

# *Measuring of Islamic Banking Productivity in Indonesia Using Malmquist Index*

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**Abstract--** *This study aims to measure the productivity of islamic banks in Indonesia in the period 2013 to 2017. The method used is the malmquist productivity index that is part of the Data Envelopment Analysis (DEA) method. The results show that in 2014 is the most productive period for islamic banks in Indonesia, the most consistent bank has increased productivity is Bank Syariah Mandiri, the bank that has the most decreased productivity is Bank Victoria Syariah, the bank that is most able to increase productivity is Bank Muamalat followed by Bank Syariah Mandiri.*

**Keywords--** *malmquist productivity index, islamic bank, productivity*

## I. INTRODUCTION

The existence and development of islamic banking industry today is one of the main indicators of economic development of Islamic finance in general in Indonesia. it proves that islamic banks have been trusted by society to be a part of their economic life. The majority of Indonesia is SMEs and MSMEs business desperately need the role of financial institutions as supporters of the capital. Therefore, banks capable of supporting the needs of SMEs will get a good legitimacy from the community. The islamic bank which is a financial institution that is currently growing in Indonesia is evidenced by the development of assets, third party funds and financing. This is allegedly because Islamic banks are able to run its operations in accordance with the needs of the community and on target. In general, Islamic banks have developed but not necessarily when viewed from the perspective of each bank. Therefore, to assess the performance of each islamic bank required research that specifically assess the productivity of each islamic bank. Of course, measuring productivity is very diverse. But more important is how to measure productivity by comparing more than one input and more than one output. Thus, the assessment of the productivity of islamic banks will be more comprehensive and can represent the operational. Determination of the limiting factor into a benchmark whether a company has worked efficiently and productively into its own problems. Not necessarily the factor chosen as a variable to measure the level of efficiency it represents the whole aspect of the company, in this case the banking. For that we need a measurement formulation of the level of efficiency and productivity that can involve multivariable [1]. In this study the variables that will be used to measure the level of productivity will be adjusted with studies that have previously been implemented such as research before

[2-4]. Basically their research focuses on assessing efficiency and productivity.

Research on the efficiency of banking has been done in Indonesia but still rarely research related to productivity. This is acknowledged by Rani et.al which states that analysis of productivity level measurement using Malmquist index, is still relatively limited in banking studies in Indonesia [5].

The use of Malmquist productivity index method in measuring bank productivity requires more than one variable so that the result will be better. Therefore this research will use the method in order to use many inputs and many outputs. The Malmquist index is part of the DEA method that specifically looks at the level of productivity of each business unit, so that it will see a change in the efficiency and technology levels used based on predetermined inputs and outputs. The Malmquist index is also used to analyze intertemporal performance changes. So in the end will be known productivity of each islamic bank, whether the productivity of a bank is in stable condition, decreased or increased.

## II. METHOD

In this study, data was collected from 11 islamic banks in Indonesia in the period 2012 to 2017 and taken from the website of each bank. There are two variabe used are input and output variables. The input variable consists of labor cost and third party fund while the output variable consists of operating income and financing. Further data is analyzed through estimation of total factor productivity (TFP) growth in Malmquist Index approach. Total productivity (Total Factor Productivity) measures the relationship between output and multiple inputs simultaneously. The relationship is expressed in the ratio of the output index to the aggregate input index. If the increased ratio means more output can be produced using a certain number of inputs, or some output can be produced using fewer inputs [6]. The TFP Malmquist change index is formed from the value of efficiency change and technology change. As is the proposal of Caves et.al where the index is defined using a distance function that permits multi-input and multi-output use without the need to involve explicit price information [7]. The results of this mamlquist calculation consists of several results: efficiency change, technological change, pure efficiency change, economic scale change and TFP change. The Malmquist index has some favorable characteristics. First, this index is a nonparametric method so it does not require specification form production function. Secondly, the Malmquist index does not require the

assumption of economic behavior of production units such as cost minimization or profit maximization, so it is useful if the goals of the producers are different or unknown. Third, the calculation of this index does not require data prices that are often not available. Fourth, the Malmquist productivity index can be broken down into two components: efficiency change and technological change. In the first generation model developed by Caves et.al [7], there are two models of the Malmquist productivity index [8]. The first is 'Malmquist input quantity index' and the second is 'Malmquist output quantity index'. Malmquist input quantity index for a production unit, at observation time  $t$  and  $t + 1$ , for tech reference in period  $k$ ,  $k = t$  and  $t + 1$ . The Malmquist input quantity index measures only the change in the quantity of inputs observed between time  $t$  and  $t + 1$ , where:

$$MI_k(Y_k, x_t, x_{t+1}) = \frac{E_k^I(y_k, x_t)}{E_k^I(y_k, x_{t+1})}, k = t, t + 1$$

Next, for the Malmquist quantity output index for a production unit, at observation time  $t$  and  $t + 1$ , for tech reference in period  $k$ ,  $k = t$  and  $t + 1$ . This Malmquist quantity output index measures only the change in the observed quantity of output between time  $t$  and  $t + 1$ , where:

$$MO_k(y_t, y_{t+1}, x_k) = \frac{E_k^O(y_{t+1}, x_k)}{E_k^O(y_t, x_k)}, k = t, t + 1$$

Bjurek introduces a new definition of the Malmquist productivity index for the production unit between  $t$  and  $t + 1$  based on the technological level at  $k$ ,  $k = t$  and  $k = t + 1$ , following the tradition of most productivity indices [8]. Adjusting the Tornqvist productivity index, the index constructed is the ratio between an output index and an input index:

$$MTFP_k = \frac{MO_k(y_t, y_{t+1}, x_k)}{MI_k(y_k, x_t, x_{t+1})} = \frac{E_k^O(y_{t+1}, x_k)/E_k^O(y_t, x_k)}{E_k^I(y_k, x_t)/E_k^I(y_k, x_{t+1})}, k = t, t + 1$$

The equation above illustrates the ratio between the output index and the input index of Malmquist. If the value of the productivity index is greater than the number 1, then there has been an increase in productivity. If the index value is less than 1, the productivity level decreases, while if the index value equals 1, the productivity level does not change.

To help analyze the research data, the calculation of islamic banking productivity is assisted with the software DEAP 2.1.

### III. RESULT AND DISCUSSION

Research data collected in accordance with the needs of this study that is from the financial statements presented islamic bank in accordance with the study period. The islamic banks that have

financial statements in 2012 to 2017 are Bank Syariah Mandiri, Bank Muamalat, BRI Syariah, Bank BNI Syariah, Bank Mega Syariah, Bank Panin Syariah, Bank BJB Syariah, Bank Bukopin Syariah, Bank BCA Syariah, Maybank Syariah and Bank Victoria Syariah.

Productivity assessment in this study using the output approach that in the assessment of efficiency with DEA is often called the maximization of output with the resources (input) owned.

The measurement of productivity improvement in islamic banks is based on the value of TFP at the output of DEAP. To know the productivity of islamic bank every year on output orientation approach, then presented table 1.

**Table 1. Average Of Productivity Every Year**

Period	Output		
	Effch	techh	Tfpch
year 2013	0,976	0,936	0,914
year 2014	0,822	1,475	1,212
year 2015	1,240	0,775	0,961
year 2016	1,031	0,925	0,953
year 2017	0,904	1,048	0,947
Mean	0,995	1,032	0,997

The above table shows that the overall productivity improvement of islamic banks occurred in 2014 and the remainder in 2013, 2015, 2016 and 2017 decreased productivity. However, from an efficiency point of view, efficiency improvements occur in 2015 followed by 2016 while efficiency reductions occur in 2013, 2014 and 2017. In view of technological changes, productivity increases occur in 2014 followed by 2017 while the rest decrease in 2013, 2015 and 2016.

On average, Islamic banks have demonstrated increased productivity in terms of technology. This is evidenced by the value of technology change of 1.032. So it shows that the role of technology for islamic banking in Indonesia is very important and support the achievement of bank productivity. Banks should continue to improve financial technology so that financial literacy and acceleration of performance improvement Islamic banks more easily obtained. The era of digitalization of the economy allows a new atmosphere for the banking sector because the current transactions require the bank to immediately increase the use of more advanced technology in order to facilitate the public in transacting business using islamic bank facilities.

To know the level of productivity in detail each islamic bank can be seen in figure 1:

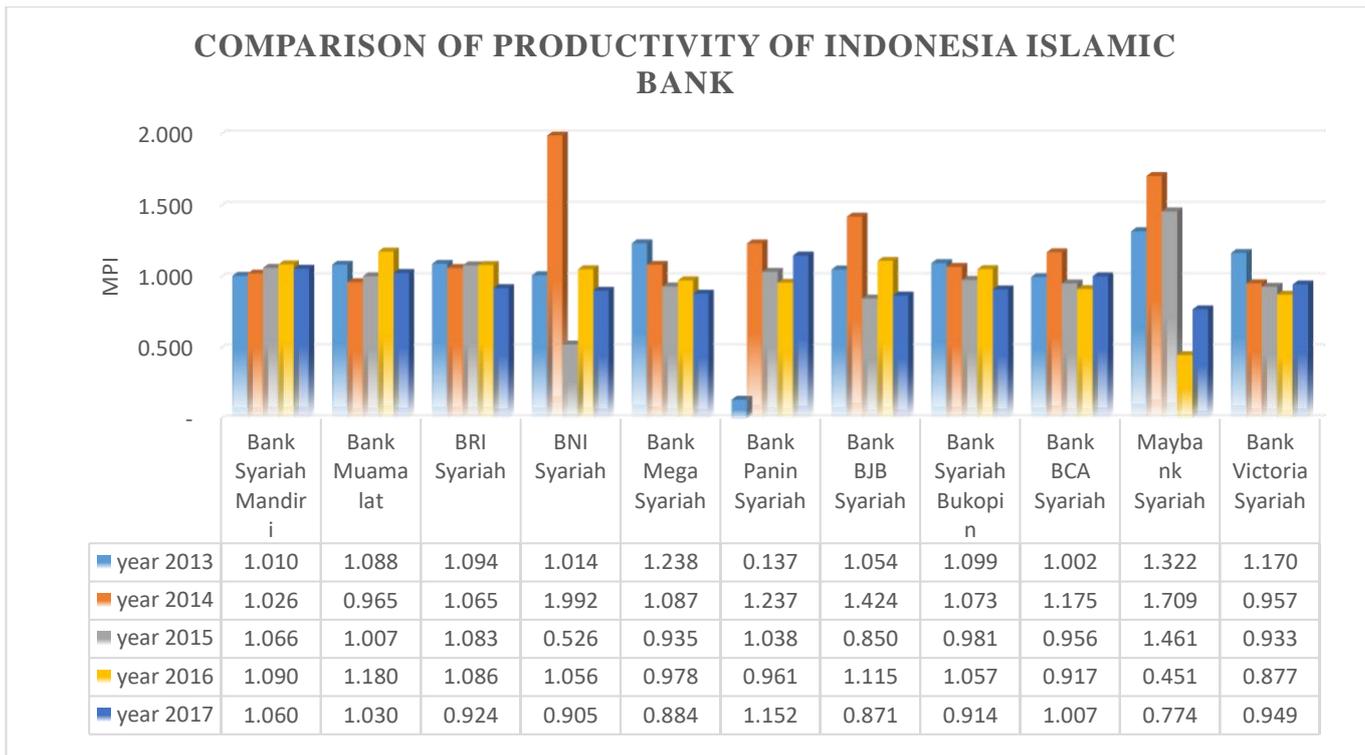


Figure 1. Graphic Comparison of Productivity of Indonesia Islamic Bank

Figure 1 shows that from all Islamic banks studied there is a bank that consistently increases productivity and there are also a lot of declines. The only bank that is able to consistently increase its productivity every year is Bank Syariah Mandiri. All values show more than 1, and the largest productivity increase occurs in 2016. Bank Muamalat decreased productivity in 2014 with a value of 0.965, and the rest in 2013, 2015, 2016 and 2017 increased. The largest increase in productivity occurred in 2016 at 1,180. This value is very far away from other years so showing 2016 is the most productive. Bank BRI Syariah from 2013 to 2016 has consistently increased productivity, but in 2017 Bank BRI Syariah was unable to maintain consistency in increasing productivity, resulting in a decline in 2017 with a value of 0.924. Therefore, the graph showing the decline in 2017 indicates that Bank BRI Syariah should be alert to the conditions at the end of the year, so there is a need for improvement in the next year in order to avoid a decline in productivity. Bank BNI Syariah, Bank Panin Syariah, Bank BJB Syariah, Bank Bukopin Syariah, and Bank BCA Syariah are banks that have inconsistent productivity. This bank is a series that each year has decreased and increased productivity. Nevertheless, Bank BNI Syariah has experienced a tremendous productivity that in 2014 there was an increase in productivity almost doubled the previous year which amounted to 1.992. In addition, special for Bank Panin Syariah experienced a tremendous decrease in productivity in 2013 with a value of 0.137. This small value indicates that Bank Panin Syariah is the most unproductive bank among Islamic banks which is the object of research. Nevertheless, the positive trend in the previous year showed that Bank Panin Syariah was very responsive to the conditions it experienced. Bank Mega Syariah, Maybank Syariah and Bank Victoria Syariah are banks that have decreased productivity trends. This declining trend certainly indicates that the management must make changes in managing the funds so that the bank should maximize its resources into large profits

through the channeling of the maximum funds and generate maximum operational income as well.

Furthermore, to know the average productivity of each Islamic bank during the study period can be seen in table 2.

TABLE 2. Average of Productivity Every Bank

Bank Names	Output		
	effch	techch	tfpch
Bank Syariah Mandiri	0,998	1,052	1,050
Bank Muamalat	0,987	1,065	1,051
BRI Syariah	1,022	1,026	1,048
BNI Syariah	0,987	1,016	1,003
Bank Mega Syariah	1,000	1,017	1,017
Bank Panin Syariah	1,000	0,721	0,721
Bank BJB Syariah	0,960	1,087	1,044
Bank Syariah Bukopin	0,969	1,055	1,023
Bank BCA Syariah	0,957	1,053	1,008
Maybank Syariah	1,000	1,029	1,029
Bank Victoria Syariah	0,956	1,017	0,972
<b>Mean</b>	<b>0,985</b>	<b>1,013</b>	<b>0,997</b>

The above data is intended to know the productivity of Islamic banks individually in the study period through the approach of output orientation. The calculation results show that the majority of Islamic banks in Indonesia have experienced an average increase in productivity from 2013 to 2017. Only Bank Panin Syariah and Bank Victoria Syariah decreased productivity.

The value of TFP Bank Panin Syariah amounted to 0.721 this value is very far from other banks so Bank Panin Syariah one of the banks that must change the management of funds so that all funds available can be maximized to finance and income. This is in line with individual productivity assessments (see Figure 1) that Bank Panin Syariah is the only bank with the most productivity levels to decline precisely in 2013. The most productive banks are Bank Muamalat which is 1.051 followed by Bank Syariah Mandiri amounted to 1.050 making both banks have the best productivity ratings in Indonesia. the success of these two banks in managing funds to generate maximum output is a form of management success in spoiling the financiers and as the most trusting banks from the community.

#### IV. CONCLUSION

The results of Malmquist Productivity Index calculation in assessing productivity level at islamic bank in Indonesia can be concluded as follows: 1). Year 2014 is the most productive period for islamic banks in Indonesia, thus indicating an increase in productivity from the previous year. 2). The most consistent bank that has increased productivity is the Bank Syariah Mandiri. 3). Banks with the greatest decrease in productivity are Bank Victoria Syariah. 4). In the period 2013 to 2017, most banks are able to increase productivity is Bank Muamalat followed by Bank Syariah Mandiri.

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