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Measuring Regional Islamic Bank Efficiency in Indonesia

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Abstract

Islamic banking comes to Indonesia which has strength that Indonesia famous with the largest Moslem in the world fairly late. Development of Islamic banks in Indonesia reflected through regional banks that come into sharia market. This study measures the size of the efficiency of regional banks using Data Envelopment Analysis. The DEA proceed by computer programe called Efficiency Measurement System which result that during the research period from 2005 to 2016, the efficiency of Sharia Regional Bank has been good. Highest Technical Efficiency, Scale Efficiency and Pure Technical Efficiency are Bank DKI Syariah, Bank Jabar Syariah and Bank Aceh Syariah.

Keywords: Efficiency, Islamic Bank, Regional Bank, DEA, EMS

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1. Background of the Research

In the last decade the world has witnessed a slowdown in the number of sharia banks in general and particularly in the West, although the idea of sharia banking is still young. This phenomenon was confirmed by Al Jarhi (1981) who stated that the largest number of Islamic banks was established either in the late 1970s or in the early 1980s. Similarly, Wilson (1990) indicated that Islamic Banking reached maturity only after 20 years of operations. Study about Efficiency took a huge attention from researcher, probably because the efficiency of banks is directly linked to the productivity of the economy [1].

Due to the complexity of their operations and the large size of their networks, traditional performance measurement technique have not been very effective in identifying and disseminating best practices throughout these organization, this is why we need to count the efficiency score.

In December 1970, second Islamic conference of foreign ministers was held in Karachi, Pakistan and Egypt. It's recommended some obligation of Islamic Bank such us: finance commercial transaction among Islamic countries; finance development and

investment institutions as its affiliates; undertake the necessary transfers, clearing and settlement among the central institutions; set up central institutions in muslim countries; support the efforts of these central institutions on the muslim countries in pursuing their objectives within the framework of Islamic directives; administer and utilize zakat funds and administer the surplus liquidity of these central institutions [39].

Indonesia has experience in encouraging the development of sharia banking. The experience contains implemented policies and regulations that aim to achieve a strong fundamental building block to support sustainable and safe development in the future. The development of Islamic Banking is phased into three main stages that focus on different emphasizes. The first stage puts strong foundation for sustainable development. The second stage focuses on strengthening industrial structure. The third stage focuses on efforts to comply with international standards for financial products and services [27].

According to Budiono (2003) to build a sound and efficient Islamic Financial not just need religious factor but also test of efficiency, market, financial stability and back up by a good rule. Some problem of Islamic Bank such us the success of Shariah banking will depend on how efficiently Islamic Banking will manage their asset [4]; Indonesia faces a situation in which two different types of banks are regulated by capitalistic banking regulation. Under dual banking system, Islamic banking in Indonesia must compete with conventional banking. Another problem that facing by Islamic banking in Indonesia that market share and asset owned by Islamic Banking in Indonesia less than 10 persen from total financial institution in Indonesia. To capture the financial market of Indonesia, Islamic bank comes with various types. Commercial bank and Islamic unit. Islamic units emerge from almost all types of conventional banking. Among them emerged from regional banks in several provinces in Indonesia. At first the regional scope of the bank was only in the province that had the largest share, and the regional bank was named the province where the bank originated. But now the bank is able to open branches in other provinces and can open a sharia business. According to Ascarya, et al. (2008), to increase market share of Islamic banking needs a measurement of efficiency.

This study will identify Regional Islamic banking efficiency. Period research will be at 2005-2016. Sample of the study just for Regional Islamic banking not include rural banking. Data used to run the efficiency analysis taken from financial report namely income statement.

2. Literature Review

2.1. Islamic banking performance and efficiency

⁴ In the 1700s, Adam Smith first developed the conventional economic efficiency theory, and governments and business have used the theory since its development [59]. Efficiency, in the study was the measurement of banks as producers of outputs such as loans and financial assets using inputs such as capital and labor. [43]. According to Spong, Sullican and De Young (1995), efficiency is the ability of banks to use their resources efficiently both in producing banking products and services and in generating income from these goods and services.

Financial Ratio Analysis is considered a simple tool that provides researchers with the opportunity to make comparisons between banks in terms of cost, revenue and profit (hassan and bashir, 2003). Operational efficiency is a broad concept sometimes referred to as x-efficiency, or technical efficiency, which measures departure from cost efficiency, representing the maximum achievable output for a given level of inputs [35].

⁵ Financial system efficiency is measured in terms of the efficiency achieved in mobilizing the savings from the savings-surplus units and allocating these funds among savings-deficit units in the economy [36]. In general, an increase in the financial assets and instruments varieties would improve the efficiency as the saver or investor has their unique risk-return expectations. The greater the variety of risk-return combinations of the financial assets, the better would be the match between the investor's preference and the available choice.

Measuring the efficiency of banking can be done in three ways or three approaches, namely DEA, SFA, and DFA approach free distribution. Three basic concepts of financial sector efficiency modeling approaches: cost efficiency, profit efficiency standards and alternative profit efficiency.

¹ Kettel, (2010) asserted that the proponents of Islamic Banking argue that it will be more efficient just because the contract of Mudaraba is based on the principles of justice and equity. It will be more efficient, again it is argued, as it will help attain a more rational and balanced allocation of financial resources among competing projects because the main consideration, in the allocation of funds under Islamic banking, would be the profitability of relevant projects and not the safe return of the principal amount, as is the case in conventional banking.

Sarker (1999); Samad and Hassan (1999) do research about the performance of Islamic banking using such variables like profitability ratios, liquidity ratios and sometimes solvency ratio. Yudistira (2004), proposed about technical, pure technical, and scale efficiency measures are calculated by utilizing the non-parametric technique, Data Envelopment Analysis. He conclude that, first, the overall efficiency results suggest that inefficiency across 18 Islamic banks is small at just over 10 percent, which is quite low compared to many conventional counterparts. Second, indicate that there are diseconomies of scale for small-to-medium Islamic banks which suggests that M&A should be encouraged. Islamic banks within the Middle East region are less efficient than their counterparts outside the region. Additionally, market power, which is common in the Middle East, does not significantly impact on efficiency.

Haron (1998) resulted a comparative study of the efficiency and productivity of the Islamic banks in South East Asia and The Middle East. He found that, First, banks as financial intermediaries are the conduit for monetary policy to strengthen the soundness and the macroeconomic stability. Second, since 1960 countries around the world have opened their markets and removed barriers in banking industries. This creates a wide opportunity for Islamic banks widely to operate and expand domestically or abroad. Hassan and Hussein (2003) evaluated Sudanese banks. Inefficiency of Sudanese bank causes by less in used of technology and not operating at a sufficient size or scale to be optimally efficient.

Then Zubair (2005), Majid et al (2003), Hassan (2005) studied about cost efficiency. They divided cost efficiency into two elements. Its Consist of purely physical or technical element that refers to the ability of a firm to produce as much output as the given input use would permit. The second is the price element requiring the firm to produce a given output with minimum input expense.

Brown, et. all (2003) measures efficiency of Islamic Banks in Malaysia. They compare the performance of Islamic banks with conventional banks. Two fundamental differences between these two forms of banking are related to financing techniques with or without interest usage and social objectives. Islamic banks typically held higher levels of equity and it was initially suggested that this might be due to equity investments such as with mudaraba and musharaka transactions.

Second-stage analysis which regresses the efficiency scores from the DEA upon environmental variables used by Coelli, Prasada and Battee (1998). Its pointed out differences in Bank Efficiency. The efficiency results from DEA recover from the environmental factors.

Grigorian and Manole (2002)¹⁹ estimate the efficiency of the banking sector in transition countries. They used the DEA method, and run the regression of the efficiency scores on variables related to macroeconomic environment, regulatory environment and bank specific variables.

2.2. Islamic banking efficiency: Input-output

M.A.Mannan (1999), mention three criteria in evaluating the performance of Islamic banking, such as: conventional balance sheet; human capital balance sheet; and social capital accumulation balance sheet.

Some of efficiency study using various output and input. Common Output variable that always used total deposit [25, 26, 30, 42]. While Input ie employee cost ([25, 26, 30]; Yuhdistira, 2003; [42, 54]).

Hassan (2003) reasearch about efficiency in Islamic banking industry in Pakistan, Iran and Sudan in periode of 1994-2001. Using two variable output (total deposit, total asset revenue_ and three variable input (total employee cost, fixed asset) result showed that in average Islamic banking industri less efficient than conventional bank. Lestari (2001), used input ie employee, capital, operational cost than output used are total credit, and deposito.

Yudhistira (2003) used the input are employee cost, fixed asset and total deposit, output used are total credit, revenue, and liquid asset. Radam et.al (2002), tahun 1991-1992, DEA dan Malmquist. Input used are employee cost, interest rate on asset. Output used are deposit, total credit and total interest revenue.

Ascarya, et.al (2008), 2002-2006, used total credit, employee cost dan asset, output used are financing and operational revenue. Sufian (2006) 2001-2004, input consist of total deposit, total employee cost, and asset. Output consist of financing and operational cost. Muharam dan Puspitasari (2007), using input are deposit and operational cost, output are financing and activa and operational revenue.

Miller and Noulas (1996) DEA to 201 US banks 1984 to 1990. Using¹⁷ four inputs which are total transaction deposits, total non transaction deposits, total interest expense dan total non interest expense. Six output which consist commercial and insutrial loans, consumer loans, real estate loans, investment, total interest income and total non interest income.

Fukuyama (1993), using DEA for 143 commercial banks in Japan. Input use are labor, capital (consist of bank premises and real estate, suspense payment for constitutions. Zaim (1995), input consist of labor, interest expenditures, depreciation expenditures,

material expenditures. Output consist of demand deposit, time deposit, short term loans and long term loans.

Ferrier and lovell (1990), 574 banks, input total number of employees, occupancy costs and expenditures on furniture and equipment. Output consis of number of DD account, number of the real estate loans, number of installment loans, number of industrial loans.

Hartana (2003), input: interest expense, non-interest expense, non-operating expense, output: interest income, non-interest and non-operating Erwinta and Wilson A (2004) with some of the intermediation approach, calculating operational efficiency using inputs the number of employees, number of ATMs, number of branches, the position of third party deposits. Output, the loans.

Purwengtyas (2002) using DEA with input resources ie the number of managers and staff working hours, the amount of computer use and the living space. Microenvironment of the number of savings accounts and the number of credit applications. Output consists of the total amount of time required to serve all the work of the ministry.

In the intermediation approach, banks placed as DMU who transformed the various forms of the funds raised in any type of loan. Deposits placed as input because of the deposits collected by banks will transform into various assets, primarily loans. there is quite a number of researches that have studied banking efficiency in less developed countries.

3. Methodology and Data

3.1. A concept of efficiency

Concept of efficiency proposed by Farrell's (1957) using an input-orientation. Farrell mentioned that the efficiency consist of two components. The two components are Technical efficiency and allocative efficiency.

This research measured Technical Efficiency (TE) as we understand that: ⁶ TE can be split into PTE and SCE. PTE exhibits improvements in productivity solely resulting from managerial and organizational skills at banks leading to an efficient use of inputs. SCE is the ratio of TE calculated under the assumption of CRS to TE calculated under the assumption of VRS (Farrel et al., 1985). Berger and Humphrey (1991), proposed ¹³ standard estimation of efficiency can be devided into two: CCR and BCC. Both models allow the TE (tehnical efficiency) ¹³ into two collecetively ¹³ exhaustive components ie ¹³ pure technical efficiency (PTE) and scale efficiency (SE) (see, [14]). The two models's

difference are the ¹³ treatment of return to scale, BCC allows for variable return to scale (VRS) and CCR assumes that each DMU operates CRS.

Two approaches for selection of inputs and outputs—intermediation and production approaches. ¹⁸ According to Berger and Humphrey (1997), the intermediation approach is more appropriate for evaluating financial institutions because it is inclusive of interest expenses, which often account for one-half to two-thirds of total costs. Another advantages of are intermediation approach may be superior in evaluating the importance of frontier efficiency to the profitability of financial institutions, since the minimization of total costs, and not just production costs, needed to maximize profits; treats the work of banks as primarily intermediating funds between savers and investors (depositors and borrowers) and the banks use operating and interest expenses to produce major assets.

⁷ This study reflects the standard intermediation approach in which capital and labor are used to intermediate deposits into loans and other earning assets when considering the input. Capital input represented by fixed assets, while the labor input represented by personnel expenses. In most DEA studies, the number of employees is common to specify input. The intermediation approach assumes that financial firms act as an intermediary institution and use total loans and securities as outputs. Meanwhile, deposits along with labor and physical capital are defined use as inputs (Charnes et al.,1990; [7, 48]).

3.2. Data envelopment analysis

DEA introduced by Charnes, Cooper and Rhodes (1978). Its a non-parametric approach which basically a technique that based on linear programming. DEA already establish (Charnes et al, 2001) for CCR, BCC and additive model ³ DEA is a linear programming based method first originated in the literature by Charnes et al (1978) as a reformulation of the Farrell's (1957) single-output, single-input radial measure of technical efficiency to the multiple-ouput, multiple-input case.

According to Siswadi (2005) used of DEA is the most significant financial statement data banking industry in Indonesia. DEA was a good tool to measure approximations of relative efficiency between peers in the indsutry, but less helpful when used in relation to a theoretical maximum [44]. Charnes (1978) introduced the efficiency ⁴ model in replacement of regression analysis to determine efficiency in an organization.

⁸ DEA has been used for the efficiency evaluation of the non-profit units. Later on, the area of application has spread to profit sector such as banking and insurance industry.

Data Envelopment Analysis (DEA) enables simultaneous consideration of more than two ratios and calculates the relative efficiency for every observed unit. Its an increasingly popular management tool and widely applied in solving real business problems.

Gijbels et al (1999) showed that the DEA estimates are statistically consistent with the strictures of production and distribution. Three concepts in defining relationships in the financial IO: Production approach, Intermediation approach and Asset approach. This research will focus on empirical model that will be estimated.

3.3. Inputs and outputs

In selecting the variables, it is important to understand the goals of the banks. Bergendahl (1998) said that there are five fundamental goals of efficient bank management: profit maximization, risk management, service provision, intermediation, and utility provision.

The DEA method can use input or output-oriented depending on its purpose. The input-oriented method defines the frontier by seeking a maximum proportional reduction in input usage, while the output is maintained constant for each DMU. The output-oriented method, looking for a maximum proportional increase in production with a fixed input level. These two methods will give the same technical efficiency score when it is assumed that Constant Returns to Scale (CRS) is applied, but yields unequal values when Variable Returns to Scale (VRS) assumed [12]. This research used the output-oriented method by assuming that in banks, it is common to assume output maximization from a given set of inputs.

TABLE 1: Input-Output for this research.

Input	Output
Profit Loss Sharing expense	Profit Loss Sharing revenue
Other operational expense	Other revenue expense
Non operational expense	Non operational Revenue
Modification by researcher	

3.4. Sample

The financial report that use are unaudited report, the reason just to make uniformity for data. Financial data were collected from the unaudites financial statements of islamic banks and bank of indonesia website (bi.go.id) in condensed financial statement sharia bank to compare the change in efficiency for each year type of banking

system. Its same case with Suhaimi (2008). We believe that the principal advantage of having panel data is the ability to observe each bank more than once over a period of time.

TABLE 2: Regional Islamic Bank Sample.

Name of bank sample	Status of bank
BANK JABAR SYARIAH	Named as BJB syariah
BANK DKI SYARIAH	Full islamic window
BPD RIAU SYARIAH	Full islamic window
BANK KALSEL SYARIAH	Full islamic window
BPD ACEH SYARIAH	Full islamic window

4. Result and Discussion

Data processing by EMS (efficiency measurement system) a program that measure efficiency scores each bank every period. [49]. This EMS program used Yayar et al (2012); Saliza and Ismail (2012); and Stavarek and Reskova (2011).

EMS run CRS and VRS and input oriented method. Model of CCR under the assumption of CRS result Technical Efficiency, Model of BCC under the assumption of VRS result Pure Technical Efficiency and for Scale Efficiency count from Technical Efficiency Under CRS divide Technical Efficiency Value under VRS.

This study uses an input orientation, which reflects the general practice in previous studies that look at banks relative to one another, and which also reflects the bank's management emphasis to reduce costs (and therefore, its implications, inputs). It also recognizes that banks collectively have only limited coverage to change their output, other than at the expense of some other banks. Efficiency scores (CCR, BCC and Scale Efficiency acquired in EMS) program have been shown in Table 3

TABLE 3: Average Value of TE, SE, and PTE.

DMU	Average Value 2005-2016		
	TE	SE	PTE
BANK JABAR SYARIAH	0.96417	0.95167	0.951
BANK DKI SYARIAH	0.97833	0.97667	0.97833
BPD RIAU SYARIAH	0.8425	0.86417	0.82908
BANK KALSEL SYARIAH	0.765	0.93667	0.82114
BPD ACEH SYARIAH	0.93833	0.95	0.94672
Average	0.89767	0.93583	0.90526

Data balance sheet of 5 Regional Islamic Bank that already establish since 2005 from data quarterly period of 2005 until 2016. The highest TE in line with the study proposed by Pasiouras (2006), otherwise the lowest TE in line with Halkos and Salamous (2004) which found that score for Greek Banking on the 60 percent value.

Value of efficiency in TE, PTE and SE on average decreased from 2007 to 2008 and then increased significantly again in 2009-2011, it is similar with Pratikto (2011) that research about efficiency on islamic bank in Indonesia during period of crisis monetary (2006-2007) and after crisis (2009-2010) and stable after 2011-2016.

For PTE result, we found that its high value same like what Another study finds PTE score for banking industry of Pakistan at 91.7 % [41] and suggest a proper sample selection for this study as well as indicate that the banks need to better utilize the available resources. Table 4, 5 and 6 provide the result of TE, PTE, SE efficiency value based on Each DMU in all period of research (2005-2016)

TABLE 4: Technical Efficiency Value each DMU Period 2005-2016 (in percentage).

DMU	TECHNICAL EFFICIENCY											
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
BANK JABAR SYA	1	1	0.96	1	1	0.77	0.67	1	1	1	1	1
BANK DKI SYARIAH	1	1	1	1	1	1	0.96	0.78	1	1	1	1
BPD RIAU SYARIAH	0.88	0.76	0.73	0.57	1	0.50	0.7	0.98	0.91	0.91	1	1
BANK KALSEL SYAR	0.63	0.48	0.62	0.88	0.82	0.92	0.71	0.88	0.99	0.95	1	0.96
BPD ACEH SYARIAH	0.76	0.91	0.94	0.92	1	1	1	1	0.89	0.98	1	0.95

TABLE 5: Pure Technical Efficiency Value each DMU Period 2005-2016(in percentage).

DMU/ BANK	PURE TECHNICAL EFFICIENCY											
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
BANK JABAR SYA	1	1	0.97	1	1	0.83	0.83	1	1	0.93	0.95	0.91
BANK DKI SYARIAH	1	1	1	1	1	1	0.97	1	0.86	1	1	0.89
BPD RIAU SYARIAH	0.92	0.88	0.81	0.76	1	0.84	0.89	1	0.94	0.84	0.73	0.76
BANK KALSEL SYAR	0.89	1	0.89	1	1	1	1	1	0.97	0.86	0.75	0.88
BPD ACEH SYARIAH	0.94	1	0.97	1	1	1	1	1	0.79	0.84	0.91	0.95

In Table 4, Table 5 and Table 6 provide the value of TE, PTE and SE for each DMU each year. Table 4 putting on the Overall Efficiency known as Technical Efficiency that

TABLE 6: Scale Efficiency Value each DMU period 2005-2016 (in percentage).

DMU/ BANK	SCALE EFFICIENCY											
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
BANK JABAR SYA	1	1	0.99	1	1	0.92	0.8	1	1	0.91	0.95	1
BANK DKI SYARIAH	1	1	1	1	1	1	0.98	1	1	1	0.85	0.91
BPD RIAU SYARIAH	0.94	0.86	0.88	0.76	1	0.62	0.77	0.79	0.88	0.92	0.88	0.81
BANK KALSEL SYAR	0.73	0.48	0.69	0.88	0.82	0.92	0.71	0.82	0.65	0.78	0.92	0.78
BPD ACEH SYARIAH	0.82	0.91	0.97	0.93	1	1	1	0.92	0.88	0.95	1	0.88

under CRS assumption. In period 2005, there are 2 banks in efficient level (Jabar Syariah and DKI Syariah) then 3 banks inefficient. The most inefficient bank is Bank Kalsel Syaria (0.89 or 89 percent). Bank Kalsel Syaria in this inefficient "condition" could be converted to efficient if bank was able to produce obtained level of output by utilizing only 11 percent less of currently utilized inputs. Other inefficient bank that have TE value 0.92 or 92 percent (BPD Riau Syariah) the possible reduction of inputs that these banks should carried out for these year to obtained output at fully efficient were 8 percent only.

¹⁵ As mentioned earlier, SE score for each bank can be obtained by taking a ratio of TE score to PTE score. The value of SE equal to 1 implies that the bank is operating at most productive scale size which corresponds to constant returns-to-scale. Table 5. shows value of PTE. At the end of research period no bank efficiency in 100 persen. Table 6. reveals that mean SE for islamic banking and SE values range from a minimum of 0.48 (Bank Kalsel yariah period 2006) to maximum of 1. Casu and Molyneux (2000), discussed that when an efficiency value of unity is achieved then this combination of inputs-outputs is the best combination units and therefore the efficient frontier is generated.

Regional bank is a bank that the owner to share holding capital from the regional government. As in Indonesia we have 33 region that known as Province. Each of this region has their own bank that operate by the own government each region. Ketkar and Ketkar (2008) found ³ that the efficiency scores of all banks, in general, have improved regardless of their holdings during the reform period. However, the efficiency difference is not significant. Das and Ghosh (2006), concluded that banks with public ownership were more efficient than their private counterparts, while other favored Mittal and Dhingra (2007) concluded that private sector banks are the best

performers. Singh et al. (2008) found that foreign banks were more efficient and showed improved efficiency during the study period while national banks decreased efficiency.

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