ROA) into net profit. In the 2018, Indonesian Islamic Financial Development Report (Keuangan, 2018), show that during 2016-2018 the ROA of Islamic Commercial Banks has increased. Ideally, the higher the ROA number, the better the assumptions of the company's performance in terms of equity management.

The elaboration of the gap phenomenon and the results of previous research as well as the variables that need to be included in measuring the efficiency of Islamic Banking using the Data Envelopment Analysis (DEA) method was carried out for further research. This study has included 12 Islamic Commercial Banks (ICBs) in Indonesia using the financial reporting period 2016-2018. The use of the DEA method was because the DEA method can obtain more accurate results when compared to using financial ratio analysis (Hadad et al., 2003). The DEA method provides information on banks that were less efficient and was able to identify which banks have achieved the highest level of efficiency so that this can be used as a reference for banks that were less efficient.

The phenomenon of the rapid development of Islamic Banking did not necessarily indicate productivity, because productivity was not merely productive or produce, but was a combination of effectiveness and efficiency (Pambuko, 2019). In this codition, productivity analysis was important because productivity was one of the performance measurements and it was possible to be a factor that was taken into account in decision making (Basalamah, 2014).

To measure productivity, this study uses the *Malmquist Productivity Index* (MPI) analysis. The Malmquist Index is part of the DEA method which specifically looks at the productivity level of each business unit, so that changes in the level of efficiency and technology used will be seen based on predetermined inputs and outputs. The Malmquist Index was also used to analyze changes in performance over time (Rusydiana, 2016).

2. LITERATURE REVIEW

a. Production and Cost Concepts

Bank is one type of company, where as an economic actor who uses factors of production (input) to produce goods or services (*output*) (Sadono Sukirno, 1994). The production function can be shown by the following formula:

$$Q = f(K, L, R, T) \quad \ldots\ldots (1)$$

Equation 1 explains that the level of production of a good or service (Q) depends on the amount of capital (K), labor (L), natural wealth (R) and the level of technology (T) used. Different amount of production naturally requires different factors of production, in addition to a certain levelof production a combination of different factors of production can also be used (Sadono Sukirno, 1994).

In the production function, there is not only the concept of production but also the concept of cost. The cost concept is closely related to the product concept introduced (R. B. Lipsey, 1992). The cost curve shows the minimum product cost at various levels of output.

In Figure 1 in the short run either one or more factors of production are assumed to be fixed. The total fixed cost (TFC) reflects all liabilities or costs incurred per unit time for all fixed inputs. The total variable cost (TVC) is the total cost borne per unit of time for all the variable inputs used. The total cost (TC) is TFC plus TVC.

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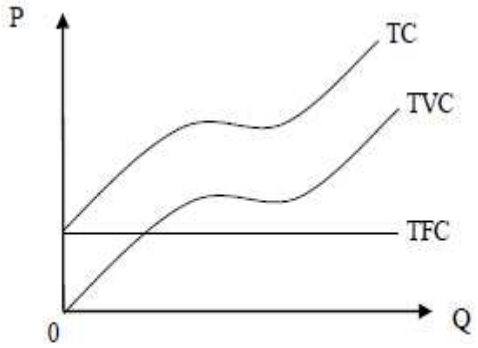

Figure 1: Total Cost Curve
Source: (Dominick Salvatore, 1994)

b. Concept of Efficiency and Productivity

Productivity efficiency can be used to measure the performance of a unit of economic activity. Both are concepts that show the ratio of the results of the comparison between input and output (Nurfikasari & Tanuatmodjo, 2019)

The concept of efficiency is a fundamental concept and was born from the economic concept of using small resources and producing optimal output. The concept of efficiency begins with the concept of microeconomic theory, namely producer theory and consumer theory. The producer theory states that producers tend to maximize profits and minimize costs. Meanwhile, consumer theory states that consumers tend to maximize their utility or level of satisfaction.

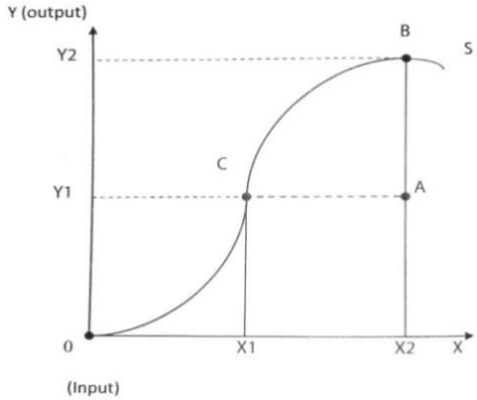

Figure 2: Efficiency Concept
Source (Collie, et al., 2000)

Figure 2 explains the concept of efficiency where in an industry, a company only uses 1 input (X) to produce 1 output (Y). Companies operating at point A are considered technically inefficient compared to companies operating at point B. This is because with the same amount of input (X2), companies operating at point B can produce more output (Y2) than the output produced by companies operating at point A, namely Y1.

From the point of view of Islamic economics, the concept of efficiency is in line with Sharia principles which aim to achieve and maintain the maqashid of Sharia, namely the maintenance of *al-maal* (Sari & Suprayogi, 2015). The concept of efficiency is basically to avoid all forms of waste as contained in the letter Al-Israa' verse 26-27:

وَءَاتِ ذَا ٱلْقُرْبَىٰ حَقَّهُۥ وَٱلْمِسْكِينَ وَٱبْنَ ٱلسَّبِيلِ وَلَا تُبَذِّرْ تَبْذِيرًا(٢٦)

إِنَّ ٱلْمُبَذِّرِينَ كَانُوٓاْ إِخْوَٰنَ ٱلشَّيَٰطِينِ ۖ وَكَانَ ٱلشَّيْطَٰنُ لِرَبِّهِۦ كَفُورًا(٢٧)

Meaning: *give to close relatives their due, as well as the poor and needy travellers. And do not spend wastefully. Surely the wasteful are "like" brothers to the devils. And devil is ever ungrateful to His Lord* (QS. Al-Israa (17):26-27).

c. *Data Envelopment Analysis* (DEA) Concept and *Malmquist Productivity Index* (MPI)

The purpose of DEA was to focus more on evaluating the performance of an Economic Activity Unit (EAU). The evaluation was carried out on the relative efficiency of comparable EAUs, then the efficient EAUs will form a frontier line. If the EAU is in the frontier line, then it can be said to be relatively efficient compared to other EAUs in sample. DEA can also show some EAUs which can be references for inefficient EAUs (Ascarya, Diana Y. dan Guruh S. R., 2008).

Malmquist Index or *Malmquist Productivity Index* (MPI) is part of the DEA method that specifically measures productivity. There are two things that are calculated in the measurement of the Malmquist Index, namely *catch-up* effect and *frontier shift effect*. The *catch-up* effect measures the rate of change in relative efficiency from period one to period two. Meanwhile, the *frontier shift* effect measures the rate of technological change which is a combination of inputs and outputs from period one to period two.

d. Sharia Banking Concept

According to the Law of the Republic of Indonesia Number 21 of 2008 dated July 16, 2008 concerning Islamic Banking, it is everything related to sharia banks and sharia business units, including institutions, operational activities, as well as methods and processes in carrying out their operational activities. Meanwhile, sharia commercial banks are sharia banks which in their activities provide services in payment traffic. According to (Karim, 2004) in (Sri et al., 2014), basically, the products offered by Islamic Banks can be divided into three major parts, namey:

1) Fund distribution products
2) Fundraising products
3) Service products

e. Framework

This study measured the efficiency level of 12 Islamic Commercial Banks in Indonesia 2016-2018 using the *Data Envelopment Analysis* (DEA) method with the assumption of *Constant Return to Scale* (CRS) and maximizaing output. The input variables included: first, the number of deposits, which means the amount of public funds both individuals and legal entities that can be collected by Islamic Banks. Second, fixed assets were tangible assets that were not intended to be sold in the context of normal company activities and have a useful life or more than one year. Third, operational costs were defined as costs used by the bank to carry out its operational activities. Fourth, the cost of profit sharing was the bank's obligation for third party funds that have been collected by Islamic banks. The output variables included: first, financing, namely murabahah financing and financing other than murabahah. Current assets that were used as output were cash and curret accounts with Bank Indonesia, which were considered as the most liquid and were not temporarily oriented to generate profits. Furthermore, operating income was income resulting from operational activities of Islamic Banks. Finally, ROA *(Return on Assets)* was one of the profitability ratios that can show the

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company's success in generating profits. ROA is able to measure the company's ability to generate profits in the past and then projected in the future. Then, to measure productivity, this study uses the analysis of the *Malmquist Productivity Index* (MPI). There were two things that were calculated in the Malmquist Index measurement, namely the *catch-up* effect which measures the rate of change in relative efficiency from period one to period two and the *frontier shift* effect which measured the rate of technological change which was a combination of input and output from period one to period two.

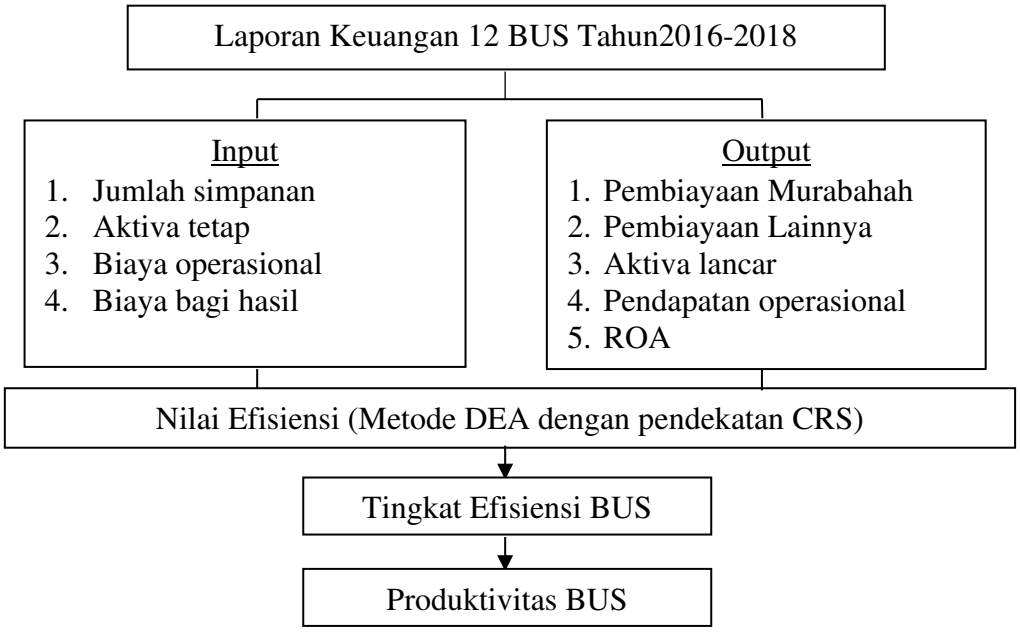

Figure 3: Framework

3. RESEARCH METHODOLOGY

This study aims to measure and analyze the efficiency and productivity of Islamic Banking in Indonesia during 2016-2018 at 12 Islamic Commercial Banks (ICBs), using a non parametric analysis method, namely the Data Envelopment analysis (DEA) method. The analytical tool used in this research was Banxia Frontier Analyst (BFA). This research was using the Data Envelopment Analysis (DEA) method, had use data in the form of inputs and outputs of an Economic Activity Unit (EAU). The input variables included the number of deposits, fixed assets, operational costs, and profit-sharing costs while the output variables consist of

murahabah financing (*istishna, ijarah, qard, mudharabah, musyarakah*), current assets, operating income, and ROA. The following 12 Islamic Commercial Banks (ICBs) were used as research samples:

Table 4. List of Bank Samples in Research

No	Sharia Commercial Banks
1	Bank Muamalat Indonesia (BMI)
2	Bank Syariah Mandiri (BSM)
3	Bank Syariah Mega Indonesia (BSMI)
4	Bank Rakyat Indonesia (BRI) Syariah
5	Bank Syariah Bukopin
6	Bank Negara Indonesia (BNI) Syariah
7	Bank Jawa Barat dan Banten (BJB) Syariah
8	Bank Central Asia (BCA) Syariah
9	Bank Victoria Syariah
10	Bank Maybank Syariah Indonesia
11	Bank Panin Syariah
12	Bank Tabungan Pensiunan Nasional Syariah

The approach used in measuring efficiency was to use the ratio of output to input, as shown in equation (1).

$$\text{Efficiency} = \frac{utput}{Input} \quad \text{..... (1)}$$

In the DEA approach, linear programming was used to maximize the ratio between input and output (Charnes, Cooper dan Rhodes, 1978), Likewise for DMUs in the Islamic Banking industry. For DMUs in the banking industry (which are the object of the study), all input and output samples were denoted (marked) by "n" and "m" respectively, where n= input and m = output. Then the efficiency of each bank was calculated through equation (2)

$$h_s = \frac{\sum_{i=1}^{m} u_i \; y_{is}}{\sum_{j=1}^{n} v_j \; x_{js}} \quad \text{..... (2)}$$

for i = 1,……., m and j = 1,……n,

where:

h_s = bank s efficiency

m = observed output of bank s

n = observed input of bank s

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

x_{js} = the amount of input j used by bank *s*

u_i = the weight of the output *i* produced by the bank *s*

v_j = the input weight *j* given by bank *s* and *i* is calculated from 1 to *m* and *j* is calculated from 1 to *n*

Equation 2 shows the use of one input and one output variable. Then, the efficiency ratio (*hs*) was maximized with the following constraints:

Maximize $h_s = \frac{\sum_{i=1}^{m} u_i \; y_{is}}{\sum_{j=1}^{n} v_j \; x_{js}} \leq 1$; $r = 1,..., N$..... (3)

Where u_i and $v_j \geq 0$ ..... (4)

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This study has used the CCR model in accordance with the opinion of Priyonggo Suseno (2008). The assumption used in this research was output maximization.

In the measurement of productivity using the Malmquist Index was introduced by Caves et.al (1982). (Rusydiana, 2016).

4. RESULT AND DISCUSSION

Based on the results of data processing using the DEA method which assumes *Constant Return to Scale* (CRS), the efficiency level of Islamic Commercial Banks in Indonesia in 2016-2018 is shown in Table 5.

Table 5. Technical Efficiency Level of 1 ICBs in Indonesia 2016-2018 (percent)

Bank Name	2016	2017	2018
Bank Muamalat Indonesia (BMI)	100	100	94.9
Bank Syariah Mandiri (BSM)	100	100	100
Bank Syariah Mega Indonesia (BSMI)	100	99.8	100
Bank Rakyat Indonesia (BRI) Syariah	100	99.7	100
Bank Syariah Bukopin	100	100	86.0
Bank Negara Indonesia (BNI) Syariah	100	100	100
Bank Jawa Barat dan Banten (BJB) Syariah	100	100	100
Bank Central Asia (BCA) Syariah	100	99.6	100
Bank Victoria Syariah	100	100	100
Bank Maybank Syariah Indonesia	100	100	100
Bank Panin Syariah	100	100	100
BTPN Syariah	100	100	100
Average Efficiency	**100**	**99.93**	**98.4**

Source: processed data

Table 5 shows that the 12 SCBs which we were used as research objects had reached a level of technical efficiency of 100 percent in 2016, decrease in 2017 with an average efficiency of 99.93 percent and in 2018 experienced a decline again with an efficiency level of 98.4 percent. Otoritas Jasa Keuangan (OJK) or The Financial Services Authority also noted that the growth of total Islamic bank assets experienced a slowdown from 23.39 percent in the second quarter of 2017 to 14.58 percent in the second quarter of 2018.

In 2017, the average efficiency value of 12 Islamic commercial banks in 2017 reached 99.93 percent with 3 percent inefficiency ICBs and 9 efficiency ICBs. The 3 inefficiency ICBs are Bank Syariah Mega Indonesia (BSMI), Bank Rakyat Indoneisa (BRI) Syariah, and Bank Central Asia (BCA) Syariah.

Table 6. Input-Output Value of Mega Indonesia Sharia Bank in 2017 (million rupiah)

Bank Name	Efficiency Rate	*Actual*	*Target*	*Potential Improvement*
Total Deposit		1198568	1198568	00.00%

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Bank Name	Efficiency Rate	*Actual*	*Target*	*Potential Improvement*
Fixed Asset	99.83%	318016	116098.14	-63.49%
Operating Cost		477214	477214	00.00%
Profit Sharing Fee		271515	271515	00.00%
Murabahah Financing		3937253	3943968.20	00.17%
Other Financing		680912	1231752.66	80.90%
Current Asset		812596	1388397.54	70.86%
Operating Income		839772	1042877.87	24.19%
ROA (percent)		1.56	1.70	8.76%

Source: data processing result

Table 6 shows the results that BSMI in 2017 has an effciciency level of 99.83 percent, which means that it has not yet reached the level of efficiency/inefficiency. The inefficiency in BSMI due to the fact that the allocation of fixed assets input. It takes a reduction of 63.49 percent of fixed assets in order toachieve the level inefficiency. The required input target should be 116,098.14 million rupiah; however, the actual input was 318,016 million rupiah. To achieve the efficiency level of output, an increase of 0.17 percent (*murabahah financing)*, 80.90 percent (other financing), 70.86 percent (fixed assets), 24.19 percent (operating income) and 8.76 percent (ROA).

Table 7. Development of BSMI Input-Output Value in 2017-2018

Input/Output		*Actual*	*Target*	*Potential Improvement*
Total Deposit	2017	1198568	1198568	0.00%
	2018	837313	837313	0.00%
Fixed Asset		**-361255**	**-361255**	
Development	2017	318016	116098.14	-63.49%
	2018	336924	336924	0.00%
Operational Cost		**18908**	**220825.86**	
Development	2017	477214	477214	0.00%
	2018	529670	529670	0.00%
Development of		**52456**	**52456**	
Profit Sharing Fee	2017	271515	271515	0.00%
	2018	257566	257566	0.00%
Development of		**-13949**	**-13949**	
Murabahah Financing	2017	3937253	3943968.2	0.17%
	2018	3885574	3885574	0.00%
Development of		**-51679**	**-58394.2**	
Other Financing	2017	680912	1231752.66	80.90%
	2018	1264293	1264293	0.00%
Development of		**583381**	**32540.34**	
Current Asset	2017	812596	1388397.54	70.86%
	2018	4549688	4549688	0.00%
Development of		**3737092**	**3161290**	
Operating Income	2017	839772	1042877.87	24.19%

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Input/Output		*Actual*	*Target*	*Potential Improvement*
	2018	837749	837749	0.00%
Development of		**-2023**	**-205128.87**	
ROA	2017	1.56	1.7	8.76%
	2018	0.93	0.93	0.00%
Development		**-0.63**	**-0.77**	

Source: DEA data processing result

From table 7 it is known that there was an improvement in 2018 that was suggested in 2017, namely the actual value of other financing and current assets increased. Other financing increased by 583,381 million rupiah from 2017 or 85.7 percent from the previous year. This increase exceeds the 2017 *potential improvement*, which is 4.8 percent. Current assets increased by 3,737,092 million rupiah from 812,596 million rupiah in 2017, or an increase of 459.9 percent from the previous year. This increase exceeds the *potential improvement*, which is 389.04 percent greater.

Table 8. BRI Syariah Input-Output Value in 2017 (million rupiah)

Bank Name	**Efficiency Level**	*Actual*	*Target*	*Potential Improvement*
Total Deposits		6533329	5293850.01	-18.97%
Fixed Assets	99.74%	177935	177935.00	00.00%
Operating Costs		1178743	1178743.00	00.00%
Profit Sharing Fees		1193918	1159573.76	-2.88%
Murabahah Financing		10457017	13440542.47	28.53%
Other Financing		6817382	9038855.27	32.59%
Current Assets		4363623	4374846.97	0.26%
Operating Income		2965527	3142934.45	5.98%
ROA (percent)		0.51	2.54	397.95%

Source: DEA Result

Table 8 shows that in 2017, BRI Syariah has an efficiency level of 99.74 percent, which means that it is not yet efficienct/inefficient. The efficiency stems from the input allocation of the amount of savings and the cost of profit sharing. It takes a reduction of 18.97 percent of the total savings and 2.88 percent of the cost of profit sharing in order to achieve the level of efficiency. The input target for the required ampunt of savings shoud be 5,293,850.01 million rupiah, but the actual input is 6,533,329 million rupiah and the required profit-sharing cost input target should be 1,159,573.76 million rupiah, but the actual *input* is 1,193,918 million rupiah. To achieve the efficiency level of output, an increase of 28.53 percent (*murabahah financing)*, 32.59 percent (other financing), 0.26 percent (fixed assets), 5.98 percent (operating income) and 397.95 percent (ROA) is required.

Table 9. Development of BRI Syariah Input-Output Value in 2017-2018

Input/Output		*Actual*	*Target*	*Potential improvement*
Total Deposits	2017	6533329	5293850.01	-18.97 %
	2018	8689987	8689987	0.00%
Development of		**2156658**	**3396136.99**	
Fixed Assets	2017	177935	177935	0.00%
	2018	221444	221444	0.00%
Development of		**43509**	**43509**	
Operating Costs	2017	1178743	1178743	0.00%
	2018	1200619	1200619	0.00%
Development of		**21876**	**21876**	
Profit Sharing Fees	2017	1193918	1159573.76	-2.88 %
	2018	1317100	1317100	0.00%
Development of		**123182**	**157526.24**	
Murabahah Financing	2017	10457017	13440542.47	28.53 %
	2018	11370876	11370876	0.00%
Development of		**913859**	**-2069666.47**	
Other Financing	2017	6817382	9038855.27	32.59 %
	2018	8249827	8249827	0.00%
Development of		**1432445**	**-789028.27**	
Current Assets	2017	4363623	4374846.97	0.26%
	2018	17641795	17641795	0.00%
Development of		**13278172**	**13266948**	
Operating Income	2017	2965527	3142934.45	5.98 %
	2018	3294489	3294489	0.00%
Development of		**328962**	**151554.55**	
ROA	2017	0.51	2.54	397.95%
	2018	0.43	0.43	0.00%
Development		**-0.08**	**-2.11**	

Source: DEA Result

Improvement to BRI Syariah in 2018, which are suggested in 2017, are theactual value of *murabahah* financing, other financing, current asset, and increased operating income. *Murabahah* financing increased by 913,859 million rupiah from 2017 or 8.7 percent from the previous year. However, this increase has not yet reached the 2017 *potential improvement*, which is 28.53 percent. Other financing increased by 1,432,445 million rupiah from 2017 or 21 percent from the previous year. Although it has increased, it has not yet reached the 2017 *potential improvement*, which is 32.59 percent. Current assets increased by 13,278,172 million rupiah or increased 304 percent from the previous year. This increase exceeds the 2017 *potential improvement*, which is 303.7 percent higher. Operating income increased by 328,962 million rupiah from 2017 or 11 percent from the previous year. This increase exceeds the 2017 *potential improvement* which is 5.98 percent, making it 5.02 percent bigger.

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Table 10. BRI Syariah Input-Output Value in 2017 (million rupiah)

Bank Name	Efficiency Level	*Actual*	*Target*	*Potential Improvement*
Total Deposits		660196	660196.00	00.00%
Fixed Assets	99.59%	81354	73944.22	-9.11%
Operating Cost		179270	179270.00	00.00%
Profit Sharing Fee		247351	247351.00	00.00%
Murabahah Financing		1557673	1564051.90	0.41%
Other Financing		2031335	2196427.69	8.13%
Current Asset		672935	675690.77	0.41%
Operating Income		489254	491257.57	0.41%
ROA (percent)		1.20	2.00	67.03%

Source: DEA Result

BCA Syariah in 2017 has an efficiency level of 99.59 percent, which means that it has not yet reached the level of efficiency/inefficiency. The in efficiency in BCA Syariah stems from the allocation of fixed assets input. It takes a reduction of 9.11 percent of fixed assets in order to achieve the level of efficiency. The required input target should be 73,944.22 million rupiah, but the actual input is 81,354 million rupiah. To achieve the efficiency level of output, an increase of 0.41 percent (*murabahah* financing*)*, 8.13 percent (other financing), 0.41 percent (fixed assets), 0.41 percent (operating income) and 67.03 percent (ROA).

Table 11. Development of BCA Syariah Input Output Value in 2017-2018.

Input/Output		*Actual*	*Target*	*Potential improvement*
Total Deposits	2017	660196	660196	0.00%
	2018	669739	669739	0.00%
Development of		**9543**	**9543**	
Fixed Assets	2017	81354	73944.22	-9.11 %
	2018	126281	126281	0.00%
Development of		**44927**	**52336.78**	
Operating Costs	2017	1178743	1178743	0.00%
	2018	186331	186331	0.00%
Development of		**-992412**	**-992412**	
Profit Sharing Fee	2017	247351	247351	0.00%
	2018	274695	274695	0.00%
Development of		**27344**	**27344**	
Murabahah Financing	2017	1557673	1564051.9	0.41%
	2018	1679410	1679410	0.00%
Development of		**913859**	**115358.1**	
Other Financing	2017	2031335	2196427.69	8.13%
	2018	2627647	2627647	0.00%

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Input/Output		*Actual*	*Target*	*Potential improvement*
Development of		**596312**	**431219.31**	
Current Assets	2017	672935	675690.77	0.41%
	2018	2776530	2776530	0.00%
Development of		**2103595**	**2100839.23**	
Operating Income	2017	489254	491257.57	0.41%
	2018	542199	542199	0.00%
Development of		**52945**	**50941.43**	
ROA	2017	1.20	2.00	67.03%
	2018	1.20	1.20	0.00%
Development		**0.00**	**-0.8**	

Source: DEA Result

The recommended improvements to BCA Syariah for 2018 in 2017 were that the actual value of operational costs decrease and *murabahah* financing, other financing, current assets and operating income increase. Operational costs decreased by 992,412 million rupiah from 2017 or 532.6 percent. The decrease in inputs has a very good effect on efficiency, because if the inputs is reduced but the output produced is the same or greater than other SCBs, the potential to achieve efficiency is high. *Murabahah* financing increased by 913,859 million rupiah from 2017 or 58.7 percent from 2017. This increase exceeded the 2017 potential improvement, which was 58.29 percent. Other financing increased by 596,312 million rupiah from 2017 or 29.3 percent. This increase exceeded the 2017 potential improvement, which was 21.2 percent. Current assets increased by 2,103,595 million rupiah or 312.6 percent from 2017. This increase exceeded the 2017 potential improvement, which was 312,1 percent. Operating income increased by 52,945 million rupiah or 10.8 percent from 2017. This increased exceeded the 2017 *potential improvement* 2017, which was 10.39 percent greater.

In 2018, the efficiency level of 12 ICBs decreased from the previous year with an average efficiency of 98.4 percent. There were 10 ICBs that are efficient and 2 ICBs that were inefficient, namely Bank Muamalat Indonesia (BMI) and Bank Syariah Bukopin.

Table 12. Bank Muamalat Indonesia *Input-Output* Value in 2018 (million rupiah)

Bank Name	**Efficiency Level**	*Actual*	*Target*	*Potential Improvement*
Total Deposits		6078344	6078344.00	00.00%
Fixed Assets	94.89%	3357284	1090192.65	-67.53%
Operating Cost		1721801	1721801.00	00.00%
Profit Sharing Fee		2162970	2044812.78	-5.46%
Murabahah Financing		15325983	16151864.08	5.39%
Other Financing		17034840	17952807.35	5.39%
Current Assets		22102705	24810311.49	12.25%
Operating Income		3569342	4560144.04	27.76%
ROA (percent)		0.08	8.29	10260.56%

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Source: Processed Data

Table 12 shows the results that in 2018 Bank Muamalat Indonesia (BMI) had an efficiency level of 94.89 percent, which means that it has not yet reached the level of efficiency/inefficiency. It takes a reduction of 67.53 percent of fixed assets and 5.46 percent of profit-sharing fees in order to achieve the level of efficiency. The input target for fixed assets required shoud be 1,090,192.65 million rupiah, but the actual input is 3,357,284 million rupiah. The input target for the required profit-sharing costs should be 2,044,812.78 million rupiah, however, the actual input is 2,162,970 million rupiah. To achieve the efficiency level of output, an increase of 5.39 percent (*murabahah* financing*)*, 5.39 percent (other financing), 12.25 percent (fixed assets), 27.76 percent (operating income) and 10,260.56 percent (ROA).

To find out more about the factors that caused Bank Muamalat in 2018 to be inefficient, the input output value in 2018 will be compared with the *input output* value in 2017.

Table 13. Development of BMI Input Value in 2017-2018

Input/Output		***Actual***	***Target***	***Potential improvement***
Total Deposits	2017	6421635	6421635	0.00%
	2018	6078344	6078344	0.00%
Development of		**-343291**	**-343291**	
Fixed Assets	2017	2653439	2653439	0.00%
	2018	3357284	1090192.65	-67.53%
Development of		**703,845**	**-1563246.35**	
Operating Costs	2017	1614484	1614484	0.00%
	2018	1721801	1721801	0.00%
Development of		**107317**	**107317**	
Profit-Sharing Fees	2017	2541321	2541321	0.00%
	2018	2162970	2044812.78	-5.46%
Development of		**-378351**	**-496508.22**	
Murabahah Financing.	2017	19342510	19342510	0.00%
	2018	15325983	16151864.08	5.39%
Development of		**-4016527**	**-3190645.92**	
Other Financing	2017	20622051	20622051	0.00%
	2018	17034840	17952807.35	5.39%
Development of		**-3587211**	**-2669243.65**	
Current Assets	2017	7793885	7793885	0.00%
	2018	22102705	24810311.49	12.25 %
Development of		**14308820**	**17016426.5**	
Operating Income	2017	4185954	4185954	0.00%
	2018	3569342	4560144.04	27.76%
Development of		**-616312**	**374190.04**	
ROA	2017	0.11	0.11	0.00%

Input/Output		*Actual*	*Target*	*Potential improvement*
	2018	0.08	8.29	10260.56%
Development		**-0.03**	**8.18**	

Source: DEA Result

Tabel 13 shows that Bank Muamalat experienced inefficiency in 2018 when compared to 2017. The reasons are, among others, first, fixed assets increased by 703,845 million rupiah or 26.5 percent so that a reduction of 67.53 percent is needed to achieve the level of efficiency. Second, operational costs increased by 107,317 million rupiah or 6.6 percent from 2017 with a contribution value of 79 percent efficiency, therefore this decrease had a big impact. Third, *murabahah* financiang decreased by 4,016,527 million rupiah or 20.8 percent from 2017. This decrease greatly affects efficiency because the contribution of *murabahah* financing to efficiency is 89 percent. The results of data processing recommended an increase of 5.39 percent in order to achieve the level of efficiency. Fourth, other financing decreased by 3,587,211 million rupiah or 17.4 percent from 2017. The result of data processing recommended an increase of 5.39 percent in order to achieve the level of efficiency. Fifth, operating income decreasd by 616,312 million rupiah or 14.7 percent from 2017. The result of data processing recommended an increase of 27.76 percent in order to achieve the level of efficiency. Sixth, ROA decreased by 0.03 percent. The result of data processing required an increase 10,260.56 percent in order to achieve the level of efficiency.

Table 14. Bank Syariah Bukopin Input Output Value 2018 (million rupiah)

Bank Name	**Efficiency Level**	***Actual***	***Target***	***Potential Improvement***
Total Deposits	85.98%	1112392	842598.61	-24.25%
Fixed Assets		315739	125193.68	-60.35%
Operating Cost		236396	236396.00	00.00%
Prodit-Sharing Fees		298526	298526.00	00.00%
Murabahah Financing		1462523	1934349.74	32.26%
Other Financing		2604668	3029243.40	16.30%
Current Assets		2857874	3323723.39	16.30%
Operating Income		537907	625588.84	16.30%
ROA (percent)		0.02	1.06	5192.32%

Source: DEA Result

Table 14 shows that in 2018 Bank Syariah Bukopin was not yet efficient as indicated by an efficiency level of 85.98 percent. It takes a reduction of 24.25 percent of total deposits and 60.35 percent of fixed assets in order to achieve efficiency levels. The input target for the required amount of savings should be 842,598.61 million rupiah, but the actual input is 1,112,392 million rupiah. The *input* target for fixed assets required should be 125,193.68 million rupiah, but the actual input is 315,739 million rupiah. To achieve the efficiency level of output, an increase of 32.26 percent (*murabahah* financing), 16.30 percent (other financing), 16.30 percent (fixed assets), 13.60 percent (operating income) and 5,192.32 percent (ROA) are required. To find out more about what factors caused Bank Syariah Bukopin in 2018 to be inefficient, the input output value in 2018 will be compared with the input output value in 2017.

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Table 15. Development of Bank Syariah Bukopin Input Output Value in 2017-2018

Input/Output		***Actual***	***Target***	***Potential improvement***
Total Deposits	2017	1335963	1335963	0.00%
	2018	1112392	842598.61	-24.25%
Developmet of		**-223571**	**-493364.39**	
Fixed Assets	2017	228913	228913	0.00%
	2018	315739	125193.68	-60.35%
Development of		**86826**	**-103719.32**	
Operating Costs	2017	241467	241467	0.00%
	2018	236396	236396	0.00%
Development of		**-5071**	**-5071**	
Profit-Sharing Fees	2017	368685	368685	0.00%
	2018	298526	298526	0.00%
Development of		**-70159**	**-70159**	
Murabahah Financing	2017	1629024	1629024	0.00%
	2018	1462523	1934349.74	32.26%
Development of		**-166501**	**305325.74**	
Other Financing	2017	2694965	2694965	0.00%
	2018	2604668	3029243.40	16.30%
Development of		**-90297**	**334278.4**	
Current Assets	2017	1386900	1386900	0.00%
	2018	2857874	3323723.39	16.30%
Development of		**1470974**	**1936823.39**	
Operating Income	2017	615093	615093	0.00%
	2018	537907	625588.84	16.30%
Development of		**-77186**	**10495.84**	
ROA	2017	0.02	0.02	0.00%
	2018	0.02	1.06	5192.32%
Development		**0.00**	**-1.04**	

Source: DEA Result

From Table 15, it can be seen that when compared to 2017, Bank Syariah Bukopin experienced inefficiency in 2018, namely, first, fixed assets increased by 86,826 million rupiah or 37.9 percent from 2017 concequently that a reduction of 60.35 percent was needed to achieve the level of efficiency. Second, *murabahah* financing decreased by 166,501 million rupiah or 10.2 percent from 2017. The result of data processing recommended an increase of 32.26 percent in order to achieve the level of efficiency. The required input target should be 1,934,349.74 million rupiah, but the actual input is 1,462,523 million rupiah. Third, other financing decreased by 3,587,211 million rupiah or 3.3 percent from 2017. The results of data processing recommended an increase of 16.3 percent in order to achieve the level of

efficicnecy. Fourth, operating income decreased by 77,186 million rupiah or 12.5 percent from 2017. It recommended an increase of 16.30 percent in order to achieve the level of efficiency.

Malmquist Index was used to measure the productivity level of each business unit. There are two things that are calculated in the Malmquist Index measurement, namely *catch-up effect* and *frontier-shift effect.* The *catch-up effect* measures the rate of change in relative efficiency fro period 1 to period 2. The *frontier-shift effect* measures the rate of technological change (*input-output combination*) from period 1 to period 2. Following are the results of the Malmquist Index data processing of 12 ICBs in Indonesia in 2016-2018:

Table 16. *Malmquist Indexes* of 12 ICSs in Indonesia in 2016-2018

Period	Bank Name	*Malmquist index*	*Catchup*	*Frontier shift*
1	BCA Syariah			
2	BCA Syariah	0.8757	0.9959	0.8793
3	BCA Syariah	1.7042	1.0041	1.6973
1	BJB Syariah			
2	BJB Syariah	0.8967	1	0.8967
3	BJB Syariah	1.6822	1	1.6822
1	BNI Syariah			
2	BNI Syariah	1.0233	1	1.0233
3	BNI Syariah	1.7192	1	1.7192
1	BRI Syariah			
2	BRI Syariah	0.9354	0.9974	0.9378
3	BRI Syariah	1.8627	1.0026	1.8579
1	BTPN Syariah			
2	BTPN Syariah	1.017	1	1.017
3	BTPN Syariah	2.138	1	2.138
1	BMI			
2	BMI	1.0638	1	1.0638
3	BMI	1.3799	0.9489	1.4542
1	Bank Panin Syariah			
2	Bank Panin Syariah	3.2669	1	3.2669
3	Bank Panin Syariah	0.3546	1	0.3546
1	B.Syariah Bukopin			
2	B.Syariah Bukopin	1.0968	1	1.0968
3	B.Syariah Bukopin	1.5166	0.8598	1.7638
1	B. Syariah Mandiri			
2	B. Syariah Mandiri	1.0015	1	1.0015
3	B. Syariah Mandiri	2.3033	1	2.3033
1	BSMI			
2	BSMI	0.8633	1	0.8633
3	BSMI	1.5457	1	1.5457
1	B.Victoria Syariah			
2	B.Victoria Syariah	5.1183	1	5.1183

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Period	Bank Name	*Malmquist index*	*Catchup*	*Frontier shift*
3	B. Victoria Syariah	1.9862	1	1.9862
1	Maybank Syariah			
2	Maybank Syariah	798.6896	1	798.6896
3	Maybank Syariah	1.0024	1	1.0024

Sourcer: DEA Result.

From Table 12, it can be seen that in 2017 there were 8 ICBs experiencing increasing returns to scale, namely BNI Syariah, BTPN Syariah, Bank Muamalat Indonesia, Bank Panin Syariah, Bank Syariah Bukopin, Bank Syariah Mandiri, Bank Victoria Syariah, and Maybank Syariah Indonesia. Meanwhile, 4 ICBs experienced a decreasing return to scale, namely BCA Syariah, BJB Syariah, BRI Syariah, and BSMI. In addition to ecperiencing decreasing returns to scale, BCA Syariah, BRI Syariah and BSMI were also inefficient in 2017. Althogh BJB Syariah experienced a decrease in productivity, in 2017 it was efficient.

In 2018, there were 11 SCBs experiencing increasing returns to scale and oly 1 SCB decreasing return to scale. The SCBs which decreases return to scale is Panin Syariah Bank with a Malmquist value of 0.3546. Despite experiencing a decreasing return to scale, Panin Syariah Bank in 2018 was efficient. Muamalat Indonesia Bank and Syariah Bukopin Bank were inefficiency in 2018 but their productivity has increased.

Sharia Commercial Banks (SCBs) whose relative efficiency change rate from 2016 to 2017 has decreased, namely BCA Syariah with a catchup value of 0.9959 and BRI Syariah with a *catchup* value of 0.9974. Meanwhile from 2017 to 2018, the SCBs that experienced a decreased in the rate of change in relative efficiency were Bank Muamalat Indonesia and Bank Syariah Bukopin. Meanwhile, the value of the *frontier-shift* effect that has decreased from 2016 to 2017 is BCA Syariah, BJB Syariah, BRI Syariah and BSMI. Meanwhile, from 2017 to 2018 only Panin Syariah Bank experienced a decline.

5. CONCLUSION

Based on the analysis that has been carried out in the previous discussion, it can be concluded tat the results of the calculation of the efficiency of 12 Islamic Commercial Banks (ICBs) in Indonesia using DEA in 2016-2018 overall decreased. Sharia commercial banks achieved an efficiency level of 100 percent 2016, decreased in 2017 with an average efficiency of 99.93 percent and in 2018 experienced a decline again with an efficiency level of 98.4 percet. mengalami penurunan kembali dengan tingkat efisiensi 98.4 persen.

The result obtained from the productivity analysis with the Malmquist Index show that in 2017, 8 out of a total of 12 ICBs experienced an increase in productivity, or about 67% of all Islamic commercial banks. Meanwhile, in 2018, 11 of the total 12 ICBs experienced an increase in productivity, or around 92% of all Islamic commercial banks. It is characterized by a score of more than 1. While the rest show a relatively low level of productivity.

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