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EFFICIENCY OF ISLAMIC BANKING COMPARED TO CONVENTIONAL BANKING: EVEIDENCE FROM INDOENSIAN BANKING SECTOR

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Abstract - Islamic banks today have rapid growth around the world. According to Solé (2007), Islamic banks exist not only in the countries that have a majority Muslim population, but also countries where Muslim are not predominant. From Indonesian Banking Statistics data in 2004-2013, Islamic banks have higher LDR than conventional banks. The main issue in this research is whether Islamic banks can maintain their efficiency while they increasing their performance. The hypothesis of this research is the efficiency of Islamic banking is higher and statistically significantly different from conventional banking. This research uses output-oriented VRS DEA model with asset approach to measure efficiency. Then, Mann-Whitney test used to compare the DEA results since the results show non-parametric data. Lastly, Spearman's correlation will be applied in order to analyze the relationship between loans to deposit ratio with the efficiency of both types of the bank. The DEA and Mann-Whitney test results prove that Islamic banking is significantly different and more efficient than conventional banks in the period of 2004-2013. It proved by DEA results in 2005, 2010, 2011, 2012, and 2013. In these years, Islamic banks are statistically significant more efficient than conventional banks. Then this result was supported by single-multi year efficiency that proved that Islamic banks are significantly different and more efficient than conventional banks. The Spearman's correlation findings identifies there is significant correlation between LDR and efficiency of both types of bank at significance level 0.01. The Spearman's correlation coefficient is 0.293, which means there is a weak relationship between LDR and efficiency of both types of the bank. This research's results can be used as consideration for the government to assign Islamic banks to support real sector since Islamic banks allocate most of their fund to financing (lending) products. Furthermore, intermediary and production approach can be considered to apply in the future research to get better insight. The lack of explanation why Islamic banking is significantly different and more efficient than conventional banking can be a topic of the future research.

Keywords: asset approach, Data Envelopment Analysis (DEA), efficiency, Islamic banks

Introduction

Islamic banks today have rapid growth around the world. According to Solé (2007), Islamic banks exist not only in the countries that have a majority Muslim population, but also countries where Muslim are not predominant. As a variety type of bank, Islamic bank also have similar basic banking function like conventional bank that is to receive surplus money from people who are not using it and serve it as a loan for those who need it for productive purpose. The different part that distinguishes Islamic banking from conventional banking is the way they taking revenue. Islamic banking use profit sharing for generates revenue, not interest like used in conventional banking (Yumanita and Ascarya, 2005). Islamic law (sharia) regards interest as *riba'* and prohibit to receiving or giving it. Revenue that Islamic bank gets must derive from financial transactions based on real economic activities that are not banned by the Islamic law (gambling, alcohol, and tobacco are examples of banned industry).

Since the world's first Islamic bank was established in Egypt in 1963, Islamic banks start growing and expanding rapidly across the world. According to the World Bank's data, there are 400 Islamic

financial institutions from 58 countries that operating across the world in 2014. Meanwhile, the total assets of the Islamic banking industry in 2013 reach USD1.57 trillion (Islamic Financial Service Board, 2013). These facts shown how fast Islamic banks grow in the banking industry.

Islamic banks starts emerge in Indonesia at 1992 marked by Government Regulation No. 72 of 1992 about Bank Based on Profit Sharing. Islamic banks in Indonesia divided into two types, Islamic commercial banks and Islamic business units (IBU). The difference of IBUs and Islamic commercial banks is IBUs are a unit of conventional bank that serve Islamic banking products and services. In 2004, there were only 18 of Islamic banks operating, consist of 3 Islamic commercial banks and 15 Islamic banking units that owned by conventional commercial banks. Then, there is a growth in number of Islamic banks that operating in Indonesia from 18 banks become 34 banks in 2013, consist of 11 Islamic commercial banks and 23 Islamic banking units that owned by conventional commercial banks.

Table 1.1 Number of Islamic Banks that Operating In Indoensia from 2004 to 2013

Type of Bank	Year				
	2004	2005	2006	2007	2008
Islamic Comercial Banks	3	3	3	3	5
Islamic Banking Unit	15	16	17	23	23
Total	18	19	20	26	28

Type of Bank	Year				
	2009	2010	2011	2012	2013
Islamic Comercial Banks	6	11	11	11	11
Islamic Banking Unit	25	23	23	24	23
Total	31	34	34	34	34

Source: Indonesian Banking Statistics, 2004-2013

The growth of Islamic banking not only showed by number of operating Islamic banks, but also can showed by the growth of Islamic banks total asset. The average of total asset growth of Islamic banking industry was reach 26% per year from 2004 to 2013. Meanwhile, the average total asset growth of conventional bank only increased of 13% per year for the same period.

Islamic banking is in expansion stage (see Figure 1.2). Both of Islamic banks and conventional banks provide the community with various forms of products and services. One of the services that both of bank types give is financing or lending service. Table 1.2 shows that Islamic banks have the higher performance of loan to deposit ratio (LDR) than conventional banks. It means that Islamic banks have higher allocated fund of third party fund in loans than conventional banks. According to Muharam and Yumanita (2007), efficiency becomes so important because the expansion of credit offer without considering the efficiency can affect the profitability. The main issue in this research is whether Islamic banks can maintain their efficiency while they increasing their performance. A company considered as an efficient company when the input that company used is less than the input used by other companies to produce the same output or using the same number of inputs to produce a more output than the other company (Sabar, 1989). Therefore, this research will measure the comparison efficiency of Islamic and conventional banks. The efficiency of conventional banks needs to be measured because it will be benchmark to find out how efficient the Islamic banks.

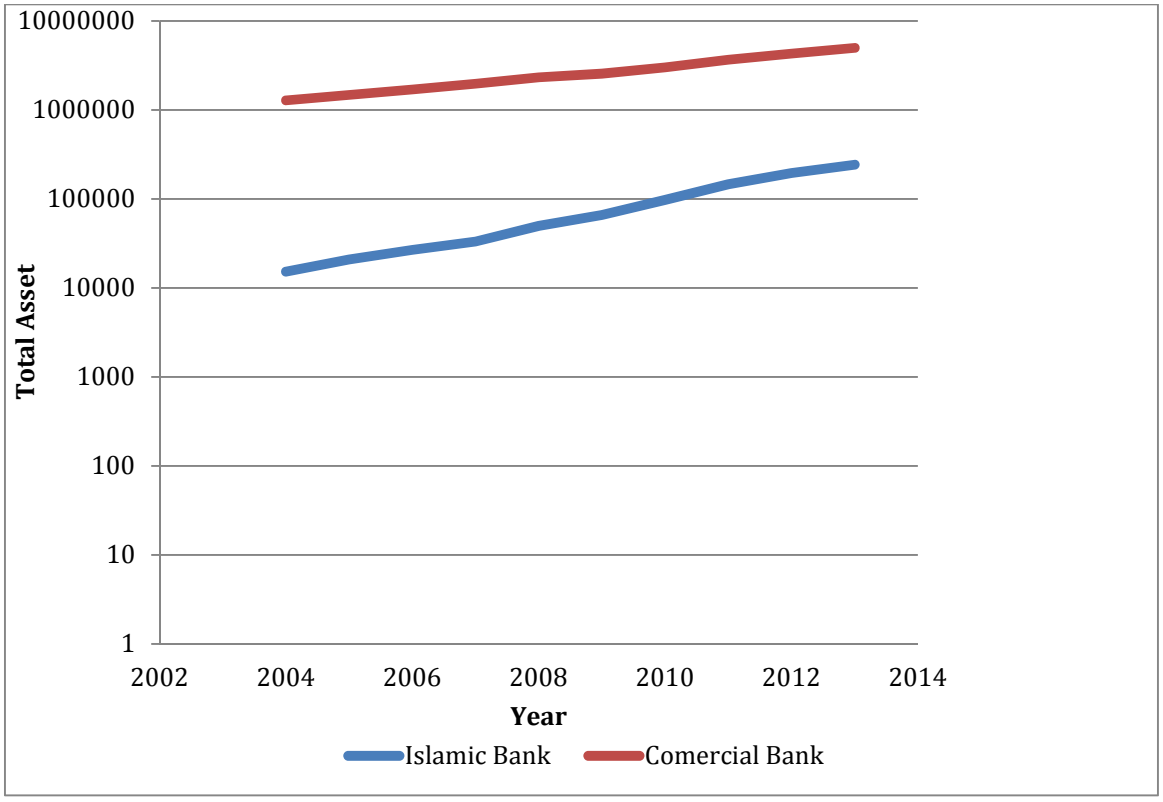

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Figure 1.2 Islamic banking and conventional banking growth (Source: Indonesian Banking Statistics, 2004-2013)

Table 1.2 Loan to deposit ratio of Islamic banks and conventional banks

Type of Bank	Year				
	2004	2005	2006	2007	2008
Conventional Banks	49.95%	59.66%	61.56%	66.32%	74.58%
Islamic Banks	96.64%	97.76%	98.90%	102.65%	103.66%

Type of Bank	Year				
	2009	2010	2011	2012	2013
Conventional Banks	72.88%	75.21%	78.77%	83.58%	89.70%
Islamic Banks	89.70%	89.67%	88.94%	100.00%	100.32%

Source: Indonesian Banking Statistics, 2004-2013

Business Issue Exploration

This chapter preserves literature review of previous researches that have relevant topic to this research. The literature review examines the comparison of differences in the Islamic banks financial report and conventional banks financial report and previous research about comparison efficiency of Islamic banks and conventional banks.

The data of the research is the financial report of Indonesian Islamic banks and Indonesian conventional banks from 2004 to 2013. Total deposits and total asset used as input variables in the VRS DEA model measurements. Meanwhile, total loans, income, and investment used as output variables in the VRS DEA model measurements. Then, VRS (variable return on scale) DEA (data envelopment analysis) model is performed to determine the efficiency of Indonesian Islamic banks

and Indonesian conventional banks. After that, statistical independent sample Mann-Whitney test applied to determine whether there is a difference in efficiency of Indonesian Islamic banks and Indonesian conventional banks or not. Lastly, Spearman's correlation test will be performed in order to seek the relationship between LDR toward the efficiency of Islamic and conventional banks.

Both Islamic banks use different standard of financial report with conventional banks. The standard of Islamic banks financial report in Indonesia is based on the Accounting and Auditing of Islamic Financial Institutions (AAOIFI) and Statement of Financial Accounting Standards No. 101. Meanwhile, for Indonesian conventional banks, the financial report is based on the International Financing Reporting Standards (IFRS) and Statement of Financial Accounting Standards No. 31. Financial report of Indonesian commercial banks, Indonesian Islamic commercial banks, and Indonesian Islamic business units from 2004-2013 were collected to conduct this research. Most of data were obtained from Financial Service Authority and some data that not available in Financial Service Authority were obtained from *Infobank* magazine. However, there are still missing data that cannot be collected.

Table 2.1 Numbers of Collected Data

Year	2004	2005	2006	2007	2008
Conventional Banks	99	114	103	103	112
Islamic Bank	18	21	23	29	30

Year	2009	2010	2011	2012	2013	Total
Conventional Banks	107	109	106	108	108	1069
Islamic Bank	31	34	34	35	34	289

Source: Financial Service Authority and *Infobank* Magazine.

The hypothesis of this research is the efficiency of Islamic banking is higher and statistically significantly different from conventional banking. There is a significant relationship between LDR and efficiency of Islamic banks and conventional banks. The higher LDR of Islamic banks compare to its conventional banks counterparts indicates that Islamic banks more efficient than conventional banks as well.

There are many studies about the comparative efficiency of Islamic banks and conventional banks have been done over the world. The approach used was different, some studies use nonparametric approach, but some other studies use another approach by using the parametric approach. In this chapter, there will be five previous studies about the comparative efficiency of Islamic banks and conventional banks will be discussed.

Mokhtar et al. (2006) analyzed the efficiency of the Malaysian Islamic banks in the period of 1997 to 2003, the period which Islamic banking was introduced in Malaysia. With Stochastic Frontier Approach that also for the first time applied to measure the efficiency of Islamic banking, the results showed that the overall average efficiency of Islamic banking industry in Malaysia has increased over the study period. In terms of assets, deposits, and financing increased rapidly between 1997 and 2003. However, the level of efficiency of Islamic banking is still less efficient than conventional banks. The study also concluded that foreign banks are more efficient than domestic banks in Malaysia.

Hassan et al. (2009) were conduct research to compare the efficiency of conventional banks to Islamic banks over the period 1990-2005 uses Data Envelopment Analysis. The data used in this study was gathered from 40 banks in 11 Organization of Islamic Conference countries. Labor cost, fixed cost, and total fund were used as input variables. for output variables, there were total loans,

other earnings asset and, off-balance sheet. The results found that there is no significant difference in mean cost, revenue, and profit efficiency scores between conventional and Islamic banks.

Magrianti (2011) conducted research about the comparative efficiency of Indonesia Islamic banks and Indonesia conventional banks using Data Envelopment Analysis (DEA). The data used in this research was both Islamic banks and conventional banks financial statements from 2004 to 2009. From the calculation of DEA with asset approach, production, and intermediation approach obtained that the average value of the efficiency of commercial banks in Indonesia is still below average. From the approach of assets and production approach showed that conventional banks were above the average value of efficiency. While, Islamic banking was above the average value of efficiency in the intermediation approach. The research found that there is a possibility that some variables less in accordance with Islamic banking scheme compared to conventional banking. Therefore, for some of the banks that have personnel costs as a cause of inefficiency should improve (reduction or increase) performance of other variables, such as an increase in output.

Rosyadi and Fauzan (2011) conducted comparative efficiency of Indonesian conventional banks and Indonesian Islamic commercial banks for the period 2006-2010. They used Data Envelopment Analysis method to measures the efficiency. Samples of this study were 5 state owned conventional banks and 3 Islamic commercial banks. They used intermediary approach to determine variables of input and output. The input variables were labor cost, deposits, and total assets. The output variables were income and financing or loans. The result of this study was Islamic banks were relatively more efficient than conventional banks based on overall efficiency.

Recently, Faturohman (2013) analyze efficiency Indonesian Islamic banks compared to their Indonesian non-Islamic banks counterparts on the period of 2003-2010. This empirical research used Data Envelopment Analysis (DEA) method to measure the efficiency of both types of banks. This research was propose a new approach of DEA efficiency measurement in this research by focusing on stakeholder efficiency and compares the results to each other types of banks. There were 4 stakeholders that referred, customer, community, employee, and shareholders. This research also applied regression analysis to determine the significance of different components of stakeholder efficiency with considering to the growth of Islamic banking in Indonesia. Results from this research were suggested that Islamic banks were different with non-Islamic banks. To reach sustainable growth, Islamic banks should improve their stakeholder efficiency.

DEA have been most frequently used method to conduct research about Islamic banks efficiency analysis and comparative study of Islamic banks efficiency and conventional banks efficiency. Commonly, the previous studies use intermediary approach to calculate efficiency of Islamic and conventional banks. Research about comparison efficiency of Islamic banks and conventional banks using DEA with asset approach was rarely conducted in Indonesia. This research will apply VRS DEA model with asset approach to measure comparison efficiency of Indonesian Islamic banks and its conventional counterparts. Independent test will be performed using Mann-Whitney test to find out there is any difference between Islamic banks efficiency and conventional banks efficiency. Spearman's correlation will be applied to find out the relationship between loan to deposit ratio and efficiency of both types of the bank.

Business Solution

This research uses output-oriented VRS DEA model with asset approach to measure efficiency. DEA have been most frequently used of the non-parametric method to conduct Islamic banks and conventional banks efficiency analysis research. Asset approach is used in this research because this research wants to seek the impact of the loan to deposit ratio to the efficiency of Islamic banks and conventional banks. The Variable Return to Sale (VRS) model used in this research because it can devoid scale efficiency effects when calculating the technical efficiency (Coelli, 1996). This research

use output-oriented measurement since this research want to seek numbers of outputs can be produced with existing inputs (Coelli, 1996). Mann-Whitney test used to compare the DEA results since the results show non-parametric data. Lastly, Spearman's correlation will be applied in order to analyze the relationship between loans to deposit ratio with the efficiency of both types of the bank.

Efficiency is analysis to describe relationship of produced output with input. According to Farrell (1957) the efficiency of the company consists of two components; technical efficiency and allocative efficiency. Technical efficiency describes the ability of the company to generate output with a number of inputs available. While, allocative efficiency describes the company's ability to optimize the use of inputs, the price structure, and production technology. The two measures are then combined into economic efficiency.

There are two general methodologies to measuring efficiency; parametric approach based econometric techniques and non-parametric approach based on linear programming. The main differences in the two approaches are how to deal with random errors and assumptions that decided limits of efficiency (Mokhtar et al. 2008).

According Yumanita and Ascarya (2005), Parametric approach calculates efficiency using stochastic econometric and trying to eliminate interference out of inefficiency influence. There are 3 parametric economic approaches: Stochastic Frontier Approach (SFA), Thick Frontier Approach (TFA), and Distribution-free Approach (DFA).

Nonparametric linear programming approach measures nonparametric approach that is not stochastic and tend to combine the interference into inefficiency. It formalizes based on the findings and observations of the population and evaluates the relative efficiency of the observed units. There are 2 approaches to calculate non-parametric efficiency; Free Disposal Hull Analysis (FDH) and Data Envelopment Analysis (DEA). The well-known approach to measure nonparametric efficiency is Data Envelopment Analysis (DEA). DEA is a mathematical programming technique that measures the efficiency of decision-making units relative to a similar decision-making unit in which all of these units are line on or below its efficient frontier curve (Charnes et al., 1978).

DEA is a non-parametric approach in frontier estimation. DEA measures the efficiency of decision-making units relative to a similar decision-making unit in which all of these units are at or below its efficient frontier curve (Charnes et al., 1978).

Charnes et al. (1978) proposed a model that assumes the existence of Constant Return to Scale (CRS). The model is the development of the idea of Farrell (1957). CRS is the same proportional change in input level will result in the same proportionate change in the level of output. Then, the model was known as CCR (Charnes-Cooper-Rhodes) DEA. It was also known as CRS DEA.

DEA CRS model have a weakness that is the model only appropriate when all decision-making units are operating at optimal scale. Decision-making units operate not at optimal scale when there are some imperfections in competition, constraints on finance, etc. (Coelli, 1996). In 1984, Banker, Charnes, and Cooper proposed an extension of the CRS DEA model to account fro Variable Return to Scale (VRS) situation. The technical efficiency will confounded by scale efficiency when CRS used in the condition of some decision-making units not operating in the optimal scale. VRS will permit the calculation of technical efficiency to devoid these scale efficiency effects.

There are 2 orientation based to calculate DEA. The first one is input-oriented measurement. According to Coelli (1996), input-oriented measurement show a number of inputs can be reduced proportionately without changing the amount of output produced. The next one is output-oriented measurement. Output-oriented measurement show number of outputs can be increased

proportionally without changing the number of inputs in use (Coelli, 1996). This research use output-oriented measurement since this research want to seek number of outputs can be produced with existing inputs.

Assume that there are K inputs and M outputs for each of N banks. The i^{th} bank is represented by column vectors x_i and y_i. The data of all banks are represented by the K x N input matrix, X, and the M x N output matrix, Y. The objective of a DEA model is to construct a non-parametric envelopment frontier where the entire observed points lie on or below the frontier. The envelopment of output-oriented VRS model can be derived as follows:

$$\max_{\phi,\lambda} \phi$$
$$\text{subject to } -\phi y_i + Y\lambda \geq 0,$$
$$x_i - X\lambda \geq 0,$$
$$N1'\lambda = 1$$
$$\lambda \geq 0.$$

Where $1 \leq \phi < \infty$, and ϕ-1 is the proportional increase in outputs that could be achieved by the i^{th} decision-making unit, with input quantities held constant.

According to Hadad et al. (2003), there are 3 approaches that can be used to determine variables of input and output of financial institutions: the intermediary approach, production approach, and the approach of assets (asset approach). Intermediary approach describes bank as a channel to distributed fund from depositors to debtor. Production approach describes the bank as a producer of production services for depositors and borrowers of credit. Asset approach sees the primary function of a financial institution as credit creator. Asset approach is approach that used in this research because this research wants to seek the impact of loan to deposit ratio to efficiency of Islamic banks and conventional banks.

The definition of input variables and output variables of this research adopted from Sufian et al (2008). The output variables are total loans, include loans to customer and others bank, income, consist of interest income and other income, and investment, include securities held, government bonds, and certificate of Banks Indonesia. Then, there are two variables of input: total deposits, which derives from customer and other banks, and total assets. Table 3.1 shows the data used to determine every input variables and output variables.

Table 3.1 Inputs and outputs components

Conventional Bank	Islamic Bank
Total deposits	
Current account	*Wadiah* Fund
Saving account	Unrestricted investment funds (*Mudharaba Muthlaqah*)
Time deposits	
Revenue Sahring investments	
Total assets	
Total assets	Total assets
Total loans	
Loans	*Murabaha* receivables and relevant accoun data

Source: Faturohman (2013)

Table 3.1 Inputs and outputs components

Conventional Bank	Islamic Bank
	Salam receivables and relevant accoun data
	Istishna receivables and relevant accoun data
	Qardh receivables and relevant accoun data
	Financing
	Ijarah
Income	
Interest income	Income from fund disbursement
Operating income other than interest	*Wadiah* consignment bonus expenses
Non-operating profit	Other operating income
	Income of provision for asset possible losses
	Income for estimated losses of commitment and contigencies
	Non-operating income
Investments	
Securities held	Securities held
Government bonds	Bank Indonesia *Wadiah* Certificate
Certificate of Bank Indonesia	

Source: Faturohman (2013)

DEA requires positive data exceeding zero in all samples of input and output variables. After calculating all components to be required inputs and outputs, there is no negatives data. Unfortunately, there are some zeros data that be produced in investments of Islamic banks and conventional banks, total loans of Islamic banks, and total deposits of Islamic banks. To make the data can be processed using DEA method, all zeros have been replaced by 1. The methods that used in this data treatment are based on research of Faturohman (2013).

Results of DEA measurements are data that distributed not normally, so a non-parametric test is appropriate to conduct statistical test for DEA results. Mann-Whitney test applied to compare efficiency of Islamic banks and conventional banks. The null hypothesis of this non-parametric test for two independent samples is the medians of compared groups are same (Fay and Proschan, 2010). Here are hypotheses of this research Mann-Whitney test.
H_0 = the DEA results of Islamic banks and conventional banks are same.
H_1 = the DEA results of Islamic banks and conventional banks are significant different.

DEA measurements results show non-parametric data, so Spearman's correlation used to determine the correlation between LDR and efficiency of both types of the bank. According to Hauke et al. (2011), correlation is an effect size and so it can verbally describe the strength of the correlation using the following guide for the absolute value of: .00 - .19 defined as very weak correlation, .20 - .39 defined as weak correlation, .40 - .59 defined as moderate correlation, .60 - .79 defined as strong correlation, and .80 - 1.0 defined as very strong correlation . Here are hypotheses of Spearman's correlation used in this research.

Ho = there is no significant correlation between LDR and efficiency of both types of the bank.
H1 = there is a significant correlation between LDR and efficiency of both types of the bank.

Conclusion and Implementation Plan

This research measures both of Islamic banks and conventional banks technical efficiency using output-oriented Variable Return to Scale (VRS) DEA method. Results of the Mann-Whitney Test show that single-multi year efficiency of Islamic banking statistically significant different from single-multi year efficiency of conventional banks in the period 2004-2013. Overall, Islamic banks statistically significant more efficient than conventional banks.

Table 4.1 Descriptive Statistics of DEA Results

Bank	N	Mean	Median	Standard Deviation	Minimum	Maximum	Interquartile
2004							
Conventional Banks	99	0.82061	0.862	0.156401	0.299	1	0.211
Islamic Banks	18	0.73678	0.8985	0.319446	0.015	1	0.462
2005							
Conventional Banks	114	0.78997	0.808	0.155471	0.289	1	0.173
Islamic Banks	21	0.86186	0.953	0.207516	0.295	1	0.195
2006							
Conventional Banks	103	0.88278	0.898	0.100811	0.552	1	0.146
Islamic Banks	23	0.81835	0.925	0.272248	0.025	1	0.366
2007							
Conventional Banks	103	0.86114	0.874	0.113288	0.492	1	0.181
Islamic Banks	29	0.82421	0.877	0.197138	0.366	1	0.273
2008							
Conventional Banks	112	0.79923	0.8125	0.14521	0.373	1	0.229
Islamic Banks	30	0.8287	0.843	0.167478	0.425	1	0.265
2009							
Conventional Banks	107	0.81101	0.801	0.122898	0.26	1	0.167
Islamic Banks	31	0.81919	0.856	0.183611	0.372	1	0.317
2010							
Conventional Banks	109	0.7417	0.721	0.148982	0.388	1	0.188
Islamic Banks	34	0.85074	0.89	0.1539	0.51	1	0.265
2011							
Conventional Banks	106	0.74186	0.7225	0.140177	0.342	1	0.192
Islamic Banks	34	0.89047	0.9395	0.132237	0.477	1	0.148
2012							
Conventional Banks	108	0.753	0.7395	0.141237	0.36	1	0.174
Islamic Banks	35	0.87223	0.902	0.138711	0.496	1	0.217
2013							

Conventional Banks	108	0.85728	0.868	0.116435	0.409	1	0.146
Islamic Banks	34	0.90165	0.976	0.123574	0.599	1	0.179
All Year							
Conventional Banks	1069	0.68458	0.681	0.142153	0.142	1	0.153
Islamic Banks	289	0.70355	0.728	0.198435	0.007	1	0.225

Based on DEA results, Islamic banking gets 70.355% of technical efficiency score. Meanwhile, conventional banking gets 68.458% of technical efficiency. It did not mean that Islamic banking more efficient than conventional banking for every year. From each year efficiency results, Islamic banking is less efficient than conventional banking in 2004, 2006, and 2007. Respectively, efficiency score of Islamic banking in those years are 73.678%, 81.835%, and 82.421%. On the other hand, the efficiency score that conventional banks get in those years are 82.061%, 88.278%, and 86.114% respectively.

Table 4.2 Summary of comparison efficiency between Islamic banks and conventional banks

Type of Bank	Year				
	2004	2005	2006	2007	2008
Conventional Banks					
No Statistical Significance Differences	V		V	V	V
Islamic Banks		V			

Type of Bank	Year					Single-multi year
	2009	2010	2011	2012	2013	
Conventional Banks						
No Statistical Significance Differences	V					
Islamic Banks		V	V	V	V	V

*Note: V sign shows which type of banks is more efficient than the other. It can also show that efficiency of Islamic banks and conventional banks is same.

From Mann-Whitney test with 0.05 of significance level, there are statistically significance differences between Islamic banking efficiency and conventional banking efficiency. This results proved by asymptotic significances (2-tailed) score that have lower score than 0.05 of significance level in 2005, 2010, 2011, 2012, and 2013. It means that, the technical efficiency of Islamic banking exceeded the efficiency of conventional banking statistically significant in 2005, 2010, 2011, 2012, and 2013.

The Spearman's correlation findings identifies there is significant correlation between LDR and efficiency of both types of bank at significance level 0.01. The overall Spearman's correlation coefficient is 0.293, which means there is a weak correlation between LDR and efficiency of both types of bank. For Islamic banks, the Spearman's correlation coefficient is 0.260, which indicates there is a weak correlation between LDR and efficiency of Islamic banks. Meanwhile, The Spearman's correlation coefficient of conventional banks is 0.246, which indicates there is a weak correlation between LDR of conventional banks and its efficiency.

In conclusion, Islamic banking is statistically significant more efficient than conventional banks in the period of 2004-2013. It proved by DEA results in 2005, 2010, 2011, 2012, and 2013. In these years, Islamic banks are statistically significant more efficient than conventional banks. Then this results

supported by single-multi year efficiency which proved that Islamic banks are statistically significant differ and more efficient than conventional banks. It means that Islamic banks have more allocation of their fund to the real sector than conventional banks. There is a significant relationship between loan to deposit ratio and efficiency of both types of the bank.

There are 5 recommendations can be implemented as result of the research.

- Government can assign Islamic banks to support real sector since Islamic banks allocate most of their fund to financing (lending) products.
- The Islamic banks allocation of the investments has a huge potential to be developed since Islamic banks only allocate a little fund on the investments products like Islamic government bonds, Bank Indonesia *Wadiah* Certificate, and company's Islamic bonds.
- Since the efficiency results based on the used approach, it is better to have intermediary approach and production approach to get better insight for future research.
- This research measures the technical efficiency. Researcher also can measures allocative efficiency and combine it with technical efficiency to get economic efficiency in the future research.
- This research did not examine variables that cause the result. It is can be topic for the future research to find out why Islamic banking is statistically different and more efficient than conventional banking.

References

Bank of Indonesia 2004, 'Indonesian Banking Statistics December 2004', Directorate of Islamic Banking Bank Indonesia, Jakarta.

Bank of Indonesia 2005, 'Indonesian Banking Statistics December 2005', Directorate of Islamic Banking Bank Indonesia, Jakarta.

Bank of Indonesia 2006, 'Indonesian Banking Statistics December 2006', Directorate of Islamic Banking Bank Indonesia, Jakarta.

Bank of Indonesia 2007, 'Indonesian Banking Statistics December 2007', Directorate of Islamic Banking Bank Indonesia, Jakarta.

Bank of Indonesia 2008, 'Indonesian Banking Statistics December 2008', Directorate of Islamic Banking Bank Indonesia, Jakarta.

Bank of Indonesia 2009, 'Indonesian Banking Statistics December 2009', Directorate of Islamic Banking Bank Indonesia, Jakarta.

Bank of Indonesia 2010, 'Indonesian Banking Statistics December 2010', Directorate of Islamic Banking Bank Indonesia, Jakarta.

Bank of Indonesia 2011, 'Indonesian Banking Statistics December 2011', Directorate of Islamic Banking Bank Indonesia, Jakarta.

Bank of Indonesia 2012, 'Indonesian Banking Statistics December 2012', Directorate of Islamic Banking Bank Indonesia, Jakarta.

Bank Indonesia 2013, 'Indonesian Banking Statistics December 2013', Directorate of Islamic Banking Bank Indonesia, Jakarta.

Banker, RD, Charnes, A & Cooper, WW 1984, 'Some models for estimating technical and scale inefficiencies in data envelopment analysis, *Management Science,* vol. 30, pp. 1078-1092.

Beck, T, Demirgüç-Kunt, A & Merrouche, O 2013, 'Islamic vs, conventional banking: business model, efficiency and stability', *Journal of Banking & Finance,* vol. 37, pp. 433–447.

Charnes, A, Cooper, WW & Rhodes, E 1978, 'Measuring the efficiency of decision making units', *European Journal of Operational Research,* vol. 2, pp. 429-444.

Coelli, T 1996, 'A Guide to DEAP Version 2.1: a data envelopment analysis (computer) program', *CEPA Working Paper.*

Farrell, MJ 1957, 'The measurement of productive efficiency', *Journal of the Royal Statistical Society. Series A (General),* vol. 120**,** pp. 253-290.

Faturohman, Taufik . 2013. An examination of the growth of Islamic banking in Indonesia from 2003 to 2010. Ph.D. Curtin University, School of Economics and Finance, Curtin Business School.

Fay, MP and Proschan, MA 2010, 'Wilcoxon-Mann-Whitney or t-test? On assumptions for hypothesis tests and multiple interpretations of decision rules', Statistics Surveys, vol. 4, 1-39.

Financial Servive Authority [Online]. Available: <http://www.ojk.go.id/lembaga-perbankan> [8 August 2015]

Hadad, Muliaman D., et al. (2003), 'Analisis Efisiensi Industri Perbankan Indonesia: Penggunaan Metode Nonparametrok Data Envelopmnet Analysis (DEA)', *Research Paper*, no. 7/5, Biro Stabilitas Sistem Keuangan Bank Indonesia.

Hauke, Jan, and Tomasz Kossowski. "Comparison of values of Pearson's and Spearman's correlation coefficients on the same sets of data." *Quaestiones Geographicae* 30.2 (2011): 87-93.

Hanif, Muhammad 2011, 'Differences and Similarities in Islamic and Conventional Banking', *International Journal of Business and Social Science*, vol. 2, no. 2, pp. 166-175.

Hassan, T, Mohamad, S & Bader, MKI 2009, 'Efficiency of conventional versus Islamic banks: evidence from the Middle East', *International Journal of Islamic and Middle Eastern Finance and Management,* vol. 2, pp. 46–65.

Ikatan Akuntan Indonesia 2010, *Pernyataan Standar Akuntansi Keuangan No. 31 Akuntansi Perbankan* (2010).

Ikatan Akuntan Indonesia 2014, *Pernyataan Standar Akuntansi Keuangan No. 101 Penyajian Laporan Keuangan Syariah* (2014).

Indonesia Government Regulation No. 72 1992 Bank Based on Profit sharing

Islamic Financial Services Board 2013, *Islamic Financial Service Industry Stability Report 2013* (2013).

Magrianti, Tessa 2011, 'Perbandingan Efisiensi BUS dengan Bank Konvensional di Indonesia', *Iqtishodia Jurnal Ekonomi Islam Republika*, pp. 25.

Mokhtar, HSA, Abdullah, N & Al-Habshi, SM 2006, 'Efficiency of Islamic Banking in Malaysia: a Stochastic Frontier Approach', *Journal of Economic Cooperation*, vo. 27, pp. 37-70.

Mokhtar, HSA, Abdullah, N & Al-Habshi, SM 2008, 'Efficiency and Competition of Islamic Banking in Malaysia', *Humanomics,* vol. 24, pp. 28-48.

Muhamad Ibrahim, Shahul Hamed bin 2007, 'IFRS vs AAOIFI: the clash of standards?' *Working Paper*.

Muharam, H and Pusvitasari, R. 2007. "Analisis Perbandingan Efisiensi Bank Syariah dengan Metode Data Envelopment Analysis (Periode tahun 2005)". *Jurnal Ekonomi dan Bisnis Islam,* Vol.2 No.3.

Rosyadi, Imron and Fauzan 2011, 'Komparatif Efisiensi Perbankan Syariah dan Perbankan Konvensional di Indonesia', *Benefit Jurnal Manajemen dan Bisnis,* vol 15, No. 2, 129-147.

Sabar, Syafaroedin 1989, 'Konsep Efisiensi Untuk BUMN', *National conference of Efisiensi Ditinjau Secara Multi Konsep*.

Sufian, F, Noor, MAM & Majid, M.-ZA 2008, 'The efficiency of Islamic banks: empirical evidence from the MENA and Asian countries Islamic banking sectors', *The Middle East Business and Economic Review,* vol. 20, no. 1, pp. 1- 19.

Solé, Juan 2007, 'Introducing Islamic Banks into Conventional Banking Systems' International Monetary Fund, 2007: 3.

World Bank 2014, *Global Financial Development Report 2014* (2014).

Yumanita, Diana and Ascarya 2005, 'Analisis Efisiensi Perbankan Syariah di Indonesia', *Pusat Pendidikan dan Studi Kebanksentralan,* Bank Indonesia.