

**EFISIENSI PERBANKAN SYARIAH DI INDONESIA;  
TWO-STAGE DATA ENVELOPMENT ANALYSIS APPROACH**

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***Abstract***

The purpose of this study is to evaluate the performance of Islamic banks in Indonesia during a period of 2007-2011. To measure the performance, Two-stage Data Envelopment Analysis (DEA) is used. The first step of this method is measuring efficiency performance of Islamic banks using Data Envelopment Analysis (DEA) method and then, the second step estimating factors affecting the efficiency performance using Tobit regression model. Based on the measurement of DEA method, the highest efficiency reached in 2007, and then there is improvement in efficiency as well based on technical, on scale and on overall efficiency from 2010 to 2011 i.e., 96.86% in technical efficiency in 2007, 96.69% in 2008, 94.43% in 2009, 93.32% in 2010 and 93.72% at 2011. Furthermore, the second stage of the test uses Tobit regression method. The result shows that Size has negative impact on performance whilst cost has positive impact. In addition, the coefficient of CAR and ROA are positive significant, whilst NIM and NPF show positive signs but not significant.

Keywords: islamic banks, technical efficiency, data envelopment analysis, tobit regression

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## Background

The establishment of Islamic Development Bank (IDB) in 1975 triggered the establishment of Islamic banks in several countries for instant, Dubai Islamic Bank (Dubai) in 1975, Faisal Islamic Bank (Egypt & Sudan) in 1977 and Kuwait Finance House (Kuwait) in 1977. Up to 2010 the assets of global Islamic banks all over the world reach US\$825 (Erst and Young, 2011).

In Indonesia, Islamic financial institutions start their existing in the brink of 1980 with the establishment of *baitut tamwil* "Salman" in Bandung and "Ridho Gusti" Cooperation in Jakarta. However, the establishment of Islamic banking started when Bank Muamalat Indonesia was established in 1992 (Ascarya, 2006).

The progress of Islamic banking in Indonesia tends to show good indication. Up to December, 2011 based on Islamic banking statistics, the total of pure Islamic banks is 11 banks, 23 Islamic Business Units and 154 Bank Pembiayaan Rakyat/BPR (Islamic small financing banks for small business) with 2,086 branches all over Indonesia (Indonesia Central Bank, 2011).

Based on *Global Index for Islamic Finance Report 2011*, Islamic finance industry in Indonesia is amongst the big four in the world after Iran, Malaysia, dan Saudi Arabia. The total capitalization of Islamic finance industry in Indonesia reach between US\$ 24 billion US\$ 30 miliar in 2011 and occupy the 10 position in the world (IGIFR, 2011).

Aside of those progress, however, the target of Indonesia Central Bank of 5% market share has not been reached. The growth rate in total of Islamic bank is not better than the growth of the market share itself.

The underperformance of *market share* target of Islamic bank in 2011 could be used as an evaluation benchmark in evaluating the efficiency of Islamic bank performance. Syaifuddin and Takdir (2009) finds that there is a causal relationship between efficiency and market share. Reaching the market share target is an indicator of firm efficiency. This indicator is consistent with the nonstructural theoretical approach by Demzet (1973) and Pelzman (1977) about factor that distinguish efficiency value of the firm.

The symptom of inefficiency in banking industry could also been detected through a ratio of operational expenses divided by operational revenues as in Muhammad (2007) about bank health evaluation/assessment from management aspect. It states that larger ratio indicates that the bank has deteriorated in efficiency. Based on the Islamic bank statistics, for two years consecutively 2010-2011 the ratio increase substantially.

Various hindrances facing the Islamic bank industry such as competition, government regulation suggesting conversion from islamic business unit into pure islamic bank that consumes substantial investment fund. As a consequent, islamic banks should face frontal competition from conventional banks. To be able to compete with conventional banks, islamic banks should pay a lot attention on efficiency aspects of the bank. To win the war, islamic banks should be aware of their strength and weakness through efficiency measurements and how far it impacts on overall performance of islamic banks (internal & external measurement).

Researches on islamic bank efficiency has progressed very well either using parametric or nonparametric approaches (Astiya et al, 2004, Sufian, 2006, Novarini 2009, and Ascarya, 2009). However, these studies stress on *one-stage efficiency*, whereas studies that go deeply by measuring or by analyzing various factors that influence efficiency performance (*two-stage efficiency*) are relatively scarces.

Measuring efficiency using *data envelopment analysis* (DEA) is a nonparametric approach using linier programming to measure the output and input ratio comparison for all units producing efficiency scores for all units studied. Harvrylichyk (2006), Das isie Ghost

(2006), Hahn (2007), and Jafry et al. (2007) in Endri (2009) employed *two-stage data envelopment analysis* (DEA) in their studies with the following stages:

1. Using DEA approach to measure bank efficiency using sample, and
2. The efficiency score from stage 1 is then regressed with bank and country-specific factors using Tobit regression.

The advantage of *Two-stage DE*, beside giving the result of Islamic bank efficiency is also providing the description about the factors that influence those efficiencies. This study is important for Islamic banks as a guidance in their policies in deciding to expand and knowing both their internal and external environment. Consequently, the policies taken will stimulate the Islamic banks in competition.

Limited studies have been done in investigating various factors related to Islamic bank efficiency specifically using sensor regression technique or Tobit regression model. Most studies use multivariate regression analysis to estimate the determinants of efficiency. Several factors commonly used in those studies amongst others are: bank's size, bank's type, net interest margin, return on asset, nonperforming loan/financing, capital adequacy ratio, and operational cost.

Empirically, there is an ambiguous relationship between bank size and bank efficiency but some studies find a positive relationship between them (Ataullah, Cockerill, and Lee, 2004; Berger, Hancock, and Humphrey, 1993; Chen et al., 2005; Miller and Noulas, 1996). On the other hand, some studies find a negative relationship (DeYoung and Nolle, 1996; Girardone, Molyneux, and Gardener, 2004; Isik and Hassan, 2002). Several studies do not find any relationship between bank size and bank efficiency (Berger and Mester, 1997; Pi and Timme, 1993).

Ownership type has been studied in its relationship with bank efficiency. State-owned bank, private bank and foreign bank have been regressed with their efficiencies, and it is found that foreign banks are highly associated with bank efficiency more than private banks and state-owned banks. (Berger, Demirgüç-Kunt, and Levine, 2004; Bonin et al., (2005a,b); Delfino, 2003; Berger, Clarke, Cull, Klapper, and Udell, 2005). In India, Bhattacharya, Lovell, and Sahay, 1997 find that state-owned banks are more efficient than foreign banks and domestic banks. In addition, in China Wei and Wang, 2000 and Zhao, Zhong, and Jiang, 2001, find that the efficiency of China state-owned banks are lower.

Net interest margin (NIM) can be considered as an intermediation financing cost. It focuses on the difference between saving costs and loan costs. Larger spread or high NIM is an indication that banks operate inefficiently. Demirguc-Kunt and Huizinga (1999) tested the determinants of interest rate spread using bank-level data for 80 countries for 1988-1995 and identified that bank-specific, institution, regulatory and macroeconomic variables influence bank spread and profit.

In emerging countries, domestic banks reap lower *margin* and *profit* compared to foreign banks whereas in developed countries in the opposite. Using a sample of 1,400 banks in 72 countries for a period of 1995-99, Demirguc-Kunt *et al.* (2003) study the impact of *bank margins* on market concentration, *regulatory* and macroeconomic variables controlled by *bank-specific variables*. The results show that high interest margin is associated with the escalation of regulation in order to restrict bank operation and install a barrier to entry. Though competition is not directly assessed, this study covering all banks that operate in a less-competitive market, banks can reap a high margin.

On other empirical studies that include CAR as determinants find that there is a correlation between bank efficiency and capitalization with mixed results. Some studies show that large-capitalization banks are more efficient (Carvallo and Kasman, 2005; Casu and Girardone, 2004; Chang and Chiu, 2006) whereas other studies find a negative relationship (Altunbas et al., 2004; Freixas and Rochet, 1997).

Study that investigates the relationship between return on asset (ROA) on efficiency is done by Blaug (2001) and find that efficiency is moved by market structure. Blaug call it “competition as a process of rivalry”. The highly-efficiency firms will produce high profit.

More concentrated market facing several firms provide them with larger market share with dynamic market condition. This condition provide larger potential profits for them. Consequently, there is positive relationship between efficiency and profitability. In the opposite, there is another opinion saying concentrated market structure dominated by a few companies with very large market share tend to monopolize. Blaug (2001) call it “*competition as an end-state*”. In general empirical findings show that more profitable banks with higher ROA/ROE tend to be more efficient (Ataullah et al., 2004; Casu and Girardone, 2004; and Chang and Chiu, 2006).

Moreover, some empirical studies find that there is positive relationship between *Non Performing Financing* (NPF) and bank inefficiency. Higher-risk banks (higher NPL ratio) tend to be inefficient. Bank with higher efficiency evaluate their loans properly. Banks with larger cost in guaranteeing and supervising their loan portfolios relatively operate inefficient in the short run but in the long run they become efficient due to lower nonperforming loan.

Another variable considered having influences on bank efficiency is cost. Empirically, it proves that there is positive relationship between operational efficiency (*cost-to-income ratio*) and large margin. Therefore, banks with large costs tend to operate with high margin. If it is viewed from another angle (cost to income ratio or total cost to total asset), thus banks with high ratio tend to be inefficient (Ataullah et al., 2004; Casu and Girardone, 2004; Chang and Chiu, 2006).

## **Problem Statement**

Failing to reach target *market share* and the increasing ratio of operational expense to operational income of islamic bank in Indonesia is the base framework to measure the level of their efficiency and to investigate factors responsible for the condition. There are two problems in this studies as follows:

1. How efficient the Islamic banks in Indonesia assessed using Data Envelopment Analysis (DEA) ?
2. How Size, Bank Type, ROA, CAR, NIM, NPF and Cost have impact on Islamic bank efficiency?

## **Purpose of Study**

The purpose of the study has two folds. One is to measure the level of Islamic bank efficiency in Indonesia. Secondly, this study is to investigate factors that influence that efficiency. Size, Bank type, Return on Asset, CAR, NIM, NPF and COST are several factors identified having strong influence on the efficiency.

## **Literature Review**

Efficiency is very important for organization in business. Efficiency often time is associated with doing the thing right. Researches on efficiency in Islamic bank using DEA relatively scarce specifically two-stage DEA. Yudhistira (2003) studied 18 Islamic banks in the world for a period of 1997-2000 using DEA approach and input-output specification based on intermediary approach. The result show that overall there is slight inefficiency for the 18 islamic banks in the common level of 10% compared to conventional banks. This occurred

due to 1998-1999 crisis facing those banks that affect the banks' performance during that period. The study suggests the small Islamic banks should merge or acquire.

Hasan (2005) studied the efficiency of Islamic banks all over the world using cost, profit, revenue and X-efficiency. Firstly, the study employs stochastic cost frontier approach to calculate cost efficiency of Islamic banks during 1996-2003. Secondly, calculate profit efficiency paying into account the cost and revenue. Thirdly, determine revenue efficiency to investigate if Islamic banks innovate banking products to increase revenue. Fourthly, uses nonparametric Data Envelopment Analysis (DEA) to calculate overall efficiency (technical, pure technical, allocative, and scale efficiency). The result shows Islamic bank industry relatively less efficient on average compared to conventional banks.

In Malaysia, the efficiency of Islamic bank in this country increase significantly. Sufian (2006) measures and analyzes both local and foreign Islamic bank in this country for 2001 to 2004 and find that overall the Malaysian Islamic bank efficiency increase significantly. DEA approach is employed in this study and total saving, labor cost, and total assets are included in the model while operational financing and revenue are the output. Additional finding of this study is that on average foreign Islamic banks are less efficient from domestic Islamic banks during the research observation.

Ascarya and Yumanita (2007) study the efficiency of Islamic banks during a period of 2002 to 2004 using DEA method. The result shows that technical efficiency of Islamic bank during that period 100% (intermediary approach) and 85% (production approach) in 2004. Furthermore, scale efficiency of intermediary approach is 87% and production approach is 97%. In general, technical efficiency of Islamic bank using production approach decreases but scale efficiency increases because for the that time, Islamic banks expand substantially by opening new branches.

Beside single-stage DEA which is commonly used, Two-Stage Data Envelopment Analysis DEA is introduced with various advantages. Pasiouras (2006, 2007) stated that the advantages of two-stage DEA are: (i) easy to implement, (ii) covering a number of environment variables simultaneously without increasing unit of efficiency, (iii) no need to know the orientation of every environment variable, (iv) possible to use several (all) environment variables together to be part of individual variable.

A number of studies has been conducted using two-stage DEA for example, Pasiouras, et. al. (2009) and Endri (2011). Pasiouras, et. al (2011) find that cooperation banks in Greece are able to increase 17% on average. With Topit regression, it is found that all variables in the model indicate positive results except gross domestic products per capita and unemployment which have negative impact on banks efficiency.

The finding of this study is consistent with that of Endri (2011). Endri (2011) used two-stage DEA to evaluate technical efficiency of banks in Indonesia for the year of 2008-2009. The first-stage test found that the performance of all conventional banks in Indonesia has not been optimal with the score of technical efficiency is under 100%. With their capability, the foreign-owned banks performance are relatively better than domestic-owned banks. The second-stage test showed that total assets, type of bank, net interest margin, capital adequacy ratio, credit quality proxied by Non Performing Loans have positive effect on efficiency of all banks. On the contrary, operational cost has negative effect on efficiency of all banks.

Following (2006), Ascarya and Yumanita (2007) and Endri (2011), Two-stage DEA is employed in this study. However, there is a slight difference between this study and that of Sufian (2006) and Ascarya and Yumanita (2007) in term of the stage used and this study investigate factors that affect efficiency. In general this study measure efficiency with intermediary as in the studies by Yudhistira (2003), Sufian (2006), Ascarya and Yumanita

(2007) and Endri (2011), but is slight different approach from those of Hasan (2009) and Pasiourus, et. al. (2009) whot utilized technical, allocative, and cost approach.

Following Kurnia (2004) the intermediation approach is employed to consider the vital role of banks as financial intermediation collect funds from surplus units and channelling it to deficit units. Another consideration is the characteristics and the nature of banks which transform quality assets (as qualitative asset transformer) from saving they collect. However, yet there is no agreement which approach is most suitable and in determining inputs and outputs.

Iqbal and Molyneux (1998) in S. Mohamad, T. Hassan and M. Khaled I. B. (2003) add that intermediation approach so far is the best approach to evaluate financial institution for the whole financial instution function as a whole financial institution. Astiyah S. and Husman A. (2006), add also that intermediation institution is very important. If this intermediation does not work, it the reflection of central bank about the relationship between the policy apparatus and economic performance does not match with expectation. Ascarya, Diana Y. and Guruh S. R. (2008) stated that to describe the real function of Islamic banks, intermediation approach is considered the most appropriate.

Variables used in efficiency measurement with DEA method used in this study follows Sufian (2006) and Ascarya and Yumanita (2007) with input variable comprise of : total saving, labor cost, and assets while output variabel comprise of operational financing and revenues.

The second-stage analysis using Tobit regression follows Endri (2011) using Total Assets (TA), Bank Type (TYPE), Profitabilitas/Return on Assets (ROA), Capital Adequacy Ratio (CAR), Net Interest Margin (NIM), Net Performing Financing (NPF) and Operational Costs (COST). Furthermore, this study is different from those two previous studies in term of stage on variables and selection of stage two variables which are adjusted according to Islamic banks concepts.

## **Research Methodology**

### **Input and Output Variable**

Output variable used in this study is Total Financing ( $Y_1$ ) and Total Revenue ( $Y_2$ ), while input variables comprise of Total Saving ( $X_1$ ), Labor cost ( $X_2$ ), dan Total Assets ( $X_3$ ). The definition of the variables is described in the Table 3.1.

**Tabel 1**  
**Variable Definition**

| <b>Dimension</b>          | <b>Definition</b>   | <b>Indicator</b>                                  |
|---------------------------|---|---|
| Total Financing           | Funds loaned by islamic banks (both pure islamic banks and islamic banks business units) using akad mua'malah in million rupiah.  | Total funds loaned                                |
| Total Operasional Revenue | Revenues received from operation (both pure islamic banks and islamic banks business units). Revenues from operation include:<br>1) Revenues from funds loaned to customers i.e. selling and buying (mudharabah, salam, and istishna), leasing (ijarah), profit sharing (mudharabah and musyarakah), etc.<br>2) Other operational revenue: administration service revenues, ATM transaction services, specific financing, commission services, profit (loss) from exchange rate transactions, fee from online-payment point system. | Total revenues from operation and other revenues. |
| Total Saving              | Funds from both individuals and institutions that Islamic banks (both pure islamic banks and business unit of islamic banks) collect from their customers.  | Funds collected from third party                  |
| Labor Cost                | Salary, employee education expenses, allowances both for Pure Islamic banks and Business Unit of Islamic bank (in million rupiah)   | Total cost for employees.                         |
| Total Assets              | Total assets owned by Islamic banks   | Total Assets                                      |

*Source : data processed*

Selain variabel stage-1 di atas, penelitian ini juga mengukur faktor yang berpengaruh terhadap efisiensi perbankan syariah di Indonesia. Pendekatan stage -1 menggunakan DEA, sedangkan stage-2 dengan menggunakan regresi tobit. Pengukuran hubungan dengan regresi tobit dengan ketentuan sebagai berikut :

1. Dependent variable is a variable that is influenced, in this case, overall technical efficiency i.e. 0 or 1;
2. Independent variable is a variable that influence the level of Islamic banks efficiency in Indonesia. The variables consist of Size, Bank Type, ROA, CAR, NIM, NPF and COST.

### **Data Analysis**

To analyze the efficiency of Islamic banks in Indonesia is done through two steps. Firstly, DEA is used to measure the technical efficiency of Islamic banks for a period of. Then, the score of the efficiency is regressed with several independent variables with highly possibly influence the efficiency using Tobit Regression model.

First Stage: Data Envelopment Analysis (DEA) Method. DEA is a method of frontier non parametric that uses linier programming model to compute the comparation output and input ratio for all units compared in a population. The purpose of DEA method is to measure the level of efficiency of decision-making unit (DMU) i.e. bank relatively toward similar banks when all units are under their efficient frontier “curve”. Thus, this method is used to evaluate relative efficiency amongst objects (performcance benchmarking).

DEA method compute technical efficiency for the whole units. Efficiency score for every unit is relative depends on the efficiency of other units in the sample. Every unit in the sample is considered having efficiency nonnegative and the value is between 0 and 1 with the rule that one is perfect efficiency. Then, the units with the score of one is used in making envelop for efficiency frontier while other units in the envelop showing the level of inefficiency.

Second Stage: Tobit Regression Model. Tobit method assumes that independent variables has unlimited value (non-censured); only dependent variable that is censured; all variables (both independent or dependent) are measured properly; no autocorrelation; no heteroscedascity; no perfectly multicollinierity; and then the matematical model used will become appropriate. In regression analysis method for social and economic research, most of data structure where the response variables having the value of zero for some of observation while some other observation having certain value with high variation. This kind of data structure is called censored data.

Tobit regression model is used to analyze factors that influence Islamic banks efficiency in Indonesia. Potential factors that are predicted to have influence on technical efficiency of Islamic banks in Indonesia are Size, Bank Type, ROA, CAR, NIM, NPF and Cost.

The reason using Tobit regression method is because data used in this study is censured data that is the value of the variable is nonindependent i.e. EFT, limited with the range of only between 0 to 100. If OLS method is used, the regression results will be bias and inconsistent. Tobitregression model is as follows:

$$EFT_i = \beta_1 + \beta_2 ASSET_i + \beta_3 TYPE_i + \beta_4 ROA_i + \beta_5 COST_i + \beta_6 CAR_i + \beta_7 NIM_i + \beta_8 NPF_i + \varepsilon_i$$

Explanation:

EFT = Overall Score Data Envelopment Analysis (DEA)

ASSET= Ln Total Assets

TYPE = Bank type (1 if it is Pure Islamic banks from the start and 0 if it is a business unit Islamic banks).

ROA = Return On Asset

COST = Ln Total Operasional Cost

CAR = Capital Adequacy Ratio

NIM = Net Interest Margin

NPF = Non-Performing Financing

## Results and Discussion

### Results

The object of this study is Islamic banks in Indonesia from 2007 to 2011. There are two types of Islamic banks Pure Islamic banks and Business Unit Islamic banks. The total of Pure Islamic banks (functioned as Decision Making Unit/DMU, hereafter) are five banks i.e. Bank Syariah Mandiri (BSM), Bank Muamalat Indonesia (BMI), Bank Mega Syariah Indonesia, Bank BNI Syariah, and Bank BRI Syariah. Therefore, there are totally 25 observations.



## DEA Computation

**Table 2**  
**The Level of Efficiency of Pure Islamic Banks 2007-2011**

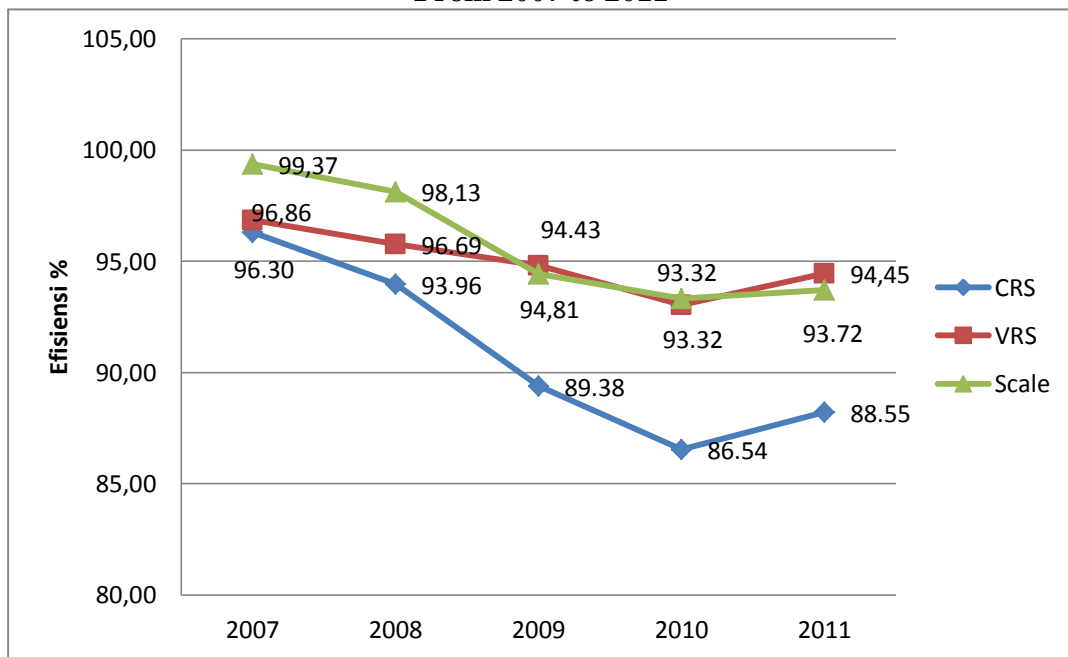
| Bank Name              | CRS (overall technical efficiency) | VRS (pure technical efficiency) | Scale (scale efficiency) | RTS |
|------------------------|------------------------------------|---------------------------------|--------------------------|-----|
| 2007-BSM               | 96.09                              | 96.1                            | 99.99                    | -1  |
| 2008-BSM               | 93.78                              | 100                             | 93.78                    | 0   |
| 2009-BSM               | 87.76                              | 97.18                           | 90.31                    | 1   |
| 2010-BSM               | 88.47                              | 97.19                           | 91.03                    | 1   |
| 2011-BSM               | 90.47                              | 100                             | 90.47                    | 0   |
| 2007-BMI               | 100                                | 100                             | 100                      | 0   |
| 2008-BMI               | 100                                | 100                             | 100                      | 0   |
| 2009-BMI               | 86.08                              | 100                             | 86.08                    | 0   |
| 2010-BMI               | 89.18                              | 100                             | 89.18                    | 0   |
| 2011-BMI               | 82.95                              | 100                             | 82.95                    | 0   |
| 2007-Bank Mega Syariah | 100                                | 100                             | 100                      | 0   |
| 2008-Bank Mega Syariah | 82.25                              | 83.46                           | 98.55                    | -1  |
| 2009-Bank Mega Syariah | 91.51                              | 93.72                           | 97.64                    | 1   |
| 2010-Bank Mega Syariah | 88.42                              | 100                             | 88.42                    | 0   |
| 2011-Bank Mega Syariah | 92.38                              | 96.58                           | 95.65                    | 1   |
| 2007-BNI syariah       | 85.45                              | 88.2                            | 96.88                    | -1  |
| 2008-BNI syariah       | 93.81                              | 95.4                            | 98.33                    | -1  |
| 2009-BNI syariah       | 81.58                              | 83.13                           | 98.14                    | -1  |
| 2010-BNI syariah       | 66.72                              | 68.06                           | 98.03                    | -1  |
| 2011-BNI syariah       | 75.3                               | 75.67                           | 99.51                    | -1  |
| 2007-BRI syariah       | 100                                | 100                             | 100                      | 0   |
| 2008-BRI syariah       | 100                                | 100                             | 100                      | 0   |
| 2009-BRI syariah       | 100                                | 100                             | 100                      | 0   |
| 2010-BRI syariah       | 99.95                              | 100                             | 99.95                    | 0   |
| 2011-BRI syariah       | 100                                | 100                             | 100                      | 0   |

Source: Computed using *Software Banxia Frontier Analyst 3*

Table 2 shows that from 25 observations, only 7 DMUs that are always scale and overall efficient. In addition, there are 14 DMUs that are efficient while the rests are having score of above 60% which means on average all DMUs has been showing moderate efficiency.

In general, the performance of Islamic banks in Indonesia in 2007 tends to be more efficient than those of the following years. This can be seen from the score of technique, scale and overall efficiency. (look at Figure 1). However, there is an increase in efficiency from 2010 to 2011 based on technique, scale and overall efficiency.

**Figure 1**  
**Efficiency Trend of Islamic Banks in Indonesia**  
**From 2007 to 2011**



Source: *data processed*

Figure 1 shows that Islamic banks in Indonesia are both moderately technical and scale and overall efficient. The technical efficiency scores are 96,86% in 2007, 96,69% in 2008, 94,43% in 2009, 93,32 % in 2010 and 93,72% in 2011. The high level of efficiency indicates that the performance of Islamic banks is relatively good in channelling funds and generating revenue with resources they own.

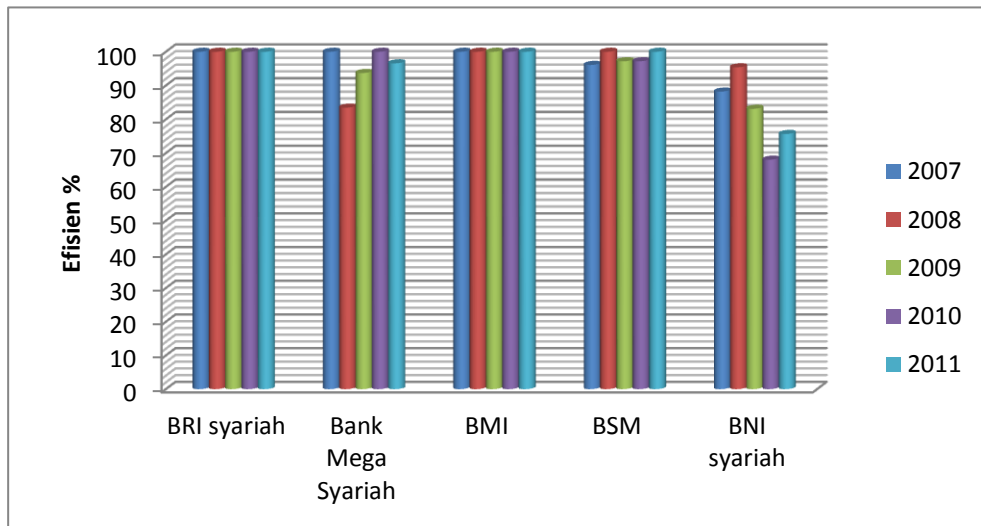
DEA approach is capable of measuring and ensuring whether a DMU has optimalize its capacity as intermediary institution i.e. how optimal the use of inputs in generating outputs. In this case, a DMU will fall into a conditions of Return To Scale (RTS) which comprises of three categories: Increasing Return to Scale (IRS), Constant Return to Scale (CRS), and Decreasing Return to Scale (DRS).

The result shows that there are four DMUs belong to IRS category with the score of 1, 7 DMUs belong to DRS with the score of -1 and 14 DMUs fall into CRS with the score of 0. In IRS it is possible to increase the outputs using the existing inputs because the addition of inputs will not effective due to the less-optimum current inputs utilization. In DRS, it is important to reduce inputs due to the imbalance between inputs and outputs (the outputs could be generated using less inputs).

### Efficiency Comparation amongst Islamic Banks

Based on the data from 2007 to 2011, Bank BRISyariah is the most technical efficient with the score of 100% for the whole period.

**Figure 2**  
**Technical Efficiency Comparison among Islamic Banks in Indonesia**  
**From 2007 to 2011**

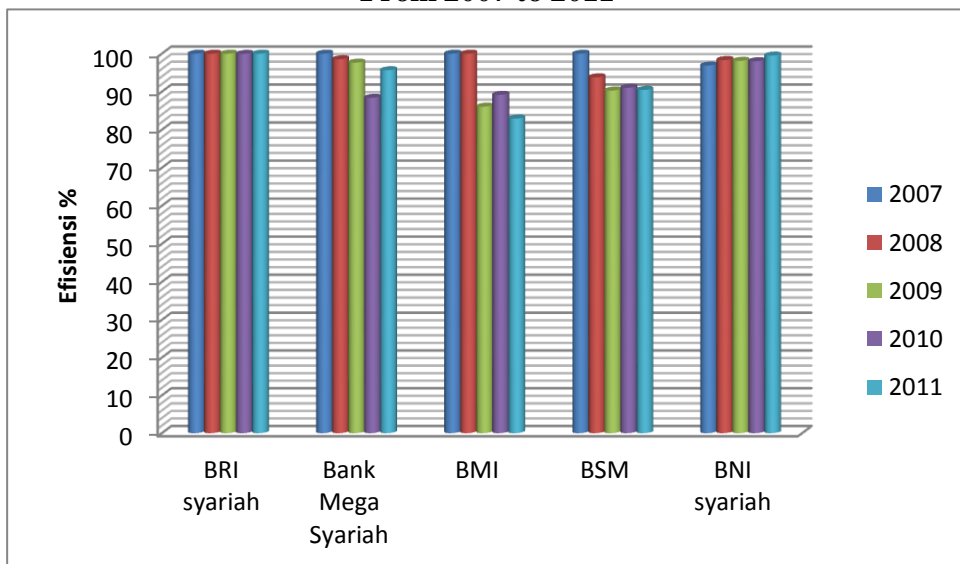


*Source: data processed*

Factors that influence inefficiency technically is the suboptimal use of input capacity. It can be inferred from the value of RTS (return to scale) of 1 or the condition of increasing (look at Table 2). On the contrary, Bank BNISyariah indicates the condition of decreasing or -1 in 2010 and 2011 where the addition of input will not increase output at the same rate or larger. Consequently, it is imperative to reduce input in order to reach a point of Constant Return to Scale (CRS).

Based on scale efficiency calculation, Bank BRISyariah is the most efficient (look at Figure 3). Scale efficiency shows that with minimal input, Bank BRISyariah is able to generate larger output.

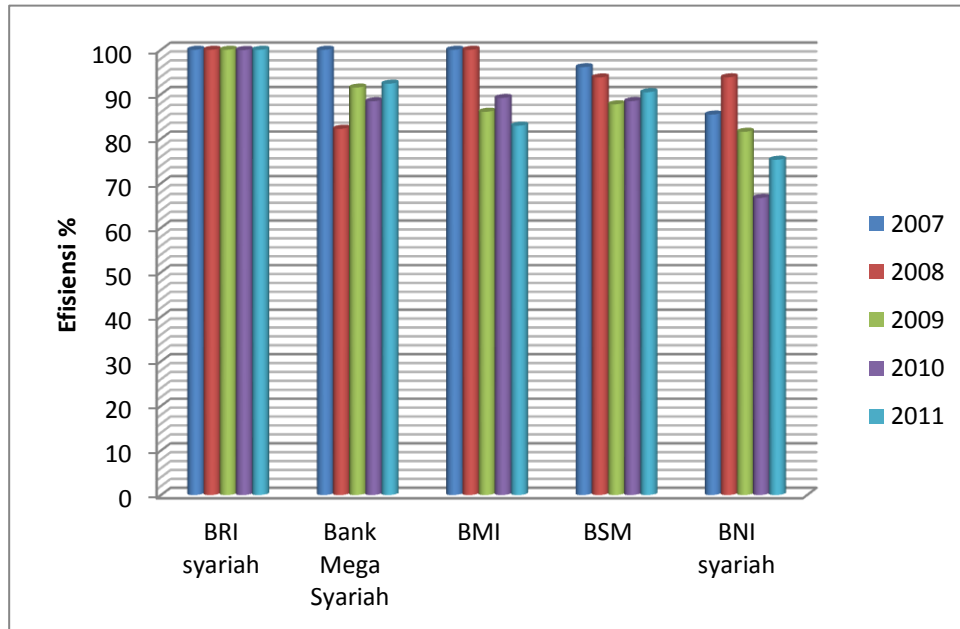
**Figure 3**  
**Scale Efficiency Comparison among Islamic Banks**  
**From 2007 to 2011**



*Source: data processed*

Similar to the technical efficiency measurement, overall efficiency indicates that Bank BRISyariah is the most efficient (look at Figure 4).

**Figure 4**  
**Overall Efficiency Comparison among Islamic Banks**  
**From 2007 to 2011**



*Source: data processed*

The high overall efficiency indicates that BRISyariah operates efficiently (both technical and scale efficiency). Therefore BRISyariah can be used as a benchmark for other Islamic banks. Other Islamic banks show good scores of efficiency as well with a score of almost 100% and none is below 60%. However, Bank BRISyariah can be a role model for other Islamic banks because Bank BRISyariah can maintain its efficiency from time to time with the score of 100%.

### **Tobit Analysis**

Efficiency measurement using DEA does not take into account factors that affect it. Thus, to measure factors that influence the efficiency of Islamic banks in Indonesia, second stage analysis (Coelli, 1998). The second analysis of this study uses Tobit model. It is used because the dependent variable consist of efficiency value of 0 and 1.

The result is presented in Table 3. Those factors is tested the influence toward Islaamic banks efficiency score. The analysis of the influence uses the score of overall technical efficiency as dependent variable.

**Table 3**  
**Stage 2 Analysis Using Tobit Method**

| Variable | Coefficient | p-value  |
|----------|-------------|----------|
| CAR      | 0.249642    | 0.5623   |
| NIM      | -1.639136   | 0.2918   |
| NPF      | -2.146863   | 0.3066   |
| ROA      | 1.644973    | 0.3865   |
| SIZE     | -20.44548   | 0.0483** |
| COST     | 17.48658    | 0.0895** |
| TYPE     | 8.671900    | 0.1691   |

**Note:** \* is significant at 10%, \*\* is significant at 5%, and \*\*\* is significant at 1%.

The result of Tobit regression is presented in Table 3. The table shows that there is strong negative effect of size on efficiency. Previous findings are inconclusive. Das and Ghosh, (2009) find that size could increase efficiency and so do Drak, Hall & Meringis, (2006) and Yudistira (2003). On the other hand, there are findings that banks will not be able to maintain their efficiencies consistently in merger or aquisition and expansion (Bdour & Al-Khoury, 2008; Danesh, 2007; Sufian, 2007). The negative significant effect of size on efficiency of Islamic banks is explainable. For example, network expansion is currently a trend in Islamic bank industry in Indonesia. Some banks expanded massively. Network expansion certainly increases size of the firm and followed by large expenditures for Islamic banks. Consequently, it will be a inefficient factor for Islamic banks in Indonesia. This finding is consistent with previous studies that stated banks will not be able maintain their efficiency when they are doing expansion. The finding is also supported by several previous studies (De Young & Nolle, 1996; Girardone, Molyneux, and Gardener, 2004; Isik & Hasan, 2002).

Bank type is one of independent variables in the model. Bank type is classified into (1) Islamic bank from the start and (2) Islamic bank resulted from spin off or a branch of conventional bank. The result shows that bank type is positively associated with efficiency but insignificant. This could be explained that both types operate under the same regulation i.e. UU No. 21 tahun 2008 (The law that regulates Islamic bank management system).

Net interest margin (NIM) has negative effect on efficiency but not significant. This finding is in consistent with previous empirical findings which find that net interest margin has positive effect on efficiency (bank with high interest margin ratio is more efficient. In addition Estrada et al. (2006) and Gelos (2006) find that more efficient banks tend to be having low net interest margin ratio. The finding of this study can possibly explained: the Islamic banks revenues are dominated by murabahah financing, and thus revenues from profit sharing scheme of mudharabah and musyarakah financing is just small portion from total profit sharing revenues.

This study finds that CAR and ROA have no impact on efficiency. It is inconsistent with several previous findings from previous studies. Some previous studies find that there is positive relationship between CAR and efficiency. Banks with high CAR have higher efficiency. CAR indicates the capability of a banks in coping with unpredicted loss. As a result, CAR of a bank is not an indication of that bank security, thus there are some reasons why CAR does not have impact on Islamic bank efficiency as follows: (1) CAR does not

reflect a bank financial health but it is important because it is a requirement covered in rule of Central Bank of Indonesia regulation. Furthermore, together with other variables in CAMELS analysis the bank health could be ranked, (2) CAR is a ratio between capital to total assets, thus with the current expansion of Islamic bank, the assets of the banks is dominated by fixed assets.

Similarly, ROA does not significant effect on Islamic banks efficiency. Islamic banks market share is relatively small due to the small scale of Islamic banks, thus it difficult for Islamic banks to generate large return. Consequently, with large ROA without an increase of market share, it is difficult to improve banks efficiency. Both ROA and market share should move together.

Empirical fact states that larger cost is associated with inefficiency. This study proved the oposite. It is found that banks with relative large costs are more efficient. Large cost Bank tends to operate with high margin. Murabahah-dominated financing causes high margin revenue which at the end will generate large revenue for the banks (bank revenue is called mudharib). Then, the high operational cost can be considered as part of bank expansion which at the end will escalate the Islamic bank business.

The result shows that there is a negative coefficient of -2,15 of Non Performing Financing on overall Islamic bank efficiency. The negative sign of NPF although not significant indicates that an increase in NPF will increase Islamic bank risk which at the end will affect efficiency. The insignificant finding could be explained (1) the scale of the Islamic bank industry is small, (2) the portion of NPF is relatively small compared to Financing Deposit Ratio (FDR).

## **Conclusion and Recommendation**

### **Conclusion**

In general, islamic bank performance in Indonesia in 2007 is more efficient than the following years. However, there is slight improvement in efficiency from 2010 to 2011 in term of technical, scale and overall measurements. The technical efficiency for 2007 is 96,86%, 2008 is 96,69%, 2009 is 94,43%, 2010 is 93,32% and 2011 is 93,72%. The high technical efficiency indicates that Islamic bank performance has not reach optimal efficiency in utilizing their input and output.

From Tobit calculation, size has negative effect on islamic bank efficiency whereas cost has positive effect on overall technical efficiency. Other factors such as CAR and ROA affect efficiency positively although not significant. Finally, net interest margin and non performance financing has negative impact on overall efficiency of Islamic bank in Indonesia.

### **Recommendation**

1. Data Envelopment Analysis Approach can be used as an alternative in measuring Islamic bank performance comparable to conventional approach of CAMELS.
2. It is essential to identify comprehensive performance of Islamic bank and together with Islamic bank management to elaborate the function and the role of Islamic banks in the national economy so that input-output specification can provide comprehensive guidance to develop Islamic bank industry in Indonesia.

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