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## Efficiency Analysis of Sharia Bank in Indonesia Based on Data Envelopment Analysis (DEA)

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**Abstract---** This study aimed to determine the efficiency of Islamic banks in Indonesia using the 2015-2019 data envelopment analysis (DEA) method. The population in this study were Islamic banks in Indonesia in the 2015-2019 period, which amounted to 189 banks consisting of 14 Sharia Commercial Banks (SCB), 20 Sharia Business Units (SBU), and 164 Sharia People's Financing Banks (SPFB). The sample used in this study was 6 Islamic banks that published financial statements during 2015-2019, with several criteria for determining the sample. Based on the calculation of the average efficiency level of all Islamic banks in this study, in 2015, it was 86.9%, in 2016 it was 93.3%, in 2017, it was 97.2%, in 2018, it was 87.8%, and in 2019, it was 93.6%. Thus, the average level of efficiency at Islamic Commercial Banks in Indonesia fluctuated during the study period. Increasing the level of efficiency can be done by increasing or reducing the amount of input and output of each Islamic Bank following the input target or output target based on the results of calculations in this study every year and maintaining the input and output targets that have been 100% well achieved.

**Keywords---** data envelopment analysis, efficiency of Islamic, Islamic bank,

#### Introduction

The rapid growth of the Islamic banking industry in Indonesia increases the demand for Islamic banking efficiency measurements. The measurement of the efficiency level of the Islamic banking industry is an urgent matter for intense competition in the Islamic banking industry (faza Firdaus & Hosen, 2013; Hassan & Aliyu, 2018; Ghenimi et al., 2017). Lone & Rehman (2017), anticipate that Islamic banks are alliances of arbitrators who take care of anticipated investors to keep their interests and money returns pristine with market doubts. Based on brand mediation increases intuition about Islamic finance to improve persistence and oblige humanity more helpfully.

The position of Islamic commercial banks is growing and strengthened by their success in dealing with two periods of the financial crisis in the millennium era. The development of Islamic banking in Indonesia has been very encouraging in recent years (Wahyuni, 2012; Wulandari & Subagio, 2015; Pooranam & Nandhini, 2018). In 2007 there were only 3 Sharia Commercial Banks (SCU), 26 Sharia Business Units (SBU), and 114 Sharia People's Financing Banks (SPFB), but as of March 2016, there were 12 SBU, 22 SCU, and 165 SPFB spread to Indonesia.

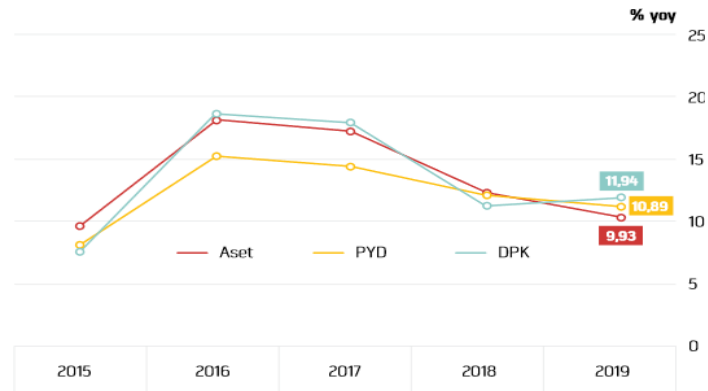


Figure 1. Indonesian Islamic banking which continues to show positive growth  
Source: OJK, 2019

### *Growth of Islamic Banking in Indonesia*

Based on the graph above, Indonesian Islamic banking, which consists of Sharia Commercial Banks (SCB), Sharia Business Units (SBU), and Sharia People's Financing Banks (SPFB), continues to show positive growth. In 2019, the Islamic banking intermediation function went well. Disbursed financing (DF) and third-party funds (TPF) grew by 10.89% (YoY) and 11.94% (YoY), resulting in growth in Islamic banking assets during the period of 9.93% (YoY). The total assets, DF, and TPF of Islamic banking reached IDR 538.32 trillion, IDR 365.13 trillion, and IDR 425.29 trillion at the end of 2019.

According to a report (State Bank of Pakistan, 2010), the assets of Pakistan's financial sector grew to 9.2 trillion rupees in 2010 with a five-year average increase of 13.86% annually, and the banking sector is the most significant player in the composition of assets in financial sector 73.2% (Sufian & Noor, 2009; Johns et al., 2014; Rosman et al., 2014; Zuhroh et al., 2015; Mensi et al., 2017). One method that is often used to analyze the efficiency of Islamic banks is to use a non-parametric method called Data Envelopment Analysis (DEA).

The level of efficiency can provide an overview of the business performance of Islamic banking: the more efficient the banking industry, the better the company's performance, and vice versa. For investors, efficient banking can provide confidence that the funds invested in the bank will provide results and profits. For customers, an efficient bank can provide benefits with low transaction costs, and for the government, and the efficient bank will provide benefits in the form of corporate taxes. Therefore, banks must pay more attention to the efficiency and productivity of their institutions (Akhtar et al., 2011; Widiarto & Emrouznejad, 2015). Based on the above background, this study aims to see how efficient Islamic banks in Indonesia are by using the 2015-2019 data envelopment analysis (DEA) method (Tone, 2001; Lertworasirikul et al., 2003).

### **Method**

The population in this study is Islamic banks in Indonesia in the 2015-2019 period. The population in this study was 189 banks consisting of 14 Sharia Commercial Banks (SCB), 20 Sharia Business Units (SBU), and 164 Sharia People's Financing Banks (SPCB) (Phillippi & Lauderdale, 2018; Holliday, 2010; Marshall et al., 2013; Harris et al., 2016; Sgier, 2012; Robins, 2003; Boddy, 2016; Grbich, 2012; Reay, 2014). Based on the above criteria, from several 14 Islamic Commercial Banks (ICB) in Indonesia still operating in 2015-2019 and banks that meet the requirements as the research sample, there are six banks. The number of observational data to be processed in this study results from multiplying the number of banks with the number of observation periods, namely for five periods (2015-2019). So the number of observations in this study for the group of Islamic Commercial Banks (ISB) in Indonesia is 30 observation data.

### **Result and Discussion**

*Results of calculation and analysis of bank efficiency levels using data envelopment analysis (DEA)*

Efficiency calculations at PT. Bank Muamalat Indonesia, PT. Bank Syariah Mandiri, PT. Bank Mega Syariah, PT. Bank BRI Syariah, PT. Bank Syariah Bukopin, and PT. Bank BNI Syariah using the data envelopment analysis

(DEA) method use five variables, namely third-party funds (TPF) total assets, operating expenses, financing and labor costs as input variables, while operating income and return on assets (ROA) as output variables (Nemoto & Goto, 1999; Homburg, 2001).

Table 1  
Efficiency Level of Islamic Banks in Indonesia 2015-2019 (In percent)

No.	Islamic Commercial Bank	Efficiency Score				
		2015	2016	2017	2018	2019
1	PT. Bank Muamalat Indonesia	1.000	1.000	1.000	1.000	1.000
2	PT. Bank Syariah Mandiri	1.000	1.000	1.000	1.000	1.000
3	PT. Bank Mega Syariah	1.000	1.000	1.000	1.000	1.000
4	PT. Bank BRI Syariah	0.214	0.595	0.830	0.402	0.894
5	PT. Bank Syariah Bukopin	1.000	1.000	1.000	1.000	1.000
6	PT. Bank BNI Syariah	1.000	1.000	1.000	0.867	0.720
	Evarage	0.869	0.933	0.972	0.878	0.936

Based on the data in Table 1.1, it can be seen that the efficiency level of six Islamic banks in Indonesia from 2015 to 2019 showed the best efficiency or a value of 100%, namely PT. Bank Muamalat Indonesia, PT. Bank Syariah Mandiri, PT. Bank Mega Syariah, and PT. Bank Syariah Bukopin. PT. Bank BNI Syariah in 2015-2017 showed an efficiency score of 100%, in 2018 it showed an efficiency score of 0.867. In 2019 it showed an efficiency score of 0.720 by showing an average efficiency score of 0.917. PT. Bank BRI Syariah also showed unfavorable results because from 2015-2019, it had never achieved maximum efficiency, or in other words, its efficiency score was still less than 100%. In 2015 it showed an efficiency score of 0.214; in 2016, it showed an efficiency score of 0.595; in 2017, it showed an efficiency score of 0.830; in 2018, it showed an efficiency score of 0.402, and in 2019 it showed an efficiency score of 0.894 with an average score of 0.587.

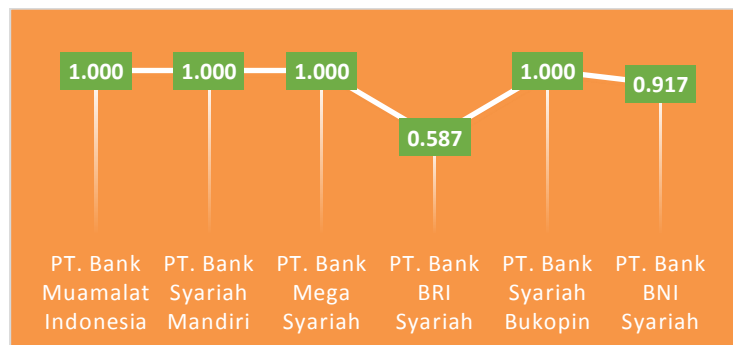


Figure 2. Average Efficiency Score for Islamic Banks in Indonesia in 2015-2019

Based on the data in Figure 1.1, it can be seen that the average level of efficiency at PT. Bank Muamalat Indonesia, PT. Bank Syariah Mandiri, PT. Bank Mega Syariah, PT. Bank BRI Syariah, PT. Bank Syariah Bukopin and PT. Bank BNI Syariah fluctuated during the period 2015-2019. Based on the data in Figure 2 above, it can be seen that the lowest efficiency level is at an efficiency level of 0.587, which occurs at PT. Bank BRI Syariah, and PT. Bank BNI Syariah shows an average efficiency level of 0.917. While the average efficiency level at PT. Bank Muamalat Indonesia, PT. Bank Syariah Mandiri, PT. Bank Mega Syariah, PT. Bank Syariah Bukopin has a constant efficiency level from 2015-2019 of 100%.

Table 2  
Summary of malmquist index for Islamic commercial banks

No.	General Bank Syariah	effect	tech	pech	sech	teach
1	PT. Bank Muamalat Indonesia	1.000	1.040	1.000	1.000	1.040
2	PT. Bank Syariah Mandiri	1.000	1.108	1.000	1.000	1.108
3	PT. Bank Mega Syariah	1.000	1.328	1.000	1.000	1.328
4	PT. Bank BRI Syariah	1.254	1.186	1.429	0.878	1.488

5	PT. Bank Syariah Bukopin	1.000	1.038	1.000	1.000	1.038
6	PT. Bank BNI Syariah	0.811	1.044	0.921	0.881	0.847
	Mean*	1.003	1.119	1.047	0.958	1.123
	effch<1	techch<1	pech<1	sech<1	tfpch<1	
	= 1	= 0	= 1	= 2	= 1	
	effch=1	techch=1	pech=1	sech=1	tfpch=1	
	= 4	= 0	= 4	= 4	= 0	
	effch>1	techch>1	pech>1	sech>1	tfpch>1	
	= 1	= 6	= 1	= 0	= 5	

Sources: Secondary Data, processed 2021

Based on the table above, it can be seen that as many as 4 Islamic Commercial Banks, including PT. Bank Muamalat Indonesia, PT. Bank Syariah Mandiri, PT. Bank Mega Syariah, and PT. Bank Syariah Bukopin showed that there was no change in technical efficiency. PT. Bank BRI Syariah showed an increase in technical efficiency by 25.4% (1.254-1), while PT. Bank BNI Syariah experienced a decrease in technical efficiency by 18.9% (0.811-1). Furthermore, when viewed from the technology side, in this case, Technological Change (techs), all banks have increased in terms of technological innovation because all banks have a tech value > 1. Regarding bank productivity or TFPCH, there is one sharia commercial bank, namely PT. Bank BNI Syariah, which is less productive because its touch value is 0.847. In contrast, five other Islamic commercial banks experiencing productivity or experiencing good productivity because the touch value is greater than 1. Overall Islamic commercial banks in Indonesia are considered productive because the average value (geometric mean) of TFPCH is 1.123.

Table 3  
Summary of the Annual Malmquist Index of Islamic Commercial Banks in Indonesia 2015-2019

Year	effch	techch	pech	sech	tfpch
2015/2016	1.235	0.988	1.186	1.041	1.220
2016/2017	1.037	0.933	1.057	0.981	0.967
2017/2018	0.728	1.238	0.865	0.841	0.901
2018/2019	1.086	1.375	1.108	0.980	1.493
Mean*	1.003	1.119	1.047	0.958	1.123

Source: Secondary Data, processed 2021

\*All Malmquist Index Means Use Geometric Means

Based on the data above, it is known that 2017/2018 was the year where the change in technical efficiency touched the lowest point of 0.728, while the best increase in efficiency occurred in 2015/2016, which was 1.235. In terms of technology or tech, the lowest point was in 2016/2017, which was 0.933, and the optimal increase in technological innovation was in 2018/2019, which was 1.375, and in that year, the productivity level or teach had an optimal value of 1.493. Based on this, the most significant change in bank productivity comes from technological changes where Islamic banking must continue to innovate technology to increase productivity.

## Conclusion

Based on the results of the analysis and discussion that has been carried out, the results of the research can be concluded as follows: The level of efficiency in Islamic banks using Data Envelopment Analysis (DEA) at PT. Bank Muamalat Indonesia, PT. Bank Syariah Mandiri, PT. Bank Mega Syariah, PT. Bank Syariah Bukopin during the research period, 2015-2019, it showed an efficient level of 100%. PT. Bank BNI Syariah experienced inefficiency in 2018 and 2019, while in 2015-2017, it showed a level of efficiency. PT. Bank BRI Syariah experienced poor results because from 2015-2019, it had never reached maximum efficiency, or in other words, the efficiency score was still less than 100%. Based on calculating the average efficiency level in the 5-year research period, namely in 2015-2019. Based on the calculation of the average efficiency level of all Islamic banks in this study, in 2015, it was 86.9%, in 2016, it was 93.3%, in 2017, it was 97.2%, in 2018, it was 87.8%, and in 2019 it was 93.6%. Thus, the average level of efficiency at Islamic Commercial Banks in Indonesia fluctuated during the study period.

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