International Research Journal of
BUSINESS STUDIES

ISSN: 2089-6271 | e-ISSN: 2338-4565 | https://doi.org/10.21632/irjbs

Vol. 13 | No. 2

The X-Efficiency of Shariah and Conventional Banking's in Indonesia

Aimatul Yumna

Universitas Negeri Padang, Jl. Prof. Dr. Hamka, Air Tawar Bar., Kec. Padang Utara, Kota Padang, Sumatera Barat 25171

ARTICLE INFO

Keywords:
X-efficiency,
DEA,
Shariah and conventional banks

Kata Kunci:
X-efficiency,
DEA,
Bank Shariah dan konvensional

ABSTRACT

This paper investigates the X-efficiency of fifteen commercial banks in Indonesia consisting of seven Shariah banks and eight conventional banks. This study uses three stages of data analysis: non-parametric data envelopment analysis (DEA) approach, t-test, and multiple regression method. The results show that in the period of this study, both Shariah and conventional banks in Indonesia have not reached the optimal level of efficiency. However, conventional banks obtain a higher level of allocative and total efficiency compared to Shariah banks. The inefficiency of Islamic banks is stemed from allocative inefficiency rather than technical problems. The bank's X-efficiency is significantly influenced by size, rather than number of banking channels and staff costs. This study provides important implications for Shariah banking in order to improve X- efficiency and compete in the banking industry in Indonesia by focusing on the improvement of the combination of quality assets.

SARI PATI

Makalah ini menyelidiki X-efisiensi dari lima belas bank komersial di Indonesia, terdiri dari tujuh bank Shariah dan delapan bank konvensional. Penelitian ini menggunakan tiga tahap analisis data: non-parametrik, pendekatan data envelopment analysis (DEA), uji-t, dan metode regresi ganda. Hasil penelitian menunjukkan bahwa dalam periode penelitian ini, baik bank Shariah maupun konvensional di Indonesia belum mencapai tingkat efisiensi yang optimal. Namun bank konvensional memperoleh tingkat efisiensi alokatif dan total yang lebih tinggi dibandingkan dengan bank Shariah. Inefisiensi bank Shariah bersumber dari inefisiensi alokatif daripada masalah teknis. Efisiensi X bank secara signifikan dipengaruhi oleh ukuran, bukan jumlah bank saluran dan biaya staf. Studi ini memberikan implikasi penting untuk perbankan Shariah dalam rangka meningkatkan efisiensi X dan bersaing di industri perbankan di Indonesia dengan fokus pada peningkatan kombinasi aset berkualitas.

Corresponding author:
aimatulyumna@gmail.com

INTRODUCTION

Indonesia is one of the countries that is applying the dual banking system in which both Shariah and conventional banks are fully supervised by the Financial Service Authority. Since the regulations on Shariah banking were established in 1998, there has been a rapid development of Shariah banking in Indonesia both in terms of the number of assets, financing and banking channels. Yet, the market share has never exceeded five percent of total banking assets in Indonesia. Table 1 shows some statistics of Islamic banking indicators, including growth in asset values, third party funds and financing from 2011 to 2015. The table shows a slowdown in the growth of asset, third party fund and financing of Islamic banking since 2014. This growth rate is even lower than the growth of conventional banks by 9.3%. Profitability indicators also indicate that there is a significant decrease in Retun on Asset (ROA) from 2013 to 2015. This paper investigates financial performance of Shariah and conventional banks in Indonesia using efficiency measures.

The discussion of bank efficiency has attracted attentions of researchers since the study put forward by Berger et al. (1993) who found that the inefficiencies in the banking industry led to an increase in operating costs by 20%. A good level of efficiency illustrates that an insitution is able to generate maximum potential outputs from the given inputs or minimum potential inputs required to produce a given output (Lovell, 1993). In the context of Shariah banking in Indonesia, the study of efficiency is also increasingly important due to the high competition in the industry today as shown by Bank Indonesia publication data that the growth of Islamic banking over the past 5 years reached 72%. This high growth encourages banks to continuesly improve efficiency.

In the Indonesian context, some studies on banking efficiency have been conducted by several researchers with different approaches. These studies have concluded that Shariah banking in Indonesia has not reached the optimal level of efficiency (Hadad et. al, 2008; Amirillah 2010; Firdaus and Hosen 2013). Using a large dataset of whole banking industry, Hadad et. al (2008) found that average bank efficiency within industry in 2007 was between 62-67% with state owned banks appeared to be the most efficient banking groups. Furthermore, Hadad et. al (2008) found Islamic banks enjoyed efficiency level in between 57%-74%, although they had different operational structures from the conventional ones. Some other

Table 1. Development of assets, third party funds and financing in Shariah banking (in Billion Rupiah)

Indicators	2011	2012	2013	2014	2015
Total Assets (TA)	145,47	195,02	242,28	272,34	296,262
Growth of TA		3,064%	24,23%	12,41%	8,78%
Market share	3,98%	4,58%	4,89%	4,85%	4,83%
Third party funds (TPF)	115,41	147,51	183,53	217,86	231,17
Growth of TPF		27,81%	24,42%	18,71%	6,11%
Total financing (TF)	102,66	147,51	184,12	199,30	212,96
Growth of TF		43,69%	24,82%	8,24%	6,85%
ROA	1,79%	2,14%	2%	0,79%	0,84%

Source : Shariah Banking Statistics Report 2015

researchers (such as Ika and Abdullah, 2011) also compared the financial performance of Shariah banking with conventional banking, but they did not specifically focus on measuring the efficiency of the institutions.

The objectives of this paper are: (1) to measure the X efficiency of Islamic Banking in Indonesia using three measurements: technical, allocative and cost efficiency; (2) to compare the efficiency of Shariah Bank and Conventional bank; (3) to find determinant factors of banking efficiency. The X-Efficiency is an improvement of the traditional efficiency measures since it also considers cost efficiency. In addition, this study also compares the X efficiency of Shariah banking with conventional banking and analyses the factors affecting X efficiency in both banking industries. The efficiency in this study was calculated using a non-parametric method known as Data Envelopment Analysis (DEA). This research is considered useful for Islamic banks to measure their ability to compete with conventional banks and see what factors that must be considered to achieve optimal efficiency.

LITERATURE REVIEW

Efficiency in banking context

In economics, efficiency is defined as the ability of a company or an economic unit to produce maximum output with a certain amount of input. Theory of efficiency was first proposed by Farrel (1957) who suggests two types of efficiency: technical efficiency and allocative efficiency. Criticisms on measures of efficiency that include technical and allocative efficiency are expressed by Leibenstein (1966) who argued that efficiency measurement using technical and allocative efficiency was not able to fully explain the inefficiencies that occured in an economic unit. Leibenstein's theory was later known as X-efficiency. X in X- efficiency is defined as an unknown factor that causes the company's inefficiency. X-efficiency indicates the presence of non-optimal behaviour leading to company inefficiency. For example, the innapropriate allocation of managerial assignments can cause the decline in the field they manage and the overall performance of the company. The X describes a non-allocative inefficiency whose source is unknown. X-inefficiency is sourced from several factors such as imperfect market, incomplete labor contract, and/or waste in production process. X-efficiency can be stemed from technical inefficiency that occurs due to excessive input use and allocative inefficiency due to errors determining and choosing input combinations consistent with relative prices (Komaryatin, 2006).

The definition of technical and allocative efficiency in the banking context has also been explained by many experts. Komaryatin (2006), for instance, explains that banks achieve technical efficiency if they are able to produce maximum output with a certain resource or produce a certain amount of output with the least input. While the allocative efficiency is achieved if the banks are able to determine the various outputs that can maximize their profits.

In the banking industry, efficiency can be measured by two approaches: the production approach and the intermediate approach (Sathye 2001). In the production approach, the banks as a unit of economic activity perform production activities that produce output in the form of savings and loans to customers by using optimally possible all inputs they have. According to this approach, the inputs used are the amount of labor and fixed activities. While in the intermediation approach, banks are seen as intermediary institutions that change inputs in the form of public savings in various loan products.

This research uses intermediation approach because this approach is considered more relevant with banking function as intermediation institution (Berger and Humphrey, 1997). The intermediary function is more obvious for the islamic financial system that encourages participation and employs profit loss sharing method. Therefore, intermediary approach is more suitable for measuring efficiency of Islamic banking (Yudistira, 2004). The inputs used

for efficiency measurement in this study are staffs, capital and third party funds that are ready to be invested. While the resulting outputs are loans and savings. The selection of these inputs and outputs refers to a research project conducted by Sathye (2001).

Factors affecting banking efficiency

Research on Islamic banking efficiency using both parametric and non-parametric approach has been conducted in several countries such as in Sudan (Hassan and Hussein, 2003); Malaysia (Yudistira, 2004; Samad and Hassan, 2000); Bangladesh (Sarker, 1999). The findings of those studies suggest that Islamic banks suffer from inefficiency in the period of study. The inefficiency has been driven by many factors. In the case of Sudan, for example, the inefficiency has been caused by mis-selection of inputs, specifically the problems related to incompetence of the workers. In Malaysia, Yudistira (2004) found that inefficiency of banking has been due to economic crisis that occurred in Malaysia in the period of 1997-1998. Country macroeconomic factors also become important determinant variables in explaining efficiency of banking industry in Europe. Research by Maudos et.al (2002) found that European banks operating in the country with high GDP growth present higher level of profit efficiency. Using a cross country data set of 43 banks in 21 countries, Hassan (2008) provides a comparison of Islamic banks efficiency from several countries with different banking regulation and laws. Hassan found that the average cost efficiency of Islamic bank is 73,5% and the average profit efficiency is 84,4%. Islamic banks operating in the country where the banking system operates fully under Shariah law are more allocatively efficient. Compared to conventional banking, Islamic banks are less efficient and the source of inefficiency is due to allocative efficiency rather than technical efficiency.

Other determinant factors of efficiency is size of the bank. Yudistira's study (2004) found that Islamic banking with small assets has a lower value of efficiency than banks with large assets. Therefore, he suggests small banks to merge to achieve higher level of efficiency. Similarly, Hassan (2008) also notes that it is imperative for Islamic banks to merge to achieve optimal size in order to be more efficient and compete with conventional bankings. In the Indonesian context, Firdaus and Hosen (2013) also found that size is positively significant in influencing technical and allocative efficiency in Islamic banking. They believe that banks with large assets will easily adopt new technologies that can reduce the company's operational costs and achieve economies of scale. In contrast, Maudos et.al (2002) found that size does not significantly influence the efficiency of European banking. Medium sized banking enjoys higher efficiency compared to high sized banks. In addition, staff cost often becomes an important factor to explain the efficiency of an institution. Berger (1995) suggets that firms with superior management may increase their efficiency. A superior management will ask for higher salaries which causes high operational costs per staff. Using data of Australian banking, Sathye (2000) confirms that staff costs have positive and significant effects to total efficiency of Australian banking.

METHODS

The object of this research is both Shariah and conventional banking in Indonesia. At the time of this study, there were 11 Islamic banks in Indonesia, including Bank Muamalat Indonesia, Bank Shariah Mandiri, Bank Shariah Mega Indonesia, Bank Bukopin Shariah, Bank Rakyat Indonesia Shariah, Panin Shariah Bank, Bank Jabar Banten Shariah, Bank Victoria Shariah, Bank Negara Indonesia Shariah, Maybank Shariah and Bank Central Shariah Asia. Due to the availability of data, this study only included seven banks as the samples. In addition, for comparison purposes, eight randomly selected banks were included in this study. In total, the number of samples is 15 banks. This number has met the minimum sample requirement in the use of the DEA model as proposed by Soteriou and Zenios (1998) stating that the number of samples used should be greater than the multiplication

between input and output. Further, Nunamaker (1985) states that the number of samples used in the DEA model should be at least three times greater than the multiplication between input and output. This study mainly used secondary data in the form of financial statements issued by the Financial Services Authority (OJK). The selected research period is 2011-2015

This X-efficiency measurement uses input variables and output variables. The inputs used are: X1: labor and X2: third party funds ready to be invested. The cost variable are P1: total employee expenses per total asset and P2: interest cost per third party fund. While the output is Y1: total financing disbursed. Description of the variables used are presented in the following Table 2.

Table 2. Input-Output Variables Description

Input-Output Variables Description	
Variables	**Descriptions**
Y	Total financing
X1	Number of labor
X2	Third party funds
P1	Price of employee% (total employee expenses/total asset)
P2	Price of funds (total interest expenses/total third party fund)

Source : author own work

X-efficiency can be calculated by separating relatively better performing institutions from relatively poorly performing institutions. This separation can be done in two ways; using non-parametric approach and parametric approach frontier (Sathye 2001). Data Envelopment Analysis (DEA) is a non-parametric method used in measuring the level of efficiency of a decision-making unit (DMU); in this study the DMU is a bank. This technique will create a frontier set that compares efficient and inefficient banks and calculates efficiency scores between 0 and 1. DEA was firstly introduced by Charnes, Cooper and Rhodes in 1978 based on the efficiency study by Farrel (1957). The general DEA equation is :

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

Where h_s shows the technical efficiency of the bank s; y_{is} the output used by the bank s; and u_{js} is the output weight; x_{js} is the input used by the bank s; and v_{js} is input weight. As the maximum efficiency score is 1, the constraint function must be made as follows:

$$\frac{\sum_{i=1}^{m} u_{iS} y_{is}}{\sum_{j=1}^{n} v_{jS} x_{js}} \leq 1 \; for \; r = 1 \ldots N \; and \; u_{iS} \; and \; v_{jS} \geq 0$$

N in the function shows the number of samples. The first equation ensures that the efficiency ratio is not more than 1. The second equation ensures that the efficiency value is always positive. DMU is said to be efficient if the ratio value is close to 100 percent, and getting closer to 0 indicates the lower the efficiency value. This research used DEAP software to measure technical efficiency, allocative efficiency and cost efficiency of banks in Indonesia.

The second stage of data analysis is comparing X-efficiency of Shariah banking and conventional banking in Indonesia by using t-test metho-. Unequal variance t-test requires research data to be grouped based on certain criteria. In this study, the three measurements of efficiency, including technical, allocative and total (cost) efficiency of Shariah banking, were compared to conventional banking.

Lastly, factors affecting the X-efficiency of Islamic banking and conventional banking in Indonesia were compared using multiple regression model. Referring to the research proposed by Firdaus and Hosen (2013), Sathye (2001) and Hassan (2008), the dependent variable used in this study is the total efficiency value calculated by the DEA method. While the independent variables include the size of banking proxied by total assets (X1), numbers of banking channels (X2) and cost per employee (X3) and Dummy variables in the form of bank statue (1 = Conventional Bank and 0 = Bank Shariah).

The regression model of factors affecting the efficiency of banking is as follows:

$$Y = a + b_0 + b_1X_1 + B_2X_2 + b_3X_3 + b_4D_1 + e$$

Where:
Y = Total efficiency calculated by the DEA method
= coefficients
X1 = ln total assets
X2 = number of branches
X3 = cost per employee
D1 = dummy variable (1 = Conventional Bank, 0 = Shariah Bank)

The data used in this model should be measured correctly in the sense of having to go through the classical assumption test first. Classical assumption test used include normality test, autocorrelation test, heteroscedasticity test and multi-collinearity test.

RESULTS AND DISCUSSION

Descriptive statistics

The results of the statistical description shows that Shariah banking in Indonesia has a much smaller size compared with conventional banking when viewed from the total financing, the number of employes and the amount of third party funds. Based on the data shown in Table 3, Shariah banking is able to distribute an average loan of IDR 14,307 million or only about 7.5% of total loans disbursed by the conventional banking. While from the third party fundraising capabilities, Shariah banks are only able to collect approximately IDR 15,531 million or 6% of third party funds collected by conventional banking. Different results are found in employee cost per total asset and cost of funds. The data in this study indicates that the cost of employees per total assets and cost of funds of Shariah banks are greater than the cost incurred at the conventional banking. The average employees cost incurred by Shariah banks is 2.1% of total assets, while conventional banks only charge 1.3% of their total assets. The cost of funds of Islamic banking is 4.7%, which is higher than the cost of fund conventional banks in the amount of 4.1%.

The results of the statistical descriptions of this study indicate that Shariah banking has not yet reached the economies of scale that enable them to operate efficiently. One of the possible reasons is the age of Shariah banks is still relatively much younger than conventional banking. It may take a long time to socialize the principles of Shariah banking to the people of Indonesia.

The X-Efficiency with Data Envelopment Analysis Method

The X-Efficiency of Shariah Banks

Efficiency is an indicator of the performance of an institution that compares the level of output and inputs used. An institution is said to be efficient when it can get maximum output from a certain

Table 5. Statistics Descriptives

	Shariah banks	Conventional banks
Variable	Mean (*st dev*)	Mean (*st dev*)
Y/Output (total financing) in million Rp	14.307,828	188.920,542
	16.708,458	*134.597,841*
X1/Input1 (number of employee)	4.070,667	20.892,333
	5.049,847	*20.349,541*
X2/Input2 (total third party funds)	15.581,179	242.706,542
	18.104,278	*178.124,115*
P1 (employee cost per total asset)	0,021	0,013
	0,006	*0,003*
P2 (cost of fund)	0,047	0,041
	0,010	*0,014*

SPSS output

input level or use minimal input to produce a certain output. An efficient institution will always minimize its unit cost of production at a given level of output. The level of efficiency measured using the input and output comparison approach is known as technical or operational efficiency.

The data of this study shows that the average technical efficiency of Shariah banks in Indonesia from 2011 to 2015 is 93.4%. The value of technical efficiency of 93.4% indicates that Shariah banks have not been able to optimize the use of input in the form of employees and Third Party Fund to produce maximum financing output. In other words, there are still wasted / unused inputs. Although the average technical efficiency of Shariah banks is not yet optimal, Table 4.2 shows that there are several Shariah Banks that have reached the optimum technical efficiency level of 1. They are Bank Rakyat Indonesia Shariah, Bank Muamalat Indonesia, Bank Shariah Mandiri and Bank Bukopin Shariah. While the banking with the lowest technical efficiency is Bank Central Asia (BCA) Shariah.

Another measure of efficiency is the allocative efficiency, which is an instution's ability to use and allocate inputs in optimal proportions. Allocative efficiency is characterized by reduced production costs proportionately. To calculate the allocative efficiency, this study uses two cost variables, namely employee cost per total asset and interest cost per third party fund amount.

The result of data analysis presented in Table 4 shows that the average of the allocative efficiency of Shariah banks is lower than technical efficiency that is equal to 84,8%. This finding shows that the costs incurred to use inputs are still too high. To achieve optimum allocative efficiency levels, Shariah banking can review policies related to employment and interest costs. Although the average allocative efficiency of Shariah banking is lower than technical efficiency, the results show that Bank Shariah Mandiri (BSM) is able to achieve optimum allocative efficiency of 1. This means that BSM is able to allocate inputs in the right proportion.

Another measure of efficiency that focuses on this research is X-Efficiency. X in X- efficiency is defined as an unknown factor leading to inefficiency of an institution. X-efficiency indicates a non-optimal behaviour that causes inefficiency. Quantitatively, X-Efficiency is proxied as the total efficiency or that is a multiplication of technical and allocative efficiency (Hassan 2008; Sathye 2001).

The results presented in Table 4 also show that Shariah banks in Indonesia have an average cost efficiency of 79.4%. Nevertheless, this study also found that Bank Shariah Mandiri (BSM) is consistently able to achieve optimal levels of efficiency, including technical, allocative and cost efficiency. It can be said that in the period of research (2011-2015), Bank Shariah Mandiri is the most efficient Shariah bank in Indonesia. The cause

Table 4. X-Efficiency of Shariah Banks in Indonesia

Shariah Banks	TE	AE	Overall /Cost Efficiency
Bank Central Asia Shariah (BCAS)	0,654	0,894	0,564
Bank Negara Indonesia Shariah (BNIS)	0,968	0,961	0,962
Bank Rakyat Indonesia Shariah (BRIS)	1,000	0,797	0,797
Bank Muamalat Indonesia (BMI)	1,000	0,950	0,950
Bank Victori Shariah (BVS)	0,945	0,693	0,638
Bank Shariah Mandiri (BSM)	1,000	1,000	1,000
Bank Bukopin Shariah (BBS)	1,000	0,644	0,644
Average	**0,938**	**0,848**	**0,794**

Table 5. Technical Efficiency, Allocative Efficiency and Total Efficiency of Conventional Banks in Indonesia

Conventional banks	TE	AE	Total Efficiency
Bank Negara Indonesia	0,963	0,999	0,963
Bank Rakyat Indonesia	0,967	1,000	0,967
Bank Mandiri	1,000	0,996	0,996
Bank Tabungan Negara	1,000	1,000	1,000
Bank Central Asia	0,959	0,903	0,865
Bank Permata	0,993	0,960	0,953
Bank Panin	0,984	0,944	0,929
Bank Bukopin	1,000	1,000	1,000
Average	0,983	0,975	0,959

of ineffective cost efficiency of Shariah banks is the inability of the companies to allocate input optimally. Hassan (2008) mentions that allocative inefficiency can also be attributed to lack of adequate support from government policies and national banking infrastructure such as the maximum interest rate policy.

Overal findings show that the average technical efficiency of Shariah banking is 0,938 and the average allocative efficiency is 0,848. The findings suggest that the inefficiency of Shariah banking in Indonesia can be attributed to choosing the incorrect input combinations rather than wasting of input.

The X-Efficiency of Conventional Banks

This study also measures X Efficiency of eight conventional banks in Indonesia consisting of Bank Negara Indonesia (BNI), Bank Rakyat Indonesia (BRI), Bank Mandiri, Bank Tabungan Negara (BTN), Bank Central Asia (BCA), Bank Permata , Bank Panin, and Bank Bukopin during the 2011-2015 period. The results of the research presented in table 5show that on average the Conventional Banking in Indonesia has not yet been able to achieve the optimal level of efficiency either for the size of technical efficiency, allocative or total. However, each measure of efficiency shows a high value above 95%. This indicates that the banking industry in Indonesia has almost reached the optimum level of efficiency.

The research findings as presented in Table 5 also show that there are two conventional banks in Indonesia that achieve the optimum level of technical, allocative and total efficiency. These banks are Bank Tabungan Negara (BTN) and Bank Bukopin. The data also shows that the bank with the lowest efficiency value is Bank Central Asia (BCA). The results of this study is quite interesting because BCA has a wider distribution network and has adopted a sophisticated information technology system. Therefore, it is necessary to further analyse the factors that affect the efficiency value.

T- test on the Efficiency of Shariah and Conventional Banking

T-test was coducted to see whether the efficiency value of Shariah and conventional banks is significantly different. T-test assuming unequal variance values. T-test results of Shariah and conventional banking efficiency in Indonesia for 2011-2015 are presented in table 6.

The results presented in Table 6 show that the technical efficiency between Shariah banks and conventional banks does not differ significantly. However, the t-test findings show that conventional banks are more efficient than Shariah banking based on allocative and total efficiency measures. The results of this study confirm the results of a statistical description analysis indicating that the allocation of employee costs and the cost of Islamic banks funds is higher than that of conventional

Table 6. T-test Efficiency of Shariah and Conventional Banks

Efficiency	Technical	Allocative	Total
Average efficiency of Shariah banks	0,938	0,848	0,794
Average efficiency of conventional banks	0,983	0,975	0,959
t-stat	*-1,290*	*-2,228**	*-2,702**
p-value	*0,210*	*0,037*	*0,013*

* significant at 5%

banks. To achieve the optimum level of efficiency Shariah banks can review their cost policy especially related to employee cost and funding cost.

Factors affecting banking efficiency

Regression analysis is used to determine whether the total efficiency of banking in Indonesia as a dependent variable is influenced by factors such as firm size (measured by total assets), bank network (measured by number of branches), employee cost (measured by cost per employee) and bank status as a Shariah bank or a conventional bank as a dummy variable. The hypothesis tested is that there is a positive relationship between total assets, network and cost per employee with banking total efficiency. The result of regression analysis of total efficiency of banking is shown in Table 7.

Table 7 shows that the only significant variable affecting total banking efficiency is firm size (asset) with p value of 0,032. The coefficient generated from the regression model of the asset variable is positive. This means that the bigger the size of the company, the banking will be more efficient. While other variables such as banking networks and labor costs have no significant effect on banking efficiency.

The results of this study are in line with the research conducted by Firdaus and Hosen (2013), Hassan (2008) and Yudistira (2004) which confirmed that assets significantly positively affect efficiency. This finding confirms the theory of economies of scale where large size firms can efficiently allocate inputs to produce optimal outputs. The findings also suggest that staff cost does not significantly affect the bank total efficiency score in Indonesia. The results of this study contradict with the research on the efficiency of banking in Australia conducted by Sathye (2001) who found that banks with higher payment for their employee salaries will achieve better efficiency scores. Related to the bank network, the study also revealed that number of banking channel is also not a significant factor in explaining the banking efficiency. This study also contradicts with another study by Firdaus and Hosen (2013) who found that the more branch offices the bank has, the more inefficient banks are in managing their resources.

This research also uses a dummy variable in the form of banking status, ie 1 for conventional bank and 0 for Shariah bank. The purpose of dummy usage of this variable is to see whether the status of

Table 7 Regression analysis between total efficiency with firm size, network, employee cost and banking status

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0,263	0,231	1,137	0,262
Asset	0,059	0,027	2,220*	0,032*
Number of Branch	0,000	0,000	-0,499	0,620
Staff cost	0,016	0,626	0,025	0,980
Dummy Variable	-0,023	0,113	-0,203	0,840

* significant at 5%, R-square = 26,36%

banking as a conventional/Shariah bank influences the achievement of company efficiency. The results of this study indicate that the status of banking (Shariah/conventional) does not significantly affect the efficiency of banking.

MANAGERIAL IMPLICATIONS

The results of this study suggests that efficiency in Indonesian commercial banking is only influenced by the total asset; while staff cost and number of banking channels are not significant in determining the efficiency scores. This finding may provide managerial implications such as in order to achieve optimum level of efficiency, small size Islamic banks may consider to merge with others to be able to compete in the banking industry in Indonesia. In addition, Islamic banks should continue to enhance their market shares by socializing Islamic banking product and services to various market segments. It is imperative for Islamic banks to invest on enhancing financial education for the society, as limited society participation in Islamic banking may due to limited financial literacy about Islamic banking values, products and services. .

CONCLUSION

The objectives of this study are to compare the X-efficiency including technical, allocative and cost efficiency between Shariah and conventional banks in Indonesia and to find the determinant factors of the total efficiency of these institutions. Using non-parametric DEA approach, this study found that Shariah banks in Indonesia have not reached the optimal level of X-efficiency (technical, allocative and total) except for Bank Shariah Mandiri. Similarly, overall findings also suggest that conventional bank have not reached the optimal level of X-efficiency, except for Bank Tabungan Negara (BTN) and Bank Bukopin. The t-test shows that coventional banks are significantly more allocatively efficient than Shariah Banks. The inefficiency in Shariah banks are stemed from incorrect inputs combinations. The results from regression explains that the only significant factor influencing efficiency of Shariah banks is total assets. To reach optimal level of efficiency, this study suggests that Shariah banks have to focus on improving the allocation of assets. ■

REFERENCES

Amirillah, M. A. (2010). *Efisiensi Perbankan Syariah di Indonesia Tahun 2005-2009*. Doctoral dissertation: Universitas Diponegoro.

Bank Indonesia. (2011). Statistik Perbankan Syariah. Jakarta

Bank Indonesia. (2015). Statistik Perbankan Syariah. Jakarta

Berger, A. N., & Humphrey, D. B. (1991). The dominance of inefficiencies over scale and

product mix economies in banking. *Journal of Monetary Economics*, *28*(1), 117-148.

Charnes, A., W. Cooper, and E. Rhoades (1978) Measuring Efficiency of Decision Making Units. *European Journal of Operational Research* 2, 429–44

Firdaus, M. F., & Hosen, M. N. (2013). Efisiensi Bank Umum Syariah Menggunakan Pendekatan Two-Stage Data Envelopment Analysis. *Buletin Ekonomi Moneter dan Perbankan, October*

Hadad, M.D, M.JB. Hall, K. Kenjegalieva, W. Santoso, R. Satria and R. Simper (2008). Efficiency in Indonesian Banking : Recent Evidence. *Departement of Economics Loughborough University Working Paper* 13

Hassan, Kabir M. (2006). The X-Efficiency in Islamic Banking. *Islamic Economic Studies* 13(2)

Ika, Siti Rochmah Ika, Abdullah , Norhayati. (2011). A Comparative Study of Financial Performance of Islamic Banks and Conventional Banks in Indonesia. International Journal of Business and Social Science 2 (15)

Komaryatin, N. (2006). *Analisis Efisiensi Teknis Industri BPR di Eks Karesidenan Pati*. Doctoral dissertation, Program Pascasarjana Universitas Diponegoro.

Leibenstein, H. (1966). Allocative efficiency vs.» X-efficiency». *The American Economic Review*, 392-415.

Lovell Knox, C.A. (1993) Production Frontiers and Productive Efficiency, in The measurement of productive efficiency : Techniques and applications,ed. Fried, H.O., Knox Lovell, C.A., Schmidt, S. S., Oxford University Press, 1993

Maudos, Joaquin, Pastor Jose M, Perez, Francisco, Quesada, Javier (2002). Cost and profit efficiency in European banks. *Journal of International Financial Markets, Institutions and Money* 12, 33-58

Nunamaker, T. R. (1985) Using Data Envelopment Analysis to Measure the Efficiency of Non-Profit Organisations: A Critical Evaluation. *Managerial and Decision Economics* 6: 1, 50–58.

Sarker, M.A.A.(1999). Islamic Banking in Bangladesh: Performance, Problems and Prospects. *International Journal of Islamic Financial Services 1*

Sathye, M. (2001). X-efficiency in Australian banking: An empirical investigation. *Journal of Banking & Finance*, *25*(3), 613-630.

Soteriou, A., and S. Zenios (1998) Data Envelopment Analysis: An Introduction and Application to Bank Branch Performance Assessment. In G. Marcoulides (ed.) *Modern Methods for Business Research*. London: Lawrence Erlbaum Associates. p. 136.

Yudistira, Donsyah. (2004). Efficiency in Islamic Banking : An Empirical Analysis of Eighteen Banks. *Islamic Economic Studies* 25(1)