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EFFICIENCY OF ISLAMIC BANKS USING TWO STAGE APPROACH OF DATA ENVELOPMENT ANALYSIS

Muhammad Faza Firdaus[1]
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Abstract

The aim of this study is to measure the efficiency of Islamic Bank in Indonesia, to analyze the factors that affect the level of efficiency which is known as Two-Stage Data Envelopment Analysis method and to propose measurement of Bank Soundness with modified CAMELS. The objects of this study are 10 (ten) Islamic Bank (BUS) in Indonesia which analyzes from the second Quarter of 2010 until the fourth Quarter of 2012. There are 2 (two) methods which are used in this study, namely non-parametric method of Data Envelopment Analysis (DEA) on the first stage and Tobit model on the second stage. In addition, this study will illustrate the formulation of the financial factors of CAELS instead of CAMEL by integrating the results of efficiency level measurement using DEA in CAELS formulation. Overall, the results, show that the efficiency level of Islamic banks in Indonesia during the time period in this study, have not yet reach the optimum level of efficiency. In addition, modification of CAELS for the bank performance level method by integrating the result of DEA shows that the modification of CAELS could be more accurate in describing the bank performance level, particularly for Islamic Bank in Indonesia.

Keywords: Efficiency, Data Envelopment Analysis (DEA), Tobit Model, CAELS + DEA
JEL Classification: C02, C14, C54,G21

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I. INTRODUCTION

The rapid growth of Islamic banking industry in Indonesia increases the demand for efficiency measurement of Islamic bank. Table 1 and Table 2 illustrate selected financial indicators and financial ratios of Islamic bank, which confirm the rapid progress on Islamic banking industry in Indonesia. From 2005 to 2010 there was an increase in the amount of the third-party funds (DPK), assets, and financing distributed by Islamic bank. Besides, the data in some financial ratios such as Non Performing Financing (NPF) and Financing Deposit Ratio (FDR) also indicated the performance improvement which automatically drew the development of Islamic banking in Indonesia. Based on the explanation of those data, thus, the measurement of efficiency level is increasingly needed. This is because by knowing the level of efficiency of one Islamic bank, thus, we can find out the capability of that bank to optimize its all resources and to give more benefit for the society as its customer which is either as the depositor or as the funder.

Table 1 The Development of Assets, DPK, and Financing of Islamic Banking in Indonesia from 2005 to 2011 (in Million Rupiah)

	2005	2006	2007	2008	2009	2010	2011
Assets	20,879	26,722	36,538	49,555	66,090	97,519	145,466
DPK	15,581	24,128	28,011	36,852	52,272	76,037	115,415
Financing	15,232	20,445	27,944	38,199	46,887	68,181	186,359

Source: the Statisticof Indonesia Banking year 2011, calculated

Table 2 The Development of the performance of Islamic Banking in Indonesia from 2005 to 2011 (in percentage)

	2005	2006	2007	2008	2009	2010	2011
NPF	2.82	4.75	4.05	3.95	4.01	3.02	2.52
FDR	97.75	98.90	99.76	103.65	89.69	89.66	88.94

Source: the Statisticof Indonesia Banking year 2011, calculated

The measurement of the efficiency level of the Islamic banking industry became an urgent thing after seeing the tight competition in the industry of Islamic banking, especially from 2005 to 2011. This could happen because of the fast growth of the number of Islamic bank which emerged along that period of time. In table 3, it could be seen that along that period of time, there was a significant increase in the number of Islamic public banks (BUS) and Islamic Work Unit (UUS). Therefore, through the measurement of the efficiency of Islamic bank, this can be an important indicator on seeing the ability of Islamic bank to survive and to face the tight competition both on this Islamic banking industry and on the national banking industry in Indonesia.

Table 3
The Development of Islamic Bank from 2005 to 2011

	2005	2006	2007	2008	2009	2010	2011
Islamic Public Bank(BUS)	3	3	3	5	6	11	11
Islamic Work Unit (UUS)	19	20	26	27	25	23	24

Source: the Statisticof Indonesia Banking year 2011, calculated

One of the methods which is commonly used to analyze the efficiency of bank is by using the non parametric method called Data Envelopment Analysis (DEA). DEA is an optimization Math program method which measures the technical efficiency of an Economy Activity Unit (UKE) and compares it to other Economy Activity Unit relatively. This method has benefit if compared to the parametric method. The benefit of using this non parametric method is that we can identify the unit which is used as the reference.

After that, the research on the level of efficiency of bank or economy activity unit was continuously inclined in many countries, and therefore, a research procedure named Two-Stage Data Envelopment Analysis was created. In this procedure, there will be two stages of research (First Stage dan Second Stage).On the First Stage, there will be a measurement on the level of efficiency using the Data Envelopment Analysis (DEA) method. While, on the Second Stage, there will be analysis to find out the factors which influence the efficiency level of a bank using Tobit model. Thus, It would result a comprehensive result about the efficiency level of a bank or an economy work unit, Endri (2008).

Besides, aside from the research on the level of efficiency of a bank, we have already known a measurement method of the health level of bank which is called as CAMELS. In this method, there are six components as the sources of measurement and they create a unit of level which draw the health level of a bank. One of the component of this calculation method is called as the component of Earning which includes BOPO ratio. As we have known, this BOPO ratio is used to measure the level of efficiency of a bank by comparing the Operational Expense to Operational Revenue. However, by seeing banking industry as an intermediation organization by using lots of input and output, then, this measurement of efficiency level using this BOPO ratio is assumed not to draw the efficiency level of a bank. This is because the calculation of the efficiency level using BOPO ratio is a Partial Efficiency. Besides, the percentage on the calculation of the level of efficiency using CAMELS method is only for about 5% has become a special attention by considering the urgency of the measurement of the efficiency level on drawing the work of a bank.

Explicitly, the aim of this paper are, first, to measure the level of efficiency of Islamic Public Bank in Indonesia (BUS) from the II quarter period of 2010 to the IV quarter period of 2012, second, to analyze the influence of assets, the number of branch of the banks, ROA, ROE, CAR,

and NPF toward the efficiency level of Islamic Public Bank (BUS) in Indonesia from the II quarter period of 2010 to the IV quarter period of 2012, third, to analyze the comparison between the measurement method of efficiency level using Data Envelopment Analysis (DEA) and the measurement of the health of bank using CAELS, and fourth, to formulate a Policy Implication which can be given as the form of implication from the result of the measurement using the method of Data Envelopment Analysis (DEA).

II. THEORY

The analysis about the efficiency of an Economy or a Company Work Unit was always about how to result a maximum output with certain number of input, Farrell (1957). In describing a condition of the achievement of efficiency in a company Farrell (1957) illustrated his idea through a simple example by a case of a company using two inputs (x1and x2) to produce a singular output (q) by an assumption of constant return to scale (CRS). By using the line of isoquant from a company with a fully efficient firm, represented by the curve of SS'in picture1, then, a calculation of technical efficiency could be conducted. If a company had used certain number of inputs which were shown by point P to produce an output unit, then, the technical inefficiency of that company would be represented by the distance of QP which was the total of all inputs which proportionally can decrease and be decreased without causing the decline of the output resulted. This indicator was commonly written mathematically in percentage as the ratio of QP/0P, as the description of the percentage of the input that can be decreased. In general, the level of technical efficiency/TE in the company was measured by the score of ratio:

$$TE = 0Q/0P$$

That equation would be the same with the equation of 1-QP/0P, in which the score was ranged from zero to one, and therefore, it resulted the indicator of the degree of technical efficiency from that company. The score of 1 implicated that the company had reached the fully efficient firm. For example, the point of Q had reached the technical efficiency because it was in the position of the curve of efficient isoquant.

If the ratio of the price of input (in picture 1) presented by the line AA' was also known, then allocative efficiency of production could be calculated. The level of allocative efficiency/ AE of a company which oriented from the point of P could be defined as the ratio of:

$$AE = 0R/0Q$$

In which the distance of RQ showed the decrease of the production cost which could be gained if the level of production was on point Q' which was allocatively and technically efficient, and it was different from Q point which was technical efficient but allocatively inefficient.

The total economic efficiency could be defined as the ratio of:

$$EE = 0R/0P$$

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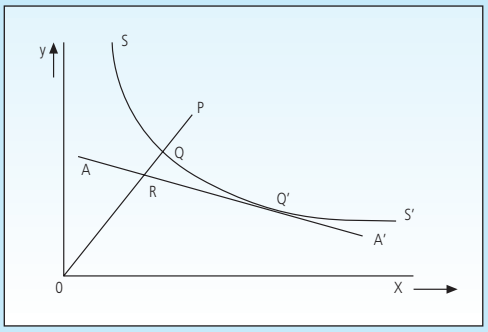
In which the distance from the point of R to point of P could be interpreted with the term of cost reduction. it showed that the product which was technically and allocatively efficient showed the achievement of the economic efficiency comprehensively.

$$TE \times AE = (0Q/0P) \times (0R/0Q) = (0R/0P) = EE$$



Source: Farrell, 1957

Picture 1. TheTechnical and Allocative Efficiency

In describing the illustration drawn by Farrel, thus, a programming model to measure the relative efficiency level called as Data Envelopment Analysis (DEA) was formulated by Charnes, Cooper, and Rhodes in 1978, (Charnes el al. 1978). The DEA modeling aimed to measure the relative efficiency level of a company compare to the same type of company. Some research on the efficiency of a company, especially on the banking industry had been numerously used all over the world. Supachet Chansarn (2008) conducted a research about level of efficiency of commercial bank in Thailand along 2003-2006. The result showed that the level of efficiency of the commercial bank in Thailand was stable and was very high with the average of 90% for every year along the period of the research. While on the research conducted by Anne (2010) it showed that the average score of efficiency score of banking sector was not more than 40% along the period of 1997-2009. Based on that research, it was seen that there was a different of the result of the score of efficiency between the banking sector in Thailand and in Kenya which described the condition of those two countries' banking sector.

III. RESEARCH METHODOLOGY

3.1. Object and Research Variable

The objects of this research included ten Islamic Public Bank in Indonesia, such as Bank Muamalat Indonesia, Bank Syariah Mandiri, Bank Syariah Mega Indonesia, Bank Bukopin

Syariah, Bank Rakyat Indonesia Syariah, Bank Panin Syariah, Bank Jabar Banten Syariah, Bank Victoria Syariah, Bank Negara Indonesia Syariah, and Bank Central Asia Syariah along the Second Quarter period of 2010 until the Fourth Quarter period of 2012. The using these ten Islamic Public Banks (BUS) in this research by deleting Bank Maybank Syariah Indonesia which was established in the Fourth Quarter of 2010 as the object of study because of the abnormal spread of data on the analysis of Second Stage using Tobit model. The data used in this research was included into the type of quantitative data and based on the source of data; this research used the secondary data.

In this research, the selection of the input and output variable to measure the level of efficiency using the method of Data Envelopment Analysis (DEA) on the First Stage used the intermediation approach as what have been used by Efendic (2009: 1-13) and Rahmat Hidayat (2011: 1-19). The input variables (I) which were used in this research included the third-party fund or DPK (I1), total assets (I2), and labor cost (I3). Besides, the output variables (O) used were financing (O1) and Operational Income (O2).

On the second stage, the dependent variable analyzed by using the model of Tobit in analyzing the factors influences the level of efficiency of an Islamic Public Bank in Indonesia was the result score of the measurement of DEA. Besides the independent variable which were used were assets (X1), the number of the branch of the banks (X2), ROA (X3), ROE (X4),CAR (X5), and NPF (X6).

3.2. Data Envelopment Analysis (DEA)

Data Envelopment Analysis is a method of non parametric which is used to measure the level of efficiency of an Economy work Unit (UKE). Besides, DEA is a method used to evaluate the efficiency of a decision maker unit (work unit) which is responsible for the using of some inputs to get the targeted output. In special, DEA is the improvement of a linear technical programming which has the function of purpose and the function of obstacle. Below is the general equation on the method of Data Envelopment Analysis (DEA).

$$h_s = \frac{\sum_{i=1}^{m} u_{is} y_{is}}{\sum_{j=1}^{n} u_{js} y_{js}}$$

In which hs showed the technical efficiency of banks; uis show the weight of the resulted output i; y_{is} is the weight of the produced input i; v_{js} is the weight of the input j; and x_{js} = the number of input j given by bank s.

In this case, it also finds the score for u and v, as the maximum efficiency measurement of hs. With the purpose for the obstacle that all measurement of the efficiency must be less

than or the same as one, one of the problems of formulations of this ratio is that this has many infinite solutions. To avoid this, then, we can determine the obstacle which will specify and easier the next process by using the computation technique which always develop all times. The function of that obstacle is below:

$$\frac{\sum_{i=1}^{m} u_{is} y_{is}}{\sum_{j=1}^{n} u_{js} y_{js}} \leq 1 \qquad ; r = 1, 2, ..., N \text{ and } u_i, y_j \geq 0$$

In which N shows the number of bank in the samples. The first inequality shows the ratio of efficiency for other company which is not more than 1, while for the second inequality is positive in value/score. The value/score of ratio will vary between 0 and 1. A bank can be said as efficient if the ratio score is close to 1 or 100 percent, and in contrast, if it is close to 0, it shows that the efficiency of a bank gets lower. On DEA, every bank can determine its own weighted and guarantee that the chosen weighted will result the best performance.

Related to the input and output used in the measurement of the efficiency, there are three approaches used, such as the approach of assets, production and intermediation. In this research, it used intermediation approach, because according to Hadad (2003: 3), he explained that the real activity of a bank organization with its function was as the organization of intermediation. Besides, It had been numerously used in research to measure the level of efficiency of banking in all over world.

Besides determining the input and output of the research, on the measurement of the efficiency level, there are two models used to analyze the efficiency of an Economy Work Unit (UKE). The first developed model was model with assumption of constant return to scale (CRS) or commonly called as the model of CCR (Charnes-Cooper-Rhodes). In the model of constant return to scale, every UKE will be compared to the whole UKE in the samples with assumption that the internal and external conditions of the Economy Work Unit are the same. According to Charnes, Cooper, and Rhodes, this model can show the technical efficiency comprehensively or the show the score of the profit efficiency for every Economy Work Unit.

In the model of CRS, there is a general Math model that has been explained on the general equation above. In that equation, it is explained that the value or score of technical efficiency can be gained through the comparison between the output ratios toward its input ratio. Further more, in that equation, it is explained that the score of measurement of efficiency score is limited in the range score of 0 until 1 and the score weight must be positive. Through that equation, it can be concluded that a Bank is stated to be efficient if it has the ratio score closes to 1 or 100 percent, in contrast, if the score is close to 0, it shows that the bank efficiency gets lower. Below is the equation of the model of CCR:

$$
\begin{aligned}
Max. \quad & h_s = \sum_{i=1}^{m} u_i y_{is} \\
st. \quad & \sum_{i=1}^{m} u_i y_{ir} - \sum_{j=1}^{m} v_j x_{jr} \leq 0 \qquad ; r = 1,\ldots,N \\
& \sum_{j=1}^{m} v_j x_{js} = 1 \\
& u_i, v_j \geq 0
\end{aligned}
$$

In that equation, it is explained that the function of purpose of that equation is to maximize the output by the function of obstacle, in which the input score is the same as one thus, the output value/score which is lessen by its output value/score will be less than or the same as 0. This means that all banks will be in the position or below the level of technical efficiency.

While the second model developed in the level of the measurement of efficiency is model by assumption of variable return to scale (VRS) or usually called as the model of BCC (Bankers-Charnes-Cooper). In this model, it is assumed that the condition of all Economy Work Unit are not the same or it can be said that not all Economy Work Unit operate optimally. The inelastic competition, the financial burden, etc can cause the company cannot operate optimally. The Math model with the approach of VRS can be modified from the model with CRS approach and still can compass on the general Math model of DEA as the equation in measuring the level of technical efficiency. By adding the obstacle of convexity constraint into the equation, so that the Math formula becomes:

$$
\begin{aligned}
Max. \quad & h_s = \sum_{i=1}^{m} u_i y_{is} + U_0 \\
st. \quad & \sum_{i=1}^{m} u_i y_{ir} - \sum_{j=1}^{m} v_j x_{jr} \leq 0 \qquad ; r = 1,\ldots,N \\
& \sum_{j=1}^{m} v_j x_{js} = 1 \\
& u_i, v_j \geq 0
\end{aligned}
$$

In which U_0 is a piece that can be positive or negative in value/score.

In this research, it used model with assumption of constant return to scale (CRS) or called as model of CCR (Charnes-Cooper-Rhodes). This model was chosen based on the research conducted by Suseno (2008: 35-55) about the unavailability of relation between the efficiency level of Islamic bank (study on ten Islamic banks) and its production scale. In that research, it was explained that the economy scale in banking industry did not occur based on the company scale because of the function one bank has been integrated with other banks. Therefore, the economy scale has moved from the company to functional. In Indonesia, this can be observed from the phenomenon of the using of collective ATM machine, collective credit card service or

collective marketing, so that the efficiency level was not seen in the company scale but possibly seen in the scale of functional of national banking industry (not merely in the industry of Islamic banking). In this research, it also used efficiency by the approach which oriented to the output, this was because, in the end, the purpose of an economy Work Unit was to get the maximum benefit by optimizing its resources.

3.3. Tobit Model

In this stage, it will conduct the analysis on factors influence the efficiency level. it gained the efficiency value or score on the first stage by using the method of DEA, thus, that score will be analyzed with some environment variables to find out the relation and the characteristic of relation between those variables toward the second stage. Therefore, these two stages in this research was called as Two-Stage Data Envelopment Analysis. In analyzing the factors influenced the level of efficiency, it used model of Tobit.

The calculation of Tobit was stated by James Tobin in 1958 when he analyzed the expense of households in the USA to buy cars. The expense for car in some households became zero (because that household did not buy car), and the this thing influence toward the result of the regression analysis. He found that if still using OLS, the calculation of the parameter will tend to be close to zero and became insignificant, or if became significant, the score experienced a bias (too big or too low) and became inconsistent (if there were new data, the result would not be the same or did not fit with the previous result).

The method of Tobit assumed that independent variables is unlimited in score (non-censured); only the dependent variables which were censured; all variables (both independent and dependent) was measured correctly; there was no autocorrelation; no heteroscedascity; no perfect multicolinearity; and the mathematic model used became precise in the using of analysis regression method for social and economic field, there were many data structure in which the response variable had the score of zero for some observation parts, while for other parts of observation had certain score which were vary. The data structure like this was named as censored data, Endri (2008).

3.4. The Method of CAELS Health Measurement and Method of Independent Sample T Test of Wilcoxon Signed Ranks Test

In this research, besides describing the level of efficiency toward the Islamic Public Bank through the procedure of Two-Stage Data Envelopment Analysis, there was also comparison between the results of the measurement of efficiency level of DEA with the result of the measurement of health by CAELS method. The reason of the using of CAELS method without using the component of "M" which was known as CAMELS was because in CAMELS method in Indonesia, there was different treatment for the score of financial factor which united became

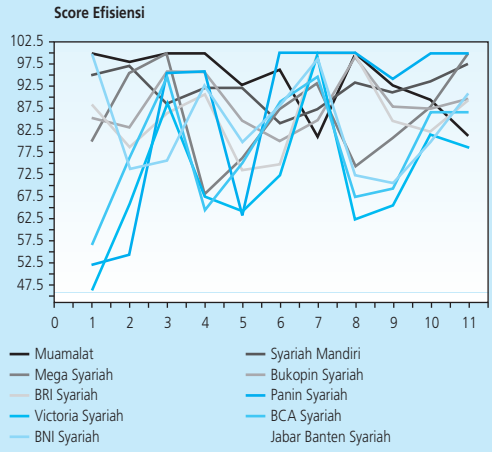
CAELS and management factor. Besides, to make the result of DEA method could be integrated on CAELS method, thus, the result of the method of DEA was divided into 5 categories, which are category "1": 100% (very efficient), category "2":80% to 99.99% (Efficient); category "3":60% to 79.99% (Efficient enough); category "4":40% to 59.99% (inefficient); and category "5":0% to 39.9% (Very inefficient).

Meanwhile, to analyze the comparison between the result of using DEA method and the result of CAELS method, the independent sample T test of Wilcoxon signed rank test is conducted. The Method of Independent sample T test of Wilcoxon Signed Ranks Test is a non parametric test that can be used if the distribution of the data is abnormal which is used to test whether there is any different or not between those two pairs of sample group Priyatno (2011: 318). Next, the result of the independent t test between the method of DEA and CAELS will be analyzed and illustrated into some modification method of CAELS + DEA in the form of mapping.

IV. RESULT AND DISCUSSION

4.1. The Result of the Measurement of the Level of Efficiency of Islamic Public Bank (BUS) from the II Quarter Period of 2010 to the IV Quarter Period of 2012 (First Stage)

In this discussion, there would be shown the level of efficiency of 10 (ten) Islamic Public Banks based on the method of Data Envelopment Analysis (DEA) along the IV quarter period of 2010 until the IV quarter period of 2012, and it would show the level of the average efficiency which were reached by each Islamic Public Bank along that period of time. The data on the input and output variables for measuring the efficiency level were taken from the publication report of the Islamic Public Bank in Indonesia. As what have been explained before, DEA method presented the result of the measurement of the level of efficiency in the form of efficiency score with range 1-100. Score100 presented the Islamic Public Bank which optimized its resources. In contrast, if the score was below 100, it mean that the Islamic Public Bank was said to be inefficient to optimize its resources and had yet to perform its function as an optimum intermediation organization. In this research, the result of measurement using the method of DEA would be presented in some graphs presenting the achievement of the average level efficiency of each Islamic Public Bank within quarter period, and the achievement of efficiency level of the Islamic Public Bank in comprehensive way.

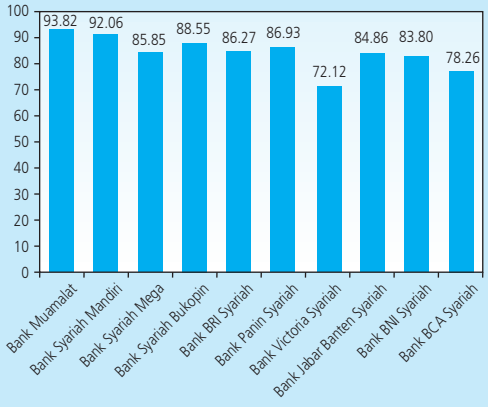


Picture 2. The Efficiencyof Ten Islamic Public Bank from the II Quarter period of 2010 to the IV Quarter Period of 2012

The result of the level of efficiency of the Islamic Public Bank in the II Quarter Period of 2010 until in the IV Quarter Period of 2012 showed a trend of fluctuation, there was no Islamic Public Bank (BUS) which had a stable efficiency score from every period of measurement. Besides, based on the result of measurement from that efficiency, it could be seen that there were some Islamic Public Bank which got the score of 100, or it could be translated that these banks had been able to optimize their all resources and were categorized as the efficient bank. And the bank which were categorized as the efficient banks were Bank Muamalat Indonesia and Bank BNI Syariah in the I Quarter, Bank Muamalat Indonesia and Bank Syariah Mega Indonesia in the III Quarter, Bank Muamalat Indonesia and Bank Jabar Banten Syariah in the IV Quarter, Bank Panin Syariah in the VI Quarter, Bank BRI Syariah, Bank Victoria Syariah, and Bank Panin Syariah in the VII Quarter, Bank Muamalat Indonesia, Bank BRI Syariah, and Bank Panin Syariah in the VIII Quarter, Bank Panin Syariah in the X Quarter, Bank Syariah Mega Indonesia and Bank Panin Syariah in the XI Quarter. Meanwhile, the other Islamic Public Banks were categorized as inefficient or it could be said that they had yet to optimize their resources.

After presenting the graph of the level of efficiency of the Islamic Public Bank along the II Quarter period of 2010 until the IV Quarter period of 2012, we would see the achievement of the average of the level of efficiency of every Islamic Public Bank along the period of time of this research. Based on Picture 2, it could be seen that the Islamic Public Bank which had been established earlier such as Bank Muamalat Indonesia and Bank Syariah Mandiri had better average level of efficiency than other newly established Islamic Public Banks such as Bank Victoria, Bank BNI Syariah, and Bank BCA Syariah. However, just like what have been stated before that there was an Islamic Public Bank which was newly established such as Bank Panin

Syariah which became the bank with efficiency score of 100 within 5 times and this condition could not be reached by other banks during the research observation of time. This also occurred in the achievement of Bank BRI Syariah and Bank Bukopin Syariah which had good level of efficiency, even though they were new in the industry of Islamic banking in Indonesia.



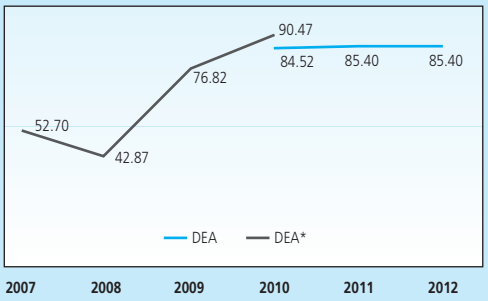
Picture 3. The Efficiency of Islamic Public Bank (the average score within the II Quarter period of 2010 –IV/ 2012)

Based on that result above, then, comprehensively, the development of the level of efficiency of Islamic Public Bank had the fluctuation trend because of the efficiency level of the bank in individual was also fluctuate as what had been presented in Picture 1.During the period of study, the highest score of efficiency of the Islamic Public Bank was reached in the IV Quarter period of 2011 with the score of 91.89 and the lowest score of efficiency occurred in II Quarter of 2011 with score of 78,46. Through this result, it could be concluded that the Islamic Public Bank in Indonesia were still categorized as inefficiency or they had yet to optimize their resources. That condition was appropriate with the research conducted by Endri (2008).

Picture 4. The Efficiency of all Islamic Public Bank (the average score within the II Quarter period of 2010 –IV/ 2012)

In this research, it will present the comparison with other similar research. By the different time of research, the two result of measurement using DEA method of the Islamic Public Bank will be the roadmap that shows the pattern of the result of efficiency of those banks from time to time. In picture 4, it shows the result of measurement in this research and the result of measurement conducted by shafitranata (2011: 47-48). The different between these two researches were in the time and the number of Islamic Public Bank which were observed. This research used 10 (ten) Islamic Public Bank as the object of the research within period of 2010 until 2012 and the research conducted by shafitranata used 3 (three) Islamic Public Bank with time of research was from 2007 to 2010. In Picture 4, it will show the annual data.

In these two researches, there was the presentation of the result of measurement of efficiency level within period of 2007 – 2012. Along that period of time, it could be seen that there was positive trend of efficiency of the Islamic Public Bank in Indonesia. Even though, the graph experienced a decline in 2008, after that, the graph of efficiency showed an increase. Moreover, there was a difference in the result of measurement in 2010. Still, that condition could be understood because during that period of time, there was the different in the number of the banks which were observed; in which this research used 10 (ten) Islamic Public Bank as the object of the research and shafitranata used 3 (three) Islamic Public Bank. Therefore, with the ranger of result of the research which was only 5,95in 2010, it could be concluded that comprehensively, there was a correlation of the result of the efficiency measurement from those two research.



Picture 5. The Roadmapof theEfficiency of Islamic Public Bank from 2007 to 2012

4.2. The Result Analysis of Factors which Influence the Level of Efficiency of Islamic Public in the IV Quarter period of 2010 – in the IV Quarter period of 2012 (Second Stage)

On the next stage of this research, there will be an analysis on factors which influenced the efficiency level of Islamic Public Bank using Tobit model so that the whole procedure in this research is called Two-Stage Data Envelopment Analysis. In the analysis of Tobit model in this research, it used a package of software Eviews 7.2. The result of the analysis of Tobit model was used to conclude the factors which influence the efficiency level of the Islamic Public Bank. Below is the result analysis using Tobit model.

Table 4
The Result Analysis with Tobit Model

Variable	Coefficient	Std. Error	Z-Statistic	Prob.
C	146.3681	13.27391	11.02676	0.0000
ASET	0.000925	0.000265	3.493988	0.0005
BRANCH	-0.159920	0.034867	-4.586623	0.0000
ROA	37.93153	8.518626	4.452775	0.0000
ROE	6.545031	2.030942	3.222657	0.0013
NPF	-6.381059	2.654531	-2.403837	0.0162
CAR	-5.947760	2.075941	-2.865091	0.0042

Based on the result analysis on Table 4, it could be seen that there were some variables which gave positive and negative impacts. However, not all variables gave significant influence or it could be said that some variables did not give real influence. Thus, by using this Tobit model,

we could see that assets variable had a positive influence and significant toward the efficiency of Islamic Public Bank. That condition was because by having lots of assets, a company could run more freely its operational activities and could achieve its optimum resources. Besides, a bank with many assets automatically would be easier to adopt new technology which could increase the profit and decrease the management cost. This result was suitable with the research conducted byIsmail, Rahim, and Majid (2009: 5).

Whereas the variable of branch of the bank had negative and significant influence or in other words the more branches of the bank the more inefficient the bank to control its resources. That condition was because the Islamic Public Bank in Indonesia had yet to achieve economies of scale and the addition of the number of branch of the bank would only increase the cost expended by that bank.This result of the research was the same as the research conducted by Jackson and Fethi (2000: 18).

On the variables ROA and ROE which represented the profitability level of a bank there were positive and significant influences. This was because a Bank that could create bigger profit could be indicated as an efficient bank. This result was appropriate with the research conducted by Gupta, Doshit, and Chinubhai (2008: 10).

On variabel NPF which showed the ratio of non-performing loan which occurred in a bank had negative and significant influence. This was because the higher the ratio of the ratio of non-performing loan in a bank automatically would disturb the operational activity of a bank, especially in on the side of liquidity of that bank. Therefore, that caused a bank to be inefficient on managing its all resources. This result of the research was appropriate with the research conducted by Ismail, Rahim, and Majid (2009: 5).

On CAR variable which presented the capability of capital of a bank in covering the risk, showed that there was negative influence between that variable and the level of efficiency of Islamic Public Bank. In this variable, there was the role of government on determining the level quantity of CAR that must be fulfilled by a bank, which was for about 8%. The result of this research showed that the lower level of CAR of an Islamic Public Bank, the higher efficiency of an Islamic Public or in other words, there were negative and significant influence between the level of CAR and the level of efficiency of Islamic public Bank. That condition probably reflected the risk-return trade-off. This occurred because if the tendency of the society prefer to choose a bank with a lower risk to a bank with higher risk but more productive.This result of research was in a line with the research conducted by Jackson and Fethi (2000 : 18).

4.3. The Result Analysis of the Independent Sample T Test between DEA Method and CAELS Method

On this stage, there would be analysis of comparison between the method of efficiency DEA and the method of measurement of work performance CAELS along the period of time

of the research by using the method of the test of independent sample t test of Wilcoxon Signed Rank Test. The purpose of this analysis was as the evaluation tool toward the method of measurement of work performance CAELS which was released by Bank of Indonesia and as the matter of concerns to Bank of Indonesia to integrate the calculation of the method of efficiency DEA in the model of measurement of work performance CAELS which would be shown in the next stage.

On Table 5, it could be seen that the result of analysis of this test showed that there was significant different between the result of these two methods.This could be seen on Asymp. Sig. (2-tailed) which showed the score below 0.05.

Table 5 The result of the analysis of independent sample T test between DEA Method and CAELS method

	DEA-CAELS
Z	-4.174
Asym. Sig. (2-tailed)	.000

From that result, there were 2 (two) things that could be explained from the result of that test above. *First*, on method of CAELS, weight given on the measurement of efficiency using the ratio of BOPO was only for about 5%. This was, of course, was imbalance with the meaning of efficiency in a company or in this case was Islamic Public Bank. This was because efficiency was one of the important indicators which presented the work performance of a bank. A bank is categorized as efficient if it can optimize its all resources, can apply strategy to maximum its profit or to minimum its cost expended. Furthermore, a bank is categorized as efficient because it can give more benefit to its customer either the customer as depositor or as funder. This is because the bank can optimum its customer funds and maximum its role as the intermediation organization. Thus the justification of weight given is imbalance with other components in the model of measurement of CAELS.

Second, the attention was pointed out to the ratio of BOPO which became the indicator of efficiency on the model of measurement of the work performance of CAELS method. The BOPO ratio that only compared Operational Expense and Operational Revenue could not be the indicator to present the efficiency of a bank comprehensively. This was because by seeing the business of banking as the production process which included input and output, then, by this meaning, it meant that there would be combinations from many inputs that would result output optimally and this condition could not be found on ratio BOPO which only compared operational expense and operational revenue. Meanwhile, on DEA method which was called

as frontier approach, it would result an optimum point in which by the minimum input could produce maximum output by using the combination of input and output. With that strength, then the measurement of the efficiency level using DEA was assumed as the method which drew the banking business in ideal way. Or in other words, it could be said that the calculation of efficiency level using ratio BOPO was assumed as Partial Efficiency, meanwhile the calculation of the level of efficiency using the method of Data Envelopment Analysis was ensured as Comprehensive Efficiency.

According to the things above, it could said that the measurement by CAELS method had yet to draw the work performance of a bank in a comprehensive way. Therefore, on the last stage, there would be the illustration of the model of the measurement of the work performance which integrated the result of measurement by using DEA method in CAELS method.

4.4. The Mapping Result of the Modification of CAELS + DEA Method

After conducting the analysis on the comparison between the method of efficiency measurement using DEA by the method of test of different of wilcoxon signed rank test on the previous stage, in this stage, there would be illustration of the result of the modification of CAELS method by integrating the result of DEA method by a mapping graph showing the result of measurement before and after the integration of DEA method into the method of measurement of work performance CAELS.

Before conducting the mapping, there would be drawn a method of the measurement of work performance CAELS with 3 (three) modifications on the weighted and the process of integrating DEA method into CAELS method in the form of table.

Table 6
The Method of CAELS before Modification

Component	Element	Percentage
CAPITAL	CAR (%)	25%
ASSET QUALITY	KAP (%)	50%
EARNING	BOPO (%)	5%
	ROA (%)	5%
LIQUIDITY	STM (%)	10%
SENSITIVITY	MR (%)	5%
TOTAL		**100%**

Source: Attachment SE No.9/24/DPbs/2007

Table 7
The Method of CAELS Modification 1

Component	Element	Percentage
CAPITAL	CAR (%)	20%
ASSET QUALITY	KAP (%)	30%
EARNING	DEA (%)	30%
	ROA (%)	5%
LIQUIDITY	STM (%)	10%
SENSITIVITY	MR (%)	5%
TOTAL		**100%**

Table 8
The Method of CAELS Modification 2

Component	Element	Percentage
CAPITAL	CAR (%)	20%
ASSET QUALITY	KAP (%)	30%
EARNING	BOPO (%)	30%
	ROA (%)	5%
LIQUIDITY	STM (%)	10%
SENSITIVITY	MR (%)	5%
	TOTAL	**100%**

Table 9
Method of CAELS Modification 3

Component	Element	Percentage
CAPITAL	CAR (%)	20%
ASSET QUALITY	KAP (%)	30%
EARNING	BOPO (%)	30%
	ROA (%)	5%
LIQUIDITY	STM (%)	10%
SENSITIVITY	MR (%)	5%
	TOTAL	**100%**

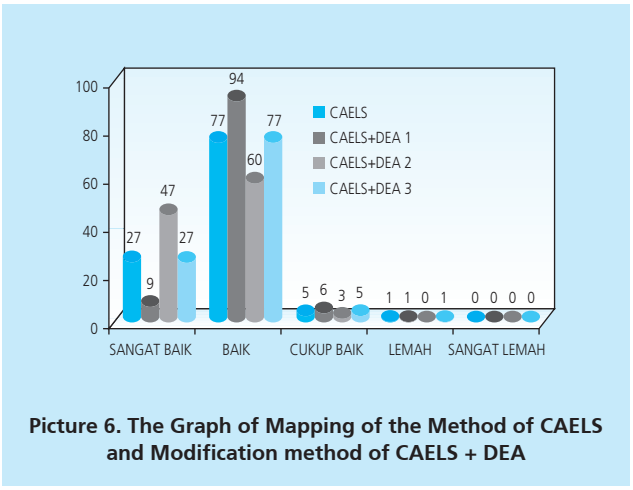
From the Table 6-9 it could be seen that there was change of weighted of some components in which the weight on the component of Capital became 20%, Asset Quality 30%, Earning 35%, Liquidity 10%, and Sensitivity to Market Risk 5%. The change of weight was illustrated

on CAELS modification 1 and CAELS modification 3. Meanwhile on CAELS modification 2, the weight is equalized to the formula of the method of CAELS before modification.

The change on the weight conducted based on the characteristic of the method CAELS which was flexible and did not based on the basic rule applied in all countries. Based on the discussion in the library study in this research, the amount of weight on each component was conducted based on justification of the regulator from every country. Therefore, the modification of the weight conducted in this research could be the thing that legalized so that the modification done in this research could be one of the considerations for Bank of Indonesia as the regulator in measuring the work performance of a bank.

Besides the change on the weight, the change was also conducted by changing the ratio of BOPO by the method of efficiency DEA. This was conducted on CAELS modification 1 and CAELS modification 3. Meanwhile on CAELS modification 2 still used ratio BOPO but the weight was changed. Thus, comprehensively, there would be illustration about 3 (three) modification from the method CAELS and method CAELS before modification.

After drawing the illustration of the modification of the method CAELS, then, after that, there would be mapping in the form of graph to see the result from the method CAELS before and after modification. As known in the method of CAELS, the work performance of a bank was divided into 5 (five) categories, which were: "1" (Very Good), "2" (Good), "3" (Quite Good), "4" (Weak), and "5" (Very Weak).



Picture 6. The Graph of Mapping of the Method of CAELS and Modification method of CAELS + DEA

On Picture 6, there was mapping graph showing the result of measurement of the health of bank by spread of each categories on method CAELS and 3 (three) methods modification CAELS + DEA. Through those 4 (four) graphs, the difference of the result measurement of the

health of the bank by the spread on every category seen on the modification of CAELS + DEA 1 and modification CAELS + DEA 2. Whereas the result of the measurement of the health of the bank with the same spread on every category could be seen through graph of CAELS before modification and modification CAELS + DEA 3.

By referring to the result of those 4 (four) graphs, it was found that by the change of the portion of the weight of some components as well as by the change of the ratio of BOPO by the method of efficiency DEA (modification CAELS + DEA 1) would change some result of measurement on the level of health of the bank if compared to the result of the measurement of the health of the bank before the modification. Meanwhile, if we did not change the weight on some components on method CAELS (modification CAELS + DEA 3), thus the result gained was the same like the result before the modification on CAELS method, even though we have changed the ratio of BOPO with the method efficiency of DEA method. Different thing happened if we made the change on weight without changing the ratio of BOPO with the method of efficiency DEA (modification CAELS + DEA 2), and then, it would be seen the result of the measurement of the health of the bank with the number of the bank which were on category "1" (very good) increased fast if compared to 3 (three) other graphs.

Therefore, by having that mapping. We could say that the ratio of BOPO could not map the efficiency of a bank as a whole. As what had been explained on the previous analysis, the ratio of BOPO was only a simplification of the measurement of efficiency of bank. Or in other words, the calculation using ratio of BOPO was assumed to be Partial Efficiency. Moreover, the change on the weight would change the result of the measurement of the health of bank. With a main focus on earning component with efficiency measurement inside, thus, there should be adaptation by changing the weight on some components in order to increase the portion of the weight on the efficiency measurement. This was because of the imbalanced of the portion of the weight of the earning component, especially on the measurement of efficiency which was only given weight for about 5%. With the urgency of the function of a work performance of a bank, such as the indicator of the achievement of an optimum work performance by optimizing its all resources as well the ability to maintain its survival, then, the increased of the weight was needed to be consideration.Then, the last thing as the focus on the modification of CAELS was to change the ratio of BOPO with the method of efficiency DEA. Because based on the mapping applied, it could be proven that the method efficiency of DEA could give the illustration of the efficiency of a bank as a whole so that it could filter the result measurement of the health of the bank through the change of the number of the bank on some categories. Therefore, policy implication offered and expected to be consideration for Bank of Indonesia as the regulator was pointed out to the modification of the method of CAELS + DEA 1.

V. CONCLUSION

This research gave some finding results, First, in general the efficiency level of 10 (ten) Islamic Public Bank had trend to fluctuate during the period of time of the research. Individually, Bank Muamalat Indonesia had the highest of the average efficiency level score of 93,82 and Bank Victoria Syariah had the lowest of the average efficiency score of 72.12.

Second, by the model application of Tobit, it was concluded that variables of branch bank, Non-Performing Financing (NPF), and Capital Adequacy Ratio (CAR) had negative influence and significant toward the efficiency level of the bank. Meanwhile on the variables Assets and Return On Asset (ROA) Return On Equity (ROE) had the positive influence and significant.

Third, the comparison between the measurement of efficiency using DEA method and the measurement of performance of work using CAELS method (through the independent sample t test of Wilcoxon Signed Rank Tests) showed differences between those two. Therefore, as the alternative which was presented in this research was by integrating the method of efficiency of DEA as the substitution of ratio BOPO as the indicator in measuring the efficiency. This could be proven that the result of mapping in which the method of CAELS for the measurement of health which had been integrated with DEA resulted a change on the result of the measurement of the health of the bank by decreasing the number of banks in category "1" (Very Good). This was because some banks on that category had low score of level of efficiency, and, of course, this thing could happen by improving the weight portion on the earning component in which in this earning component, there was the result of the measurement of efficiency of DEA method.

The findings above had some policy consequences that point out a detail attention towards factors that influence to the efficiency level. Besides, the method of DEA with the adjustment that had been illustrated in this research could be the alternative method for measuring the health of the bank.

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