

## **The efficiency of Sharia Rural Banks and Sharia Commercial Banks: A Comparison using Data Envelopment Analysis.**

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### **Abstract**

A growing number of Sharia banks (Islamic banks) in Indonesia following the launched of Law No.21 of 2008 is remarkable. Similar to conventional commercial banks, based on business scope area the Sharia bank is further classified to Sharia Commercial banks and Sharia Rural Banks. This study aims to investigate the efficiency level of the two groups using Data Envelopment Analysis (DEA). Each group is represented by ten banks covering the period from 2012 to 2016. The analysis is conducted using DEA under assumption of constant return to scale (CRS) and variable return to scale (VRS). Employing independent t-test and Mann-Whitney test, this study obtain the comparison result. The findings indicate that the level of technical efficiency under CRS and VRS models for both groups is still below the full efficiency level during the period of analysis. The test also suggest that there is no substantial different in efficiency between the two groups of banks.

**Keywords:** Technical Efficiency, data envelopment analysis, bank

### **Introduction**

The development of the Islamic banking system in Indonesia during the last two decades of financial development has achieved a number of progression, both from institutional and other supporting infrastructure aspects. The regulatory and supervision systems is in place, as well as public awareness and literacy of Islamic financial services is shown in a growing trend. Indonesian Sharia financial system is recognized as one of the best and most comprehensive systems internationally (Islamic Banking Statistics, 2016).

The increasing number of Islamic banks operating with various forms products and services offered potentially can cause disproportionate information in the community. The potential and most likely challenge is to ascertain about the performance and soundness of the existing banks. Given this condition, the assessment of bank efficiency then becomes very critical, as the efficiency is the illustration of bank's performance, as well as other factors that must be considered by the bank, in minimizing the level of risk faced in its operations. The analysis of efficiency is crucial because an aggressive operation, either in deposit collection or excessive loan lending, by disregarding efficiency factors will affect the profitability of the bank (Muharam and Purvitasari, 2007).

This study measures and compares the level of efficiency of Shariah Commercial Banks, the so-called *Bank Umum Syariah (BUS)* and Sharia Rural Banks, also known as *Bank Perkreditan Rakyat Syariah (BPRS)* in Indonesia. The sample of this study is ten BUS and ten BPRS with the period of analysis of the 2012-2016. This study uses Data envelopment analysis (DEA) with two assumption

namely constant return to scale (CRS) and variable return to scale (VRS) to calculate the technical efficiency level of each bank. At the second step, the level of efficiency of each bank group is then further tested using independent t-test and Mann-Whitney test.

Efficiency comparison analysis between BUS and BPRS is noteworthy to investigate, this is due to differences in business scale and target market. In its development both BUS and BPRS are experienced a positive growth. Meanwhile, previous studies mostly provide the comparison between Islamic commercial banks with conventional commercial banks or sharia business units.

The rest of this paper is structured as follows; the next section provides background and conditions of the Islamic banking industry in Indonesia followed by the reviews the previous research on banking efficiency with the DEA approach. The section of data and variables will be presented after review, then fifth section discusses the results. The last section conclude the paper.

### **Sharia Banking Industry in Indonesia**

The existence of the first Islamic bank in Indonesia has been emerged since 1992 following the enactment of Law No. 7 of 1992 concerning the principle of profit sharing in banking business. The existence of Islamic banks was first marked by the establishment of *PT. Bank Muamalat Indonesia* (BMI). During that period the development of Islamic banks in Indonesia was not grow rapidly. It probably due to lack of strong legal foundation which had not yet been in place to support the development of Islamic banks in the operational techniques according to of Islamic principles. In 1998, the government and the House of Representatives replaced Law No. 7/1992 with Law No. 10/1998, which explicitly stating there are two systems in Indonesian banking sector (dual banking system), namely the conventional banking system and Islamic banking system. The law was well-embraced by the Indonesian banking community, which marked by the establishment of several other Islamic banks, such as the IFI (Indonesian Finance and Investment Company) Sharia Bank, Mandiri Syariah Bank, Bank Niaga Syariah, Bank BTN Syariah, Mega Indonesia Syariah Bank, BRI Syariah Bank, Bank Sharia Bukopin, West Java Sharia Regional Development Bank and Aceh Syariah Regional Development Bank BPD and others.

The enactment of Law No.21 of 2008 concerning Sharia Banking in July 2008 is believed to be an important step in providing proper legal basis in directing the Shariah banks. Therefore, it is believed that the law boosts the growth of the banks in the country, both in term of number and assets. In fact, the development of the bank reaches the growth more than 65% per year on average during the past five years. Also, it is expected that the existence of the sharia banking plays an important role in supporting the economic growth as a whole. Subsequently, the BUS where increased from five banks to eleven banks just in two years (2009-2010). As of November 2016, sharia bank industry contains 13 Islamic Commercial Banks, 21 Sharia Business Units owned by Conventional Commercial Banks and 164 Islamic Rural Banks (Sharia Banking Statistics, 2016).

Literature notes that measuring efficiency can be performed with financial ratio analysis, index number and frontier analysis. The analysis in financial ratios commonly employs the ratio of operational expenses on operational income (known as *beban operasional terhadap pendapatan operasional* - BOPO) and on performing financing (NPF) ratio. Bank is classified as efficient if the ratio of BOPO and NPF decrease. In addition, efficiency can also be assessed by the growth of bank performance indicators such as the number of third party funds, loan and total assets. This simple data indicate the greater the amount of deposits, loan and total assets suggest the better and more productive the bank in its operational activities. Financial data and performance indicators in the form of total third party funds (TPF), loan or financing, and total assets of national Islamic banking can be seen in Table 1 as follows:

**Table 1: Financial Indicators and Financial Ratios**

Indicators	Sharia Commercial Banks			Sharia Business Unit			Sharia Rural Banks		
	2014	2015	2016	2014	2015	2016	2014	2015	2016
Total Asset *	204,961	213,423	246,361	67,383	82,839	92,982	6,573	7,739	8,899
Deposits	170,723	174,895	202,332	47,136	56,28	68,148	4,028	4,802	5,669
Financing	148,425	154,527	175,12	51,752	59,462	66,361	5,005	5,765	6,591
NPF**	4,95	4,84	4,68	2,55	3,03	3,26	7,89	8,20	10,13
BOPO	96.97	97,01	95.91	80,19	83.41	77.18	87.79	88.09	87.66

Note: \*) in billion Rupiah, \*\*) in percentage (%)

### Previous Research

Farrell (1957) classified efficiency into several types, namely technical efficiency, allocative efficiency and overall efficiency. Technical efficiency describes the company's ability to produce output with a number of given inputs. While, allocative efficiency indicates the company's ability to optimize input use, price structure, and production technology. Two measures are then combined into overall efficiency. Research on institutional efficiency finance both sharia and conventional has been carried out by several circles both domestic and abroad. In Indonesia case, research on banking efficiency with DEA's approach and comparing the level of banking efficiency have been growing, which include Huri & Susilowati (2004), Muharam & Puspitasari (2007), Hadad. et.al., (2003), Ascarya & Yuamanita (2008), Pradiknas & Faturohman (2015), Nugraha (2013), Firdaus & Hosen (2013), Muhari & Hosen (2014), Suliyanto & Jati (2014), Widiarti. et.al., (2015), and Rahmawati (2015). While the international research was carried out by Hassan (2013), Said (2013), Řepková (2015), Sillah & Harrathi (2015), and Shahid, et.al., (2010). Research on the level of efficiency with banking objects has mixed and provide various results. The variation exist related to the differences in the model or method of analysis used, the bank group, and the period of research.

## Data, Variables and Method

Data is obtained from the individual bank's financial statements published by *Bank Indonesia* (Indonesian Central Bank) during the period of 2012-2016. The sample bank consist of ten BUS and ten BPRS from a total population of 13 BUS and 164 BPRS, respectively.

According to Hadad, et.al., (2003) there are three approaches commonly to determine input and output variable in frontier methods, as well as the DEA non-parametric method, namely production approach, intermediation approach and asset approach. The different among the three method exist in the way they treat deposits, particularly in production and intermediation approach. In production approach, deposits are treated as an output, because deposits is one of services produced through bank activities, whereas in the intermediation approach deposit is placed as input. The reason behind the argument is that deposit collected by the bank is transformed into productive assets, especially loans. This study follows the intermediation approach as suggested by Berger and Humphrey (1997) the intermediation approach is a more appropriate in evaluating the performance of financial institutions in general, while production approach is suitable in evaluation bank branch level.

Given various input options available, this study uses three inputs, namely third party funds (deposits), personnel expenses and fixed assets, as well as two output variables namely total financing and other operating income. Table 2 presents the detail of input and output used.

**Table 2: Input and Output for DEA**

Variable	Definition
<b>Output</b>	
Total Financing ( $y_1$ )	Total financing and loan that is lended based on islamic law such as <i>murabahah</i> , <i>mudharabah</i> , <i>musyarakah</i> , <i>salam</i> , <i>istishna</i> , <i>rahn</i> , and others
Total Operational Income ( $y_2$ )	Total operational income by bank
<b>Input</b>	
Third party fund ( $x_1$ )	Total deposit in the form of demand account, saving and term-deposit with the principle of <i>wadi'ah</i> and <i>mudharabah</i>
Personnel expenses ( $x_2$ )	Total expenses for salary, training and other personnel expenses
Fixed asset ( $x_3$ )	Total value of fixed assets to support bank operation

This study uses a non-parametric approach. Formula general equation in the Data method Envelopment Analysis (DEA) following Firdaus & Hosen (2013) is as the follows:

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

Efficiency ratio ( $h_s$ ) later maximized by:

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

$$; r = 1, 2, \dots, N \text{ dan } u_i, v_j \geq 0$$

Where  $h_s$  indicate technical efficiency bank  $s$ ;  $u_{is}$  is the output weight  $i$ ;  $y_{is}$  is the input weight  $i$  produced;  $v_{js}$  is the input weight  $j$ ; and  $x_{js}$  is the amount of input  $j$  given by bank  $s$ , and  $i$  calculated from 1 to  $m$  and  $j$  calculated from 1 to  $n$ , and  $N$  is the number of sample banks. The first gap shows there is an efficiency ratio for the company other not more than 1, meanwhile the second gap is positive.

The ratio number will vary between 0 up to 1. Banks are said to be efficient if it has a ratio of close to 1 or 100 percent, on the contrary if it approaches 0, the bank's efficiency is lower. In DEA, each bank can determine its weighting and ensure that the chosen weight will produce the best performance measured. The DEA model used in this study is performed under the assumption constant returns to scale (CRS) and variables return to scale (VRS). The DEA scores are obtained using DEAP Version 2.1 software. Subsequently, after obtained the efficiency score for each bank, the normality of the data will be tested through SPSS application program by conducting Kolmogorov-Smirnov (K-S) test. The next procedure is to test the hypothesis of efficiency difference between Sharia Commercial Banks (BUS) and Islamic Rural Banks (BPRS) using the 5% significance level.

## Results and Discussion

### *The Efficiency Result*

Table 3 shows the average level of efficiency for BUS and BPRS from 2012 to 2016. The table indicates that the level of efficiency of BUS and BPRS under the CRS model is low compared to the level of efficiency with the VRS model. But overall both BUS and BPRS have not reached 100% efficient level. That is, both BUS and BPRS have not been able to allocate their inputs optimally to produce output.

**Table 3: The Mean efficiency level of BUS and BPRS (%)**

Year	CRS		VRS	
	BUS	BPRS	BUS	BPRS
2012	76.68	85.29	97.05	86.48
2013	77.06	87.09	97.00	87.29
2014	73.64	80.51	92.07	86.01
2015	75.81	81.27	97.18	87.96
2016	92.05	87.05	99.15	94.78
Mean	79.05	84.33	96.58	88.50

*The Comparison between BUS and BPRS*

Table 4 shows the result of normality K-S test. The results K-S test suggests that the result under CRS model for each bank group during the period of 2012 – 2012 are normally distributed, therefore independent t-test can be performed. On the contrary, the result under VRS model is shown to be opposite, hence the non-parametric Mann-Whitney test is used.

**Table 4: Normality K-S test Result**

Asymp. Sig. (2-tailed)	CRS	VRS
2012	.480	.026
2013	.162	.003
2014	.354	.046
2015	.250	.017
2016	.207	.004

*Independent T-Test*

Table 5 presents the result of Levene’s test for equality of variance, with the score of F equal to 0,937 (sig >  $\alpha$  0,05) therefore it can be concluded that the two sample are in the same variety. Given both are the same, t-test is used on the first line (equal variance assumed). The result of t-test is 0,791 while t-table with  $\alpha = 0,05$  and Df = 18 is 2,1 then it can be concluded that  $H_0$  is accepted. The value of probability is 0,439 and  $\alpha > = 0,05$  then  $H_0$  is accepted. Considering of the t values and probabilities obtained, it can be concluded that there is no strong evidence that technical efficiency is different between Sharia Commercial Bank and Sharial Rural Bank under CRS model during the period 2012-2016.

**Table 5: Independent Sample Test (T-Test)**

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2- tailed)
EfisiensiCRS	Equal variances assumed	.006	.937	-.791	18	.439
	Equal variances not assumed			-.791	17.949	.439

*Mann Whitney U Test Results*

Table 6 shows the U value is 31 and the W value is 86. If the value is converted to Z then the magnitude is - 1.467. Significance or P value is 0.142 > 0.05. If the p value > critical limit is 0.05, there is no meaningful difference between two groups or it means that H<sub>0</sub> is accepted. Hence, it can be concluded that there is no difference in technical efficiency with the VRS approach between Islamic commercial banks and Islamic people's financing banks during the 2012-2016 period.

**Table 6: Mann Whitney U Test**

	Efisiensi VRS
Mann-Whitney U	31.000
Wilcoxon W	86.000
Z	-1.467
Asymp. Sig. (2-tailed)	.142
Exact Sig. [2*(1-tailed Sig.)]	.165 <sup>a</sup>

The result from the measurement of the efficiency level for both groups, sharia commercial banks and the sharia rural bank, are below 100%. This condition appears under both assumptions, CRS and VRS, used to measure the technical efficiency during the period from 2012 to 2016. The average efficiency score for BUS and BPRS with the CRS approach is 79.05% and 84.33%, respectively, while the average efficiency level under VRS approach is 96.58% and 88.50, respectively.

Although the object of the research is different, these findings are in line with the research conducted by Suliyanto & Jati (2014), Widiarti. et.al., (2015), and Rahmawati (2015) which find that banks in Indonesia have not achieved their full efficiency level. The inefficiency of Islamic banks could be caused by various things, either excessive use of inputs or low of output produced.

It clearly indicates that the bank has not use the inputs to produce outputs optimally to achieved the target. Technically, the effort can be done is by reducing the use of input, as well as increasing the amount of output that is in the value of the slack movement.

The reductions can be done, for instance on personnel expenses, by imposing a specific policy that is the internal rules of the bank to use the contract system for employees and cooperate with educational institutions in providing quality human resources. Fixed assets that have been owned by banks should be used more efficiently. The purchase of a fixed asset should be in line with its maximum use so that it has a positive effect on the bank's income. Whereas to overcome the lack of total output can be done by adding variations of financing products and maximizing the financing products that have been running, with the increase in the amount of bank financing, it will increase the amount of operating income obtained by the bank.

To find whether there are differences in efficiency level between Sharia commercial banks and Sharia rural banks, a different independent sample t-test and Mann-whitney U test was performed. The results suggest that there is no strong evident that the different level is exist in technical efficiency under the CRS approach between Islamic commercial banks and Islamic rural banks during the 2012-2016 period. Similarly, the Mann Whitney test results also indicate that there are differences between the level efficiency with the VRS approach between the two groups. This result confirms the result of some previous studies such as by Hassan (2013) and Shahid. et. al., (2010) related to the absence of differences in the results of the efficiency of the CRS and VRS approaches.

### **Conclusions and recommendations**

The results of data analysis for Sharia commercial banks (BUS and Sharia rural banks (BPRS) the level of technical efficiency under the CRS and VRS approaches, are still under groups 100% of efficiency. Based on the CRS approach, it shows that the score of the average level of efficiency of BPRS (84.33 percent) more efficient compared to BUS (79.05 percent), while under the VRS approach it shows the average efficiency level of BUS (96.58 percent) more efficient compared to BPRS (88.50 percent). However, the result of different tests of independent t-test and Whitney test show that there is no difference in efficiency in the two groups of banks.

For the next research it is suggested that the analysis can expand by using larger sample banks, if it is not possible to use all banks, in order to capture a comprehensive result. Different inputs-output combination also can be considered, as well as different frontier method such as the Stochastic Frontier Approach (SFA) and other analytical tools.



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