Technological and Efficiency Change on Indonesian Islamic Insurance Industry

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This study attempts to analyze the productivity level of Islamic insurance industry in Indonesia, both in terms of changes of its efficiency and also its technological. There are two things that are calculated in Malmquist index measurement that is catch-up effect and frontier shift effect. The catch-up effect measures the rate of change in relative efficiency from period 1 to period 2. Meanwhile the frontier shift effect measures the rate of technological change that is a combination of input and output from period 1 to period 2. The frontier shift effect is often called an innovation effect.

Findings from the results of the productivity index analysis are very interesting. In general, there has been an increase in the level of productivity of Islamic insurance institutions in Indonesia in the period 2014 to 2016, even though its very small. The increase in productivity growth (1.076) of Islamic insurance institutions in Indonesia is generally caused by technological change (1.078) instead of changes in efficiency (0.998). Thus the service of Islamic insurance institutions is needed which is more innovative in relation to the development of technology in the future.

Keywords: Technological change; Efficiency change; Productivity; Malmquist Index; Islamic Insurance

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INTRODUCTION

Islamic economics has spread and developed in the world. The Islamic economics and finance industry, being an object of study that is always interesting to be studied. Especially if compared with the conditions of the conventional financial industry that has already existed. For example, the results of research conducted by Nurfalah etal (2018) which states that Islamic banking is relatively more stable compared to conventional banking in the face of shock both internally and externally. This is an interesting finding that needs to be proven through various research in the future. In addition to the financial industry such as Islamic banks, Islamic insurance, sharia pawnshops and so on, Islamic finance is also known as a social financial entity that also has an equally important role. One of the instruments of Islamic social finance is zakat.

Zakat is a stimulus in the economy which raises new force in the accumulation of a significant investment that would boost the production of the economy cycle in the region. Zakat has a main role in the creation of justice in the economic field, in which all citizens have a source of revenue and income to fulfill daily needs for their life. In management of the use of zakat funds, the most important is the role of amil zakat (read: Zakat Institution) as bearers of the trust in management of the zakat funds. If the amil zakat is good in its management, then eight of zakat receipts (ashnaf) will be good anyway. But if the amil zakat is not good in its management, it should not be expected to ashnaf will be good too, that is essence of the amil zakat strategic (Rusydiana, 2016).

Zakat Institution (OPZ) is the intermediary organizations based on social. The entire of operating expense is taken from the zakat and infaq funds collected. It is also justified by Sharia, because OPZ committee is Amilin zakat that also included in eight ashnaf eligible for Zakat. The portion used for operation activities and Amilin's salaries (Akbar, 2009). Although OPZ based on social, but the management still needs to uphold professional, accountability, and transparency principles. Include in this term, OPZ need to operate effectively and efficiently.

Most recently, in the measurement of the effectiveness of zakat management, Baznas in cooperation with Bank Indonesia initiate the concept of Zakat Core Principles (Beik et al, 2014). So, it is necessary to measure the performance of zakat institution to find out how efficient and productive the performance of a zakat institution. Determination of the limiting factor into a benchmark whether a company has worked efficiently and productively, are separate 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 zakat institution. For that we need a measurement formulation of efficiency and productivity level that can involve multi-variable.

In the world of efficiency measurement, currently widely known as Data Envelopment Analysis (DEA) approach. DEA is a tool that can be used to measure and compare the performance of a number of service units or business units such as banks, financial industries, hospitals and even educational institutions. DEA may also indicate the inefficiency specifications of the service unit.

Since the DEA method was first introduced by Charnes, Cooper and Rhodes in 1978, researchers in some areas recognize that DEA is an excellent method and relatively easy to use in the operational modeling process for performance evaluation. In this study, DEA is used as a tool to measure and compare the performance of zakat institutions in this case 4 biggest zakat institutions in Indonesia for 2011-2016 period.

Furthermore, to measure the productivity of zakat institutions observed, this study used Malmquist Productivity Index (MPI) analysis. Malmquist index is part of the DEA method that specifically looks at productivity level 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.

THEORETICAL FRAMEWORK

Efficiency and productivity is a concept that shows the ratio of the result of comparison between input and output. Both ratios show that efficiency and productivity can be controlled by manipulating input and output management, or even both simultaneously. Efficiency and productivity can be used to measure the performance of a unit of economic activity.

In measuring the degree of efficiency and productivity, Data Envelopment Analysis (DEA) is preferable. DEA is widely used to measure the level of technical efficiency, scale of economic and industrial banks and financial institutions. This is suitable according to research of Rani et.al (2017), Kamarudin, et.al (2008); Ozdemir (2013); Shahreki (2012); also Tsolas and Dimitris (2012).

An activity can be called efficient if the effort has been done to provide maximum output, both quantity and quality. An activity can also be said to be efficient if the minimum effort can achieve a certain output. Oscar (2008) divides efficiency into several parts, namely: technical efficiency, scale efficiency, cost efficiency and allocation efficiency. Technical efficiency is the process of converting inputs into outputs. This concept applies only to internal technical relationships between inputs and outputs. A company is considered to be economically efficient if it can minimize the production costs to produce certain output within common

technology level and market price level (Farrell, 1957, Ramanthan, 2003).

Scale efficiency is associated with achieving the economies of scale of the unit in carrying out its operations. Inefficient on a scale can only be overcome by adopting new technologies or production processes. On the other hand, technical efficiency is a managerial problem, where more output is required for a given number of resources.

However, we must understand that technological differences can create economies of scale in the production process. Economies of scale are terms used to explain the decrease in cost per unit due to the addition of units produced. In a microeconomics, economies of scale are cost savings that companies earn when expanding. Measurement of efficiency can also be assessed using price information or input and / or output costs. This notion is commonly known as the concept of cost efficiency. Meanwhile, the allocation efficiency is related to how to combine various inputs to be able to produce maximum output. If there is more than one input or output, management will be interested in using the proper input mix to maximize the results so that the organization can be efficient.

The discussion is whether the use of various inputs in the calculation of efficiency is appropriate. Is it necessary to weight the use of inputs based on their contribution to output. This weighting is not available, but at least DEA can estimate this weighting in comparative evaluation. In its development, the frontier efficiency measurement model has increased, both in theory and practice concepts. In general, the efficiency and productivity level measurement model is divided into two parts: parametric and nonparametric. The following is a general overview of the development of a successful frontier efficiency measurement model that the author identifies.

Table 1: Development of Frontier Efficiency Measurement Model Analysis

No	Model	Year	Author	Type
1	**Stochastic Frontier Approach als77**	1977	Aigner, Lovell, Schmidt	Parametric
2	**SFA Model mvb77**	1977	Meeusen & van den Broeck	Parametric
3	**Data Envelopment Analysis CCR**	1978	Charnes, Cooper, Rhodes	Non parametric
4	**SFA Model stev80**	1980	Stevenson	Parametric
5	**SFA Model mlti**	1981	Pitt & Lee	Parametric
6	**Malmquist Productivity Index**	1982	Caves, Christensen, Diewert	Non parametric
7	**DEA Model BCC**	1984	Banker, Charnes, Cooper	Non parametric
8	**Free Disposal Hull [FDH]**	1984	Deprins, Simar, Tulkens	Non parametric
9	**SFA Model fe**	1984	Schmidt & Sickles	Parametric
10	**SFA Model regls**	1984	Schmidt & Sickles	Parametric
11	**DEA Additive Model**	1985	Charnes,Cooper,Golany,Seiford,Stutz	Non parametric
12	**DEA Window Analysis**	1985	Charnes, Clarke, Cooper, Golany	Non parametric
13	**DEA Assurance Region [DEA-AR]**	1986	Thompson, Singleton, Thrall, Smith	Non parametric
14	**DEA Cross Efficiency**	1986	Sexton, Silkman, Hogan	Non parametric
15	**DEA Facet Model**	1988	Bessent, Bessent, Elam, Clark	Non parametric
16	**SFA Model mlti**	1988	Battese & Coelli	Parametric
17	**SFA Model fecss**	1990	Cornwell, Schmidt, Sickles	Parametric
18	**SFA Model kumb90**	1990	Kumbhakar	Parametric
19	**DEA Cone Ratio**	1990	Charnes, Cooper, Huang, Sun	Non parametric
20	**TFA [Thick Frontier Approach]**	1991	Berger & Humphrey	Parametric
21	**SFA Model bc92**	1992	Battese & Coelli	Parametric
22	**Fuzzy DEA**	1992	Sengupta	Non parametric
23	**DFA [Distribution Free Approach]**	1993	Berger	Parametric
24	**SFA Model fels**	1993	Lee & Schmidt	Parametric
25	**DEA Super Efficiency**	1993	Andersen & Peterson	Non parametric
26	**SFA Model bc95**	1995	Battese & Coelli	Parametric
27	**Network DEA**	1996	Fare & Grosskopf	Non parametric
28	**Hierarchical /Nested Model DEA**	1998	Cook, Chai, Doyle, Green	Non parametric
29	**Bootstrapped DEA**	1998	Simar & Wilson	Parametric
30	**DEA Russell Measure [ERM]**	1999	Pastor, Ruiz, Sirvent	Non parametric
31	**Imprecise Data [IDEA]**	1999	Cooper, Park, Yu	Non parametric
32	**Parallel Model DEA**	2000	Cook, Hababou, Tuenter	Non parametric
33	**Dynamic DEA**	2000	Fare & Grosskopf	Non parametric
34	**DEA Slack Based Measure [SBM]**	2001	Tone	Non parametric
35	**Meta Frontier**	2003	Rao, O'Donnel, Battese	Non parametric
36	**Context-Dependent DEA**	2003	Seiford & Zhu	Non parametric
37	**SFA Model gre03**	2003	Greene	Parametric
38	**SFA Model tfe**	2005	Greene	Parametric
39	**SFA Model tre**	2005	Greene	Parametric
40	**Game Cross Efficiency**	2008	Liang, Wu, Cook, Zhu	Non parametric

(Source: Rusydiana, 2018a)

The concept of productivity is basically a relationship between output and input in a production process. Productivity can be measured partially or totally. Partial productivity is the relationship between output with one input. Examples of commonly used partial productivity are labor productivity which shows the average output per worker, as well as the capital productivity that describes the average output per capital.

Total productivity or so-called Total Factor Productivity (TFP) measures the relationship between outputs with 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.

In productivity measurement, the most widely used is the total factor productivity (TFP) method. This method is used to overcome the weakness of efficiency calculation more than one input and one output. TFP is measured using index numbers that can measure changes in price and quantity over time. In addition, TFP also measures comparisons and differences between entities.

The TFP ab index measures the change in the output value of the selected N number from period "a" to "b" where p represents the output price. Commonly used indices for measuring TFP are Malmquist Index, Laspeyres Index, Pasche Index, Fisher Index and Tornqvist Index. In this study, which will be used to calculate the productivity level (TFP) is the Malmquist Index.

The Malmquist index was first created by Sten Malmquist in 1953 to measure productivity. But in its development, Malmquist Index was introduced by Caves et.al (1982). There are two things that are calculated in Malmquist index measurement that is catch-up effect and frontier shift effect. The catch-up effect measures the rate of change in relative efficiency from period 1 to period 2. Meanwhile the frontier shift effect measures the rate of technological change that is a combination of input and output from period 1 to period 2. The frontier shift effect is often called an innovation effect.

The Malmquist index is a bilateral index used to compare production technologies of two economic elements. The Malmquist index is based on the concept of a production function that measures the maximum production function with defined input limits. In the calculation, this index consists of several results: efficiency change, technological change, pure efficiency change, economic scale change and TFP change (Rusydiana, 2018b).

The Malmquist index has some favorable characteristics. First, this index is a non-parametric method so it does not require specification of production function form. Secondly, the Malmquist index does not require the assumption of the 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. According to Avenzora (2008) this is very useful because the analysis can be done more specifically by component.

In the first generation model developed by Caves et.al (1982), there are 2 (two) Malmquist productivity index models (Bjurek, 1996). 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:

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

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:

$$MO_k\,(y_t, y_{t+1}, x_k) = \frac{E_k^O\,(y_{t+1}, x_k)}{E_k^O\,(y_t, x_k)}\,,\ k = t,\ t + 1 \qquad (2)$$

Bjurek (1996) 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. Adjusting the Tornqvist productivity index, the index constructed is the ratio between an output index and an input index:

$$MTFP_k = \frac{MO_k(y_t, y_{t+1}, x_k)}{MI_k(y_k, x_t, x_{t+1})} = \frac{E_k^O\,(y_{t+1}, x_k)/E_k^O\,(y_t, x_k)}{E_k^I\,(y_k, x_t)/E_k^I\,(y_k, x_{t+1})}\,,\ k = t,\ t + 1 \qquad (3)$$

The equation above illustrates the ratio between the output index and the Malmquist input index. 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, whereas if it equals 1, the productivity level does not change.

Some research that applies zakat institution efficiency and productivity measurement with DEA and TFP change value for example done by Norazlina and Abdul Rahim (2012). They analyze the efficiency of zakat institutions in Malaysia by using data envelopment analysis (DEA) method to estimate zakat efficiency and Tobit model to determine the efficiency of zakat institution in Malaysia. Technical efficiency, pure technical efficiency and scale efficiency of DEA model being used. The empirical findings suggest that zakat

payment, computerized zakat system, board size, audit committee and decentralization significantly affect the efficiency if zakat institutions in Malaysia. The analysis showed that fully corporatized zakat institutions are positively associated with efficiency of zakat institutions in Malaysia while partially corporatized negatively affect zakat efficiency.

Nur Hafizah and Selamah (2013) analyze the profile of zakat collection institutions and the efficiency of the institutions in collecting the zakat by using Data Envelopment Analysis (DEA) approach. The study conducted in the three states of Federal Territories including Kuala Lumpur, Putrajaya and Labuan. The results of the efficiency found that all of the three areas of zakat institutions are efficient. The overall finding indicate that the center managed by Federal Territories maintain their performance and able not only to increase the total of zakat collections but also number of new and existing zakat payers.

Other research done by Rusydiana & Alparisi (2016). The study try to measure the efficiency of 3 (three) Zakat Institutions with Data Envelopment Analysis (DEA) method. Banxia Frontier Analyst 3.1 used in data calculation. The calculation of the level of OPZ efficiency in this study are relative, not absolute. The results show that there is 12 fully efficient Decision Making Unit (DMU) Zakat Institution (100% efficient). Only 6 DMU inefficient. The main factor inefficiency Zakat Institution from 2007 to 2014 due to the distribution of zakat funds to ashnaf. It is still less than optimal. So it has not been able to resolve the problem of poverty.

RESEARCH METHODOLOGY

In this study, the estimated growth of TFP and its components refers to Malmquist Index and application of DEA-Dual Programming method. The Malmquist TFP change index is formed from the value of efficiency change and technology change. Through the value of efficiency change will be known whether there is a change in the efficiency level from year to year. While technological change indicates whether there is a change of technical limit of efficiency from year to year. The malmquist TFP change is part of DEA method developed by Charnes Cooper Rhodes and Banker Charnes Cooper (Coelli et al, 1998, Coelli et al, 2005, Cooper et al, 2010). DEA is a mathematical programming technique that measure the efficiency and productivity of decision making unit or DMU to other similar DMU (Cooper et al, 2002). Early DEA and Malmquist TFP change are widely applied to the banking industry (Sherman & Gold, 1985).

The productivity index is expressed by the TFP index of Malmquist over a given period. As the suggestion of Caves et.al (1982), this index is defined using a distance function that permits multi-input and multi-output use without the need to involve explicit price information. The function of this distance can be classified into a distance function oriented to the input and output. The input distance function seeks a minimal proportional expansion of input vectors for a constant output vector. In contrast, the output distance function seeks a minimum proportional expansion of the output vector for a constant input vector. The Malmquist TFP index measures TFP changes between two data points by computing the distance ratio for each data point, relative to the technological constraints.

The data used in this study are 4 zakat institution from 2011 to 2016. The input and output variables are obtained from the financial statements of each zakat institutions. Two inputs and two outputs are used to measure the efficiency and productivity level of zakat institution. As input variables are Operational Costs (X1) and Personnel Costs (X2). Meanwhile, the output variables are Zakat Collection Fund (Y1) and Zakat Disbursement Fund (Y2).

The analysis tools used in this research are Banxia Frontier Analyst 4 to measure the efficiency level of all zakat institutions DMUs during 2011-2016. To measure Malmquist's productivity index, the DEAP 2.1 software is used. Furthermore, to make the plot of zakat institutions group quadrant with 2 categories (change of efficiency and technological change) on x and y axis, SPSS 16 software is used as a tool. This classification based on Rusydiana & Sanrego (2018), Rusydiana (2018) also Rusydiana & Firmansyah (2017).

RESULT AND DISCUSSION

Efficiency Analysis of Islamic Insurance Industry

In the table below, it appears that during the 2014-2016 research period, the level of efficiency of the sharia insurance industry in Indonesia experienced a relative decline in value, as indicated by the average value of efficiency from year to year. In 2014, the average efficiency of zakat institutions in Indonesia was 0.819 and then decreased to 0.784 in 2015. In the last observation period, 2016, the average value of the efficiency of the Islamic insurance industry for losses in Indonesia even fell to 0.732 or at the lowest level. low when compared to previous years.

Meanwhile, from the perspective of the sharia insurance industry, the one with the highest average efficiency value during the 2014-2016 period, which is at an optimal number of 1,000, is SinarMas insurance. Just like SinarMas, Astra Buana also has an average efficiency value of 1,000 or reaches maximum efficiency every year. Furthermore, sharia insurance companies with high efficiency values are Bintang insurance (0.932) and Adira insurance (0.904). These four sharia insurances are included in the loss sharia insurance industry group with high efficiency values above 90%.

The next group, with an average efficiency value of 80-90%, include: TPI insurance (0.884), Bangun Askrida (0.881), Adira (0.875), Pan Pacific (0.843), Chubb Syariah (0.827), Parolamas (0.822) , and Ramayana (0.805). The sharia insurance industry is

included in the insurance group with a fairly high efficiency. In a row then: Staco (0.794), Jasindo (0.792), Tripakarta (0.753), Takaful (0.738), Wahana Tata (0.707), Mega Insurance (0.653), ACA (0.639), Bumida (0.613), Bringin Sejahtera (0.549) and Jasa Raharja insurance (0.332). The following is a complete table regarding the efficiency score of the Islamic insurance industry in Indonesia during the 2014-2016 period.

Table 2: Efficiency Score of Islamic Insurance Industry in Indonesia

FIRM	2014	2015	2016	MEAN	RANK
(1)	0.759	0.859	0.596	0.738	15
(2)	1.000	0.739	0.743	0.827	9
(3)	0.838	0.751	0.787	0.792	13
(4)	0.812	0.814	1.000	0.875	7
(5)	0.712	1.000	1.000	0.904	4
(6)	1.000	1.000	1.000	1.000	2
(7)	0.884	0.760	1.000	0.881	6
(8)	1.000	1.000	0.797	0.932	3
(9)	0.760	0.486	0.403	0.549	20
(10)	1.000	0.463	0.375	0.613	19
(11)	1.000	0.446	0.474	0.639	18
(12)	1.000	1.000	0.465	0.822	10
(13)	0.415	1.000	1.000	0.805	11
(14)	1.000	1.000	1.000	1.000	1
(15)	0.592	1.000	0.666	0.753	14
(16)	0.924	0.619	0.416	0.653	17
(17)	0.797	0.715	0.869	0.794	12
(18)	1.000	1.000	0.653	0.884	5
(19)	0.305	0.334	0.358	0.332	21
(20)	1.000	0.748	0.779	0.843	8
(21)	0.403	0.718	1.000	0.707	16
MEAN	**0.819**	**0.784**	**0.732**		

Note: (1)Takaful, (2)ChubbSyariah, (3)Jasindo, (4)Adira, (5)Allianz, (6)Astra Buana, (7)Bangun Askrida, (8)Bintang, (9)Bringin Sejahtera, (10)Bumida, (11)ACA, (12)Parolamas, (13)Ramayana, (14)SinarMas, (15)Tripakarta, (16)Mega, (17)Staco, (18)TPI, (19)JasaRaharja, (20)PanPacific, (21)WahanaTata.

Quadrant Based on the Malmquist Productivity Index

Islamic insurance institutions are grouped into 4 (four) quadrants based on technical change level (TECH) categories and efficiency change (EFFCH) level categories, ie high and low. Quadrant 1 includes Islamic insurance institution which has technical change and high-efficiency change, so it can be considered as a high-productivity takaful institution.

Table 3: Malmquist Index Summary of Firm Means

FIRM	EFFCH	TECHCH	PECH	SECH	TFPCH	PLACE
1	0.861	1.313	1.088	0.792	1.131	Q2
2	1.019	1.276	1.004	1.015	1.300	Q1
3	0.892	1.199	0.998	0.893	1.069	Q2
4	0.784	1.230	0.990	0.792	0.964	Q2
5	1.000	0.464	1.000	1.000	0.464	Q3
6	0.907	1.030	1.000	0.907	0.934	Q4
7	0.870	1.178	0.974	0.894	1.025	Q2
8	1.000	1.896	1.000	1.000	1.896	Q1
9	1.311	0.989	1.205	1.088	1.297	Q3
10	1.378	1.319	1.356	1.016	1.817	Q1
11	1.231	1.117	1.221	1.008	1.375	Q1
12	1.000	1.461	1.000	1.000	1.461	Q1
13	0.736	0.794	0.787	0.936	0.584	Q4
14	1.000	0.853	1.000	1.000	0.853	Q3
15	0.817	1.127	0.861	0.949	0.922	Q2
16	1.334	1.275	1.324	1.008	1.701	Q1
17	1.008	0.895	1.000	1.008	0.903	Q3
18	1.133	1.558	1.127	1.005	1.765	Q1
19	1.166	0.764	1.419	0.822	0.891	Q3
20	1.012	1.337	1.000	1.012	1.353	Q1
21	0.820	0.624	1.000	0.820	0.511	Q4
MEAN	**0.998**	**1.078**	**1.054**	**0.947**	**1.076**	

Note: (1)Takaful, (2)ChubbSyariah, (3)Jasindo, (4)Adira, (5)Allianz, (6)Astra Buana, (7)Bangun Askrida, (8)Bintang, (9)Bringin Sejahtera, (10)Bumida, (11)ACA, (12)Parolamas, (13)Ramayana, (14)SinarMas, (15)Tripakarta, (16)Mega, (17)Staco, (18)TPI, (19)JasaRaharja, (20)PanPacific, (21)WahanaTata.

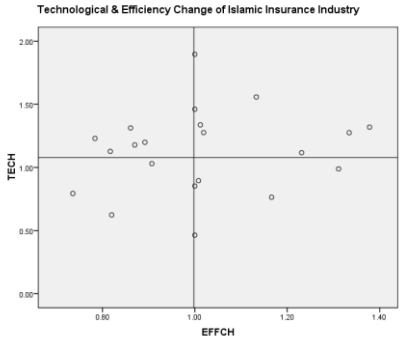
On the other hand, Quadrant 4 is a group of Islamic insurance institution with low technical change and efficiency change. A collection of institution in this group can be regarded as a Islamic insurance institution whose productivity progress is relatively stagnant due to the small value of TECH and EFFCH.

Quadrant 2 includes Islamic insurance institution that has a high technical change, but on the other hand has a low efficiency change. A collection of institution in this group can be regarded as an Islamic insurance institution with low catching up ability. Increasing the number of DMUs of Islamic insurance institution in this 2nd quadrant is a sign of ineffectiveness of takaful institution to produce efficiently (technical change and efficiency change rates are classified into high and low categories based on their mean values).

The quadrant 3 includes groups of Islamic insurance institution that have a low technical change, but on the other hand has a relatively high-efficiency change. The collection of institution in quadrant 3 can

be regarded as an Islamic insurance institution with low production technology improvement, but relatively able to achieve a high level of efficiency improvement.

Below is the Islamic insurance institution based on the calculation of Malmquist Productivity Index (MPI), with two categories namely technical change (TECH) on Y axis and efficiency change (EFFCH) on X axis.



Picture 1: Islamic Insurance Industry Quadrants Based on the Productivity Index

Information:
Quadrant 1 (High TECH, High EFFCH) : 2, 8, 10, 11, 12, 16, 18, 20
Quadrant 2 (High TECH, Low EFFCH) : 1, 3, 4, 7, 15
Quadrant 3 (Low TECH, High EFFCH) : 5, 9, 14, 17, 19
Quadrant 4 (Low TECH, Low EFFCH) : 6, 13, 21

In the picture above shows that in the study period 2014-2016, there are 8 Islamic insurance institution that is in quadrant 1, there are 5 Islamic insurance institution in quadrant 2, and 5 Islamic insurance institution in quadrant 3. Meanwhile there are 3 Islamic insurance institutions that enter the quadrant category 4.

Group quadrant 1 is an Islamic insurance institution category that has technical change and high-efficiency change. Islamic insurance institution in this category are (2) Chubb Syariah, (8) Bintang, (10) Bumida, (11) ACA, (12) Parolamas, (16) Mega, (18) TPI, and (20) Pan Pacific. All of them are included in Islamic insurance institution with high productivity value.

Quadrant Group 2 is an Islamic insurance institution category that has a high technical change, but on the other hand has a low efficiency change. The collection of institution in this group is considered an Islamic insurance institution with low catching up ability. Based on the results listed in the picture above, (1) Takaful, (3) Jasindo, (4) Adira, (7) Bangun Askrida, and (15) Tripakarta are included in this category.

Group quadrant 3 is an Islamic insurance institution category that has a low technical change, but on the other hand has a relatively high efficiency change. The institution in quadrant 3 can be considered as an Islamic insurance institution with low production technology improvements, but are relatively capable of achieving a high level of efficiency. Based on the results listed in the picture above, (5) Allianz, (9) Bringin Sejahtera, (14) Sinar Mas, (17) Staco, and (19) Jasa Raharja are included in this category.

The last quadrant is quadrant 4 is a group of Islamic insurance institution with technical change and low efficiency change. Islamic insurance institution in this category are (6) Astra Buana, (13) Ramayana and (21) Wahana Tata. The collection of institution in this group can be considered as an Islamic insurance institution whose productivity progress is relatively stagnant.

The distribution of Islamic insurance institution in 4 (four) quadrants above can be influenced by the characteristics of the existing Islamic insurance institution in each group. Some variables that can describe the characteristics of each Islamic insurance institution such as product innovation, marketing strategy, location and network of Islamic insurance institution and types of ownership of the company. This figure is still indicative and requires formal testing, but is not covered in this study.

Annual Productivity Index of Islamic Insurance Industry

On table below, it appears that for the duration of the 2014-2016 study, Islamic insurance institution in Indonesia show an improvement in productivity growth even though its very small, as indicated by the value of 1.076 TFPCH. The increase in this TFPCH showed improvement levels of productivity in the Islamic insurance institutions in Indonesia. This is evidenced by the increase TECH above 1 (1.078), also PECH (1.054). In the other side, the changes in efficiency or EFFCH decreased below 1 (0.998) and SECH (0.947). It means, the increase in productivity levels of Islamic insurance institutions in Indonesia has been largely contributed by the high level of technological change (TECH) technological innovation and the stagnation of changes in its efficiency (EFFCH).

Yearly analysis, there are also conditions in which there is an increase in TFP productivity in Islamic insurance institutions in general. As happened in 2014-2015 (TFPCH = 1.156), and 2015-2016 intervals (TFPCH = 1.001). Beyond that, in general, the MPI rate of zakat institution in Indonesia has increased productivity levels that are marked by the change value of Total Factor Productivity or TFPCH above number 1 (1.076).

Table 4: Malmquist Index Summary of Annual Means

PERIODS	EFFCH	TECH	PECH	SECH	TFPCH
2014-2015	1.033	1.119	1.045	0.988	1.156
2015-2016	0.964	1.039	1.063	0.907	1.001
MEAN	0.998	1.078	1.054	0.947	1.076

CONCLUSION

This research tries to analyze BCC model as base model in DEA to see efficiency level of Islamic insurance institution in Indonesia for period 2014-2016. Further Malmquist index is used to see the productivity level of Islamic insurance institution, both in terms of changes in efficiency and technological change which is then displayed in the form of quadrant 4 groups.

The results obtained from the Malmquist index score (TFP Change) indicate that 12 institutions from the Islamic insurance institution observed (21 institutions) has increased productivity, or 57%. It is marked with a score of more than 1. This is evidenced by the increase TECH above 1 (1.078), also PECH (1.054). In the other side, the changes in efficiency or EFFCH decreased below 1 (0.998) and SECH (0.947). It means, the increase in productivity levels of Islamic insurance institutions in Indonesia has been largely contributed by the high level of technological change (TECH) technological innovation and the stagnation of changes in its efficiency (EFFCH).

For analysis of Islamic insurance institution group with efficiency change criterion (EFFCH) and technological change (TECH), there are 8 Islamic insurance institution that is in quadrant 1(technical change and high-efficiency change), there are 5 Islamic insurance institution in quadrant 2 (technical change high but low efficiency change), and 5 Islamic insurance institution in quadrant 3(technical change is low but high-efficiency change). Meanwhile there are 3 Islamic insurance institutions that enter the quadrant category 4 (technical change and low-efficiency change).

Calculation of the level of productivity in this study are relative, not absolute. So it is very possible when the sample of Islamic insurance institution added or time series of observation expanded, would get different results. The need for every Islamic insurance Institution both public and private to issue annual financial statements in order to increase accountability and transparency in the management of funds. The ultimate goal is improvement and development of Islamic insurance industry in Indonesia.

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ATTACHMENT

Malmquist Index Summary (Output Deap 2.1)

year = 2

firm	effch	techch	pech	sech	tfpch
1	1.334	1.193	1.294	1.031	1.591
2	1.020	0.988	0.992	1.029	1.008
3	0.826	1.186	0.842	0.980	0.980
4	0.635	1.269	0.979	0.649	0.806
5	1.000	0.972	1.000	1.000	0.972
6	1.002	1.369	1.000	1.002	1.372
7	0.982	0.804	1.000	0.982	0.789
8	1.000	1.627	1.000	1.000	1.627
9	1.290	0.938	1.038	1.243	1.210
10	1.350	1.013	1.366	0.988	1.368
11	0.998	0.963	0.987	1.011	0.962
12	1.000	3.793	1.000	1.000	3.793
13	1.000	0.758	1.000	1.000	0.758
14	1.000	0.812	1.000	1.000	0.812
15	1.305	1.479	1.236	1.056	1.930
16	1.490	1.110	1.507	0.989	1.655
17	0.854	0.985	0.843	1.014	0.841
18	1.283	1.478	1.271	1.010	1.896
19	0.996	0.918	0.852	1.169	0.915
20	0.864	1.073	1.000	0.864	0.928
21	0.879	0.681	1.000	0.879	0.599
mean	1.033	1.119	1.045	0.988	1.156

year = 3

firm	effch	techch	pech	sech	tfpch
1	0.557	1.446	0.915	0.608	0.805
2	1.018	1.647	1.017	1.001	1.677
3	0.963	1.213	1.182	0.814	1.167
4	0.968	1.192	1.000	0.968	1.153
5	1.000	0.222	1.000	1.000	0.222
6	0.820	0.775	1.000	0.820	0.636
7	0.771	1.726	0.948	0.813	1.331
8	1.000	2.209	1.000	1.000	2.209
9	1.332	1.043	1.399	0.952	1.389
10	1.406	1.717	1.346	1.044	2.414
11	1.519	1.294	1.510	1.006	1.965
12	1.000	0.562	1.000	1.000	0.562
13	0.542	0.831	0.619	0.875	0.450
14	1.000	0.897	1.000	1.000	0.897
15	0.512	0.860	0.600	0.853	0.440
16	1.195	1.464	1.163	1.027	1.749
17	1.190	0.814	1.187	1.002	0.968
18	1.000	1.643	1.000	1.000	1.643
19	1.365	0.635	2.364	0.578	0.867
20	1.184	1.666	1.000	1.184	1.972
21	0.764	0.571	1.000	0.764	0.436
mean	0.964	1.039	1.063	0.907	1.001