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ARE FOREIGN BANKS MORE EFFICIENT THAN DOMESTIC BANKS? CASE STUDY: INDONESIA

Gani Akbar Hutama and Ahmad Danu Prasetyo
School of Business and Management
Institut Teknologi Bandung, Indonesia
gani.akbar@sbm-itb.ac.id

Abstract. The aim of this study is to analyze and compare the efficiency of foreign and domestic conventional banks in Indonesia in 2013-2015 based on the BUKU 3 category regulated by Bank Indonesia and further sees the growth of those efficiencies by each month during the period of the study. The objects of this study are 9 foreign and 11 domestic conventional banks that operated in Indonesia in2013-2015. Data are retrieved from monthly financial reports of the sample. This study uses input-oriented Variable Return to Scale (VRS) Data Envelopment Analysis (DEA) model with intermediation approach to measure the technical efficiencies of the banks and Malmquist Index to investigate the growth of the efficiencies and also the monthly growth of the sample in the analysis period. Mann-Whitney test is used for hypothesis testing to examine the significance level of the efficiencies and its growth. DEA results shows that in aggregate, foreign banks are more efficient than domestic banks. The malmquist index results presents that domestic banks have higher average growth compared foreign banks in the period of analysis. Moreover, the sample's performances in terms of monthly changes from the malmquist index experience fluctuation. However, there are no significant differences of both efficiency and its growth of foreign or domestic conventional banks in Indonesia during the period, meaning that both bank groups whether foreign or domestic banks in this study are operating in almost the same level.

Keywords: foreign banks, domestic banks, efficiency, Data Envelopment Analysis, Malmquist Index

Introduction

Recently, Indonesia in general has been encountering economic deceleration due to the global economic uncertainty that is affected by the US Fed Fund Rate, Chinese economic stagnancy, and the decline of global commodity prices. However, Indonesia's domestic economy seems to have managed to survive and has been exhibiting signals of positive growth. It was indicated from the 5.04% (yoy) growth of domestic economy on the fourth quarter of 2015, exceeding the 4.74% (yoy) growth from the previous year. National banking industry also grew significantly. Compared to the fourth quarter of 2014 the number of total asset, third party fund, and loans increased 9.21% (yoy), 7.26% (yoy), and 10.44% (yoy) respectively (Indonesian Banking Industry Profile Q4, 2015). It certainly cannot be separated from the important role of the domestic financial sector. Financial institution definitely put up substantial contribution in every country's economic growth. Banking, has a crucial role as an intermediation institution in the era of free trade and globalization, either to mediate the deficit and surplus sector, or as agent of development. A bank has to take rational actions and efficiency is one factor that has to be reckoned. A more efficient bank is expected to get more loans, gain optimal profit, and delivers better quality of services to the customer.

Efficiency measurement on banks is traditionally calculated by using profitability ratio analysis. One indicator of the profitability ratio is Operating Expense Operating Income ratio (OEOI or BOPO in Indonesian terms). This ratio is the common and basic measurement in giving assessment of banks' efficiency performance due to its simplicity. The lower the OEOI ratio, the more efficient the bank in managing its operational expense. Below is OEOI performance of conventional banks in Indonesia (2012-2015):

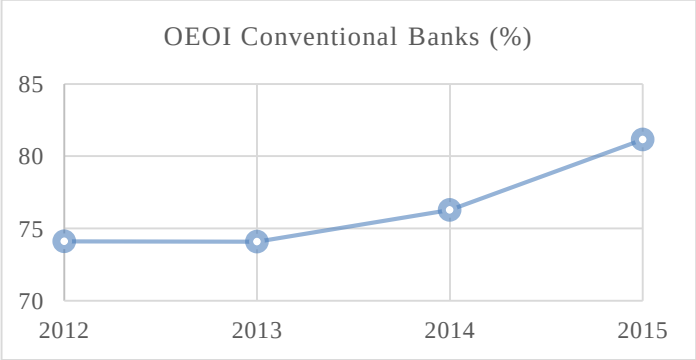

Figure 1 ***Conventional banks OEOI ratio (Source: Indonesian Banking Statistics, 2012-2015)***

As shown on the figure, the OEOI ratio of conventional banks in Indonesia is constantly increasing. In 2012, OEOI ratio was at the level of 74.1% and continuously rose until it reached 81.49% in Quartal-4 2015. The increase of interest rates on deposit drove the rise in cost fund subsequently caused the OEOI to be worsen. On the other hand, in 2014, Indonesia Financial Authorities (OJK in Indonesian terms) aimed to set OEOI level for conventional banks in Indonesia for only 60%. In contrary, ASEAN countries in average have already achieved OEOI of 40-60% (keuangan.kontan.co.id, 2016). Moreover, Loan to Deposit (LDR) ratio of conventional banks in Indonesia increased from 87.58% to 92.11% in 2015 alone, which could also be an indicator of continuous improvement of banking sector in performing its role as intermediary institution. Thus, it indicates that in implementing its intermediary function for domestic economy, efficiency performance of conventional banks in Indonesia is still low and even getting more inefficient throughout the years, compared to other neighboring countries (ASEAN). However, efficiency measurement using this type of financial ratios do not accommodate input and output data set that has multiple variables because it only compares one variable to another (Ozkan-Gunay & Tektas, 2006). It also does not signify the number of resources needed in order to gain the fruitful output for the bank. Therefore, another method of efficiency analysis that accounts multiple variables is considerably more suitable. Parametric or non-parametric methods are superior compared to this ratio analysis method because it simultaneously accounts the interaction between multiple inputs and outputs. One example is Data Envelopment Analysis (DEA) that is used in this research.

A research of bank efficiency is substantial because as mentioned before, it is generally acknowledged that financial sector development is a crucial substance for positive economic growth. The term "Efficiency" refers to the maximizing outputs in such a way with minimum input resources. Banking efficiency is defined as difference between observed quality of input and output variables with respect to optimal quality of input and output variables in banks. Mobilization of savings and facilitating transaction and risk management services provided by the financial sector are critical factors for positive economic development (Honohan & Beck, 2007). Therefore, the operational efficiency of banks is crucial for the smooth development of an economy. In fact, the long-term viability of banks is linked to their levels of efficiency.

Different banks with different characteristics may have different level of efficiency. In Indonesia, based on regulation of Bank Indonesia, banks based on its type of ownership are divided into state-owned banks, private-owned banks, union banks, and foreign banks (foreign representative branch

and joint venture banks). Furthermore, based on Bank Indonesia Regulation No 14/26/PBI/2012, banks are classified into 4 Commercial Banks Group of Business Activities ("BUKU" in Indonesian terms) according to its size of core capital, permitted business activities, productive sectors, office network expansion, and other underlying policies. Whereas foreign banks are classified based on the Capital Equivalency Maintained Asset (CEMA). The background of Indonesian government opening opportunities for foreign and joint-venture banks to be fully operating in Indonesia is strongly related to the needs of foreign capital in Indonesia. Besides, the entrance of those types of banks will hopefully excel the growth of local economic and banking condition. The profits that will be gained from foreign banks, including joint-venture banks, can be defined generally as: capital inflows channel for domestic economy, increasing competition in domestic banking industry, and to introduce the market to more diversified banking products. Therefore, foreign banks with its own classification, structure, policies, and financial decisions may have different efficiency compared to domestic banks which makes this area appealing to be further studied.

Efficiency analysis based on bank groups may enlighten which bank groups are efficient and which are not and also helpful in locating sources of inefficiencies so that stakeholders are able to initiate reforms and plan suitable strategic decisions especially in developing economies. Moreover, banking industry could set its business strategy in the future by knowing its efficiency position compared to other competitors in the same bank groups and how is the growth of the efficiency score itself throughout different periods of time.

This research measures the technical efficiency of domestic and foreign conventional banks in Indonesia that are qualified as BUKU 3 category as regulated by Bank Indonesia Regulation No 14/26/PBI/2012. Furthermore, the research also investigates the growth of the efficiency level of each banks in the period of 2015. Non-parametric approach will be used in this research by using Data Envelopment Analysis (DEA) by using input oriented Variable to Return Scale (VRS) model with intermediation input-output approach. Furthermore, the growth of the efficiency level of both bank groups will be measured by calculating the Malmquist Index as the extention of this study. The last step is using Mann-Whitney test to determine whether there are any significant differences in the results. Both DEA and Malmquist Index will be analyzed by using DEAP 2.1 software by Coelli while the Mann-Whitney test will be analyzed by using IBM SPSS Statistics version 23 software.

The data type collected for this research is quantitative panel data, consists of four inputs and three outputs of 20 banks for during the period of 2013-2015 or 36 months. , in this research the input data are total fixed assets, total non-interest expense, and total interest expense where total fixed asset comes from fixed asset and equipment subtracted by its depreciation and total deposits include current account, saving account, and time deposit. As for variables that are measured to be the output are total loans, total deposits, total non-interest income, and total interest income where total loans include loans to customer and other banks.

DEA results shows that in aggregate, foreign banks are more efficient than domestic banks. The malmquist index results presents that domestic banks have higher average growth compared foreign banks in the period of analysis. Moreover, the sample's performances in terms of monthly changes from the malmquist index experience fluctuation. However, there are no significant differences of both efficiency and its growth of foreign or domestic conventional banks in Indonesia during the period, meaning that both bank groups whether foreign or domestic banks in this study are operating in almost the same level.

The rest of the paper is organized as follows: Section 2 will discuss about the existing literatures and current issue; differences of foreign and domestic banks in Indonesia to determinants of local government efficiencies in many countries. The methodology being used in this study will be explained in Section 3. The result of comparative efficiencies will be analyzed in section 4. And lastly, concluding remarks will appear in section 5.

Literature Review

Bank

In Indonesia, according to UU No. 7 Tahun 1992 about Banking as amended in UU No. 10 Tahun 1998, a bank can be defined as a business unit that collects funds from the public in the form of deposits and lends it back to the public in the form of loans or any other forms in order to increase their standard of living. In Indonesia, commercial banks based on their form of business activities are divided into conventional bank and Islamic (Sharia) bank.

Differences of Foreign and Domestic Bank

Foreign and domestic banks are both a part of commercial bank group. Hadad, et al. (2004) stated that basically with the provisions applicable to commercial banks, there is no distinction of treatment between joint venture with domestic banks. Similar also to the branch office of foreign banks. The application of the precautionary principle as well as the settings are uniformly conducted to commercial bank which covers domestic banks, joint venture banks, as well as branch offices of foreign banks. While the restrictions or liability that are applied specifically against a foreign bank branch offices that previously existed, such as the distribution of export credit and restrictions on the number of foreign bank offices, currently does not exist. The main difference between domestic, joint venture, and foreign branch offices only exist on the side of the capital and law form of the business entity.

Foreign banks' form of legal entity will follow its main office offshore and a vital part for the headquarter. Hence, all of foreign banks' financial decision will heavily depend on the decision from the headquarter, and normally credits will only be given to huge and well-recognized companies (Pigott in Hadad et al., 2004) which occur in Indonesia where foreign banks in Indonesia tend to distribute loans only to those multinational companies that also have been receiving funding from the main office overseas. On the other hand, joint venture banks adopt local legal identity form, which is limited liability company (PT), and legally separated from the parent office. Therefore, the decision making process will also depend on the local management, that is more or less similar with domestic banks.

Determinants of Bank Efficiency and Previous Studies

There are various definition of conceptualization in defining input and output in forming a correct efficiency model. According to Hadad, et al. (2003), there are three ways in defining output-output of a financial institution: asset approach (outputs are bank loans and other assets), user cost approach (outputs contribute in net income), and value added approach (outputs contribute on value added). As for input-output relationship, Hadad, et al. (2003) defined in the terms of financial institution of either parametric or non-parametric method are: (1) production approach, (2) intermediation approach, (3) asset approach.

Production approach saw the financial institution as producer of deposit accounts and loans; defining output as the nominal of those accounts or from related transactions. Inputs in this particular case is accounted as the number of employees, expense on fixed assets, and other materials. Intermediation approach viewed a financial institution as an intermediary that transform and transfer financial assets from surplus units to deficit units. In this case, institutional inputs such as employee expense and also capital and expense on interest and deposit, with output of loans and financial investments. In the end, this type of approach overviews the primary function of a financial institution as the creator of loans. Asset approach was slightly different from intermediation approach. The difference was located in the output section, where output is defined in terms of assets.

The correct input and output selection is crucial in efficiency analysis. Until now, there are several versions regarding the selection of banks' input and output selection. However, there is no

consensus on the exact method for determining the best practice frontier against the efficiency measured (Berger & Humprey, 1997). Prior research exhibited differences in input and output of efficiency analysis of banks in various countries and time periods. The result from each research also different one from another. Table 1 shows existing literatures analyzing banks efficiencies in diverse sample area and time frame.

Table 1 **Previous studies of efficiency performance comparison between foreign and domestic banks**

No	Authors	Sample area	Time frame	Methodology	Input	Output
1	Putra, Indra (2013)	Indonesia	2007-2011	DEA	-Price of funds -Price of labor -Price of physical capital	-Total loans -Securities -Interbank Deposits
2	Tze San, Ong et al. (2011)	Malaysia	2002-2009	DEA	-Total deposits -Total fixed asset	-Total loans -Total Investment
3	Maloba, Paul Eserea(2012)	Kenya	2004-2010	DEA	-Loanable funds -Physical fixed assets	-Total loans -Government securities -Fee and commission income
4	Wijayanto, Andi & Sutarno (2010)	Indonesia	2008	DEA	-Fixed asset and software -Number of employee -Total deposits	-Total loans
5	Ozkan-Gunay, E Nur & Tektas, Arzu (2006)	Turkey	1990-2001	DEA	-Personnel expense -Administrative expense -Interest expense	-Total deposits -Total loans -Total securities -Total interest income -Total non-interest income

Source: Author's documents

Research Methodology

Data Setups

Input and output variables are taken based on intermediation approach and referring to Ozkan-Gunay & Tektas (2006) on the previous section because in that study, the authors have also interviewed some banking practitioners alongside spreading questionnaires to support the selection of the most suitable input-output variables. Intermediation approach is selected in this study because it is a better approach to evaluate performance of bank as the main function of bank is basically to collect funds and channels it to other party to gain profit (Berger & Humprey, 1997). As there is no specific requirements and standards on determining the input and output variable, in this research the input data are total fixed assets, total non-interest expense, and total interest expense where total fixed asset comes from fixed asset and equipment subtracted by its depreciation and total deposits include current account, saving account, and time deposit. As for variables that are measured to be the output are total loans, total deposits, total non-interest income, and total interest income where total loans include loans to customer and other banks. Data collection of this research is limited only to 3 years of monthly report (36 months) of listed banks under supervision of the Financial Service Authority (FSA) or Otoritas Jasa Keuangan (OJK) in Indonesian form and regulated by Bank Indonesia due to the limitation of available data (also to avoid missing data due to the changes in the number of total banks operating in Indonesia during the time period)

Data Envelopment Analysis (DEA) Application

Data envelopment analysis (DEA) is a non-parametric mathematical programming to measure the inefficiency a number of output variables given certain inputs and vice versa. This method constructs an envelopment frontier over the data points such that all observed points lie on or below the production frontier (Coelli, 1996). This method, however, does not generate general relationship and only rely on the input-output ratio optimization. It firstly introduced by Farrell (1957) who proposed piecewise-linear convex hull approach to frontier estimation and then extended by Charnes, Cooper & Rhodes (1978) that used the term *data envelopment analysis* (DEA) for the first time. Since then, numerous papers have extended and applied the DEA methodology. Charnes, Cooper & Rhodes (1978) proposed a model that had an input orientation and had assumption of constant return to scale (CRS). However, the CRS assumption is considered only applicable when all DMU's are operating at an optimal scale while constraints on finance, imperfect competition, etc. may cause a DMU to be not operating at optimal scale. Therefore, Banker, Charnes & Cooper (1984) introduced an extension a model to account for variable returns to scale (VRS) situations that accommodate when DMU's are operating at non-optimal scale environment.

Coelli (1996) comprehensively discussed about DEA method. Assume there is data on K inputs and M outputs for each of N DMU. For the i-th DMU these are represented by the vector xi and yi, respectively. The KxN input matrix, X, and the MxN output matrix, Y, represent the data of all N. Then the DMU's problem is:

$$max_{\phi,\lambda}\phi, \quad (1)$$

St
$-\phi y_i + Y\lambda \geq 0$
$x_i - X\lambda \geq 0$
$N1'\lambda = 1$
$\lambda \geq 0$

where ϕ is a scalar and λ is a Nx1 vector of constants. *N*1is a Nx1 vector of ones. The value of ϕ obtained will be the efficiency score for the i-th DMU. It will satisfy $\phi \geq 1$, with a value of 1 indicating a point on the frontier, and hence a technically efficient DMU. The proportional increase in outputs that could be achieved by the i-th DMU with input quantities held constant denotes by ϕ-1, while 1/ϕ defines the technical efficiency scores which varies between zero and one.

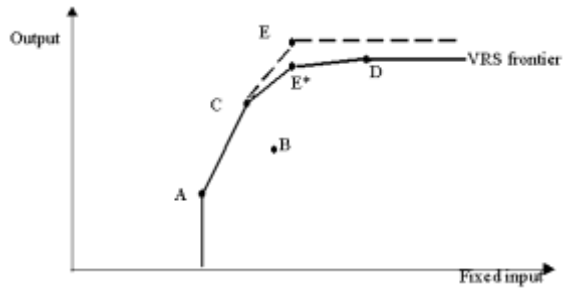

Figure 2 The VRS DEA efficient frontier

The VRS efficient frontier sorts the slopes starting from DMU which has minimum input. In figure 1, DMU A, C, E*, and D are efficient and forming an "efficient frontier", therefore the technical efficiency of those DMUs are set as 1. The technical efficiency of DMU B will be measured by considering their distances to the "efficient frontier" while the distance between E*and E means that if DMU E* was more efficient as in point E, the VRS frontier would also change. DMU (banks) will be stated as efficient if the result shows $\theta = 1$ or 100% otherwise will be mentioned as inefficient if $\theta < 1$ or less than 100%.

There are two approaches of measuring efficiency using DEA: input-oriented measurement and output-oriented measurement. Input-oriented measurement represents a set of input that could be reduced proportionally without changing the number of output produced. By using input-oriented model, the model will calculate the reduction needed to achieve efficient performance with constant output. Fethi & Pasiouras (2010) stated that banking industry that uses input-oriented approach has the assumption that the bank manager will gain more control on input variables (expenses, employee, etc.) compared to output variables (loans, incomes, etc.). On the other hand, output-oriented measurement calculates whether a number of output can be increased proportionally without changing a number of input used. By using output-oriented approach, the model will measure the enhancement of output needed to gain efficient performance with constant input. Based on the explanation above, input-oriented measurement is selected in this study.

Malmquist Index Application
According to Coelli (1996), malmquist index is an index that measures how much the efficiency improvement in aggregate has been obtained in a particular period of time. It is an extension of DEA which compares the technical efficiency at t+1 and t.

Fare et. al. (1994) specifies Malmquist index as:

$$m_0 = \left[\frac{d_0^t(x_{t+1}, y_{t+1})}{d_0^t(x_t, y_t)} \times \frac{d_0^{t+1}(x_{t+1}, y_{t+1})}{d_0^{t+1}(x_t, y_t)}\right] \quad (2)$$

where

$[d^t{}_o(x_t,y_t)]^{-1}$= Max $_{\Phi,\lambda}$ Φ
s.t.
$-\Phi y_{it}+Y_t\lambda \geq 0$,
$x_{it}-X_t\lambda \geq 0$,
$\lambda \geq 0$,

$[d^{t+1}{}_o(x_{t+1},y_{t+1})]^{-1}$= Max $_{\Phi,\lambda}$ Φ
s.t.
$-\Phi y_{it+1}+Y_{t+1}\lambda \geq 0$,
$x_{it+1}-X_{t+1}\lambda \geq 0$,
$\lambda \geq 0$,

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s.t.
$-\Phi y_{it+1}+Y_t\lambda \geq 0$,
$x_{it+1} - X_t\lambda \geq 0$,
$\lambda \geq 0$,

$[d^{t+1}{}_o(x_t,y_t)]^{-1}$= Max $_{\Phi,\lambda}$ Φ
s.t.
$-\Phi y_{it}+Y_{t+1}\lambda \geq 0$,
$x_{it} - X_{t+1}\lambda \geq 0$,
$\lambda \geq 0$,

A value of the malmquist index greater than one indicates positive improvement on efficiency. Note that the malmquist index measures the productivity of the production point (x_{t+1},y_{t+1}) relative to the production point (x_t,y_t). It does not consider whether the DMU was lying on the efficient frontier or not. As can be seen in figure 3.8.1, the position of DMU E* in the first period have changed into E in the next period. DMU A, C, E*, and D formed the efficient frontier in the first period, however only DMU A, C, E that formed the efficient frontier in the next period as DMU A and C do not move from its current position and DMU D was not efficient enough to be put on the new frontier. Nevertheless, DMU E has obtained the most drastic change in the next period with respect to its previous position, therefore it get the highest malmquist index score. Malmquist index is applied in single-multi years data to investigate the changes in Total Factor Productivity (TFP) whether it is a positive or negative growth. First the malmquist index for the banks in single-multi years data is analyzed to seek for the changes for each banks. It is then followed by the measurement to calculate the monthly TFP change performance of all banks in the sample during the period.

Mann Whitney Test

The result data from the DEA and Malmquist Index measurements shows that the data are not normally distributed. Therefore, a non-parametric test is suitable to test non parametrical data with 2 independent group sample for the DEA and Malmquist Index result. Mann Whitney test is applied to compare the efficiency and efficiency change of foreign and domestic banks and investigates

whether there is a significant statistical differences of the result. The null hypothesis of this non-parametric test for two independent samples is the medians of compared group are the same (Fay & Proschan in Pradiknas, 2015). Below is the hypothesis of Mann Whitney test with 0.05 significance level in this research:

Ho = there is no significant difference for DEA and Malmquist Index result of foreign and domestic banks
H1 = there is significant difference for DEA and Malmquist Index result of foreign and domestic banks

Data Analysis

Single Year Efficiency
In this section, the input-oriented VRS DEA measurement results will be analyzed and compared. The comparison of each year of DEA results is important to examine the pattern of foreign banks efficiency compared to domestic banks efficiency over the period of 2013-2015. The results will be presented year-by-year starting from 2013 to 2015.

4.1.1 DEA Measurement Results for 2013
The technical efficiency result of foreign and domestic banks is presented on table 2:

Table 2 VRS DEA efficiency results for 2013

Banks	Technical Efficiency Score
Bangkok Bank	1
Bank of Tokyo Mitsubishi	1
Citibank	1
Hongkong Shanghai Bank	1
Standard Chartered Bank	1
ANZ Bank	1
DBS Bank	1
Mizuho Bank	1
Sumitomo Mitsui Bank	1
Bank Tabungan Negara	1
Bank Jawa Timur	1
Bank Jawa Barat Banten	1
Bank Bukopin	1
CIMB Niaga	0.901
Bank Danamon	0.815
Bank Maybank	0.991
Bank Mega	0.815
Bank OCBC NISP	0.991
Bank Permata	1
Pan Indonesia Bank	1
Mean	0.985

The mean of the sample in this period is 0.985. Foreign banks' average technical efficiency is 1 and domestic banks' average technical efficiency is 0.956. The efficiency results have asymptotic significances (2-tailed) score of 0.024 in the Mann-Whitney test. With 0.05

significance level, it means that there are statistically significant differences between mean and median of foreign and domestic banks efficiency.

DEA Measurement Results for 2014
The technical efficiency result of foreign and domestic banks is presented on table 3:

Table 3 VRS DEA efficiency results for 2014

Banks	Technical Efficiency Score
Bangkok Bank	1
Bank of Tokyo Mitsubishi	1
Citibank	1
Hongkong Shanghai Bank	1
Standard Chartered Bank	1
ANZ Bank	0.942
DBS Bank	0.893
Mizuho Bank	1
Sumitomo Mitsui Bank	0.932
Bank Tabungan Negara	1
Bank Jawa Timur	1
Bank Jawa Barat Banten	1
Bank Bukopin	1
CIMB Niaga	1
Bank Danamon	1
Bank Maybank	0.896
Bank Mega	0.765
Bank OCBC NISP	0.884
Bank Permata	1
Pan Indonesia Bank	1
Mean	0.966

The mean of the sample in this period is 0.966. Foreign banks' average technical efficiency is 0.974 and domestic banks' average technical efficiency is 0.959. The efficiency results have asymptotic significances (2-tailed) score of 0.963 in the Mann-Whitney test. With 0.05 significance level, it means that there are no statistically significant differences between mean and median of foreign and domestic banks efficiency.

DEA Measurement Results for 2015
The technical efficiency result of foreign and domestic banks is presented on table 4:

Table 4 VRS DEA efficiency results for 2015

Banks	Technical Efficiency Score
Bangkok Bank	1
Bank of Tokyo Mitsubishi	1
Citibank	1
Hongkong Shanghai Bank	1

Standard Chartered Bank	1
ANZ Bank	0.827
DBS Bank	1
Mizuho Bank	1
Sumitomo Mitsui Bank	1
Bank Tabungan Negara	1
Bank Jawa Timur	1
Bank Jawa Barat Banten	1
Bank Bukopin	1
CIMB Niaga	1
Bank Danamon	1
Bank Maybank	0.955
Bank Mega	0.797
Bank OCBC NISP	0.978
Bank Permata	1
Pan Indonesia Bank	1
Mean	0.978

The mean of the sample in this period is 0.978. Foreign banks' average technical efficiency is 0.981 and domestic banks' average technical efficiency is 0.975. The efficiency results have asymptotic significances (2-tailed) score of 0.415 in the Mann-Whitney test. With 0.05 significance level, it means that there are no statistically significant differences between mean and median of foreign and domestic banks efficiency.

Single-Multi Years Efficiency

This section examine the comparison of single-multi year efficiency of foreign and domestic banks (2013-2015). The technical efficiency result of foreign and domestic banks is presented on table 5:

Table 5 VRS DEA efficiency results for single-multi years

Banks	Technical Efficiency Score
Bangkok Bank	1
Bank of Tokyo Mitsubishi	1
Citibank	1
Hongkong Shanghai Bank	1
Standard Chartered Bank	1
ANZ Bank	1
DBS Bank	1
Mizuho Bank	1
Sumitomo Mitsui Bank	1
Bank Tabungan Negara	1
Bank Jawa Timur	1
Bank Jawa Barat Banten	1
Bank Bukopin	1
CIMB Niaga	1
Bank Danamon	1
Bank Maybank	0.901
Bank Mega	0.815

Bank OCBC NISP	0.991
Bank Permata	1
Pan Indonesia Bank	1
Mean	0.985

The mean of the sample in this period is 0.985. Foreign banks' average technical efficiency is 1 and domestic banks' average technical efficiency is 0.973. The efficiency results have asymptotic significances (2-tailed) score of 0.099 in the Mann-Whitney test. With 0.05 significance level, it means that there are no statistically significant differences between mean and median of foreign and domestic banks efficiency.

Malmquist Index Result

Malmquist index is applied in single-multi years data to investigate the changes in Total Factor Productivity (TFP) whether it is a positive or negative growth. First the malmquist index for the banks in single-multi years data is analyzed to seek for the changes for each banks. It is then followed by the banking industry's malmquist index measurement to calculate the banking industry's performance during the period.

Banks' Malmquist Index Result

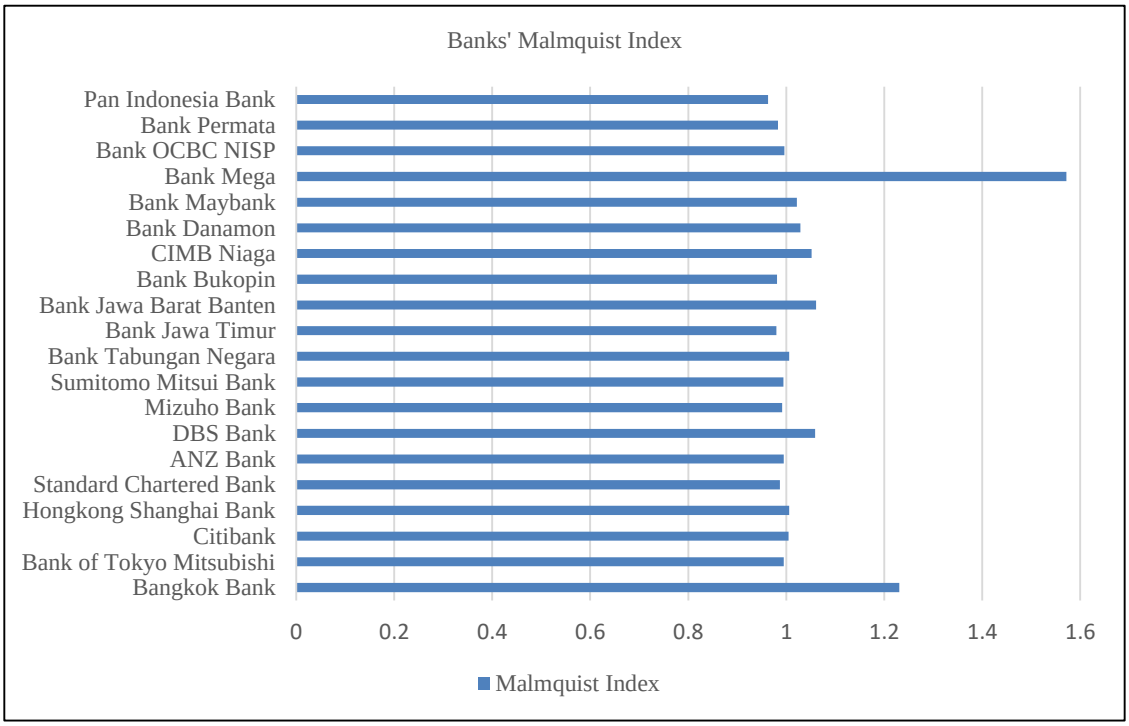

Figure 3 Banks' malmquist index

The mean of the sample in this period is 1.039. Foreign banks' average TFP change is 1.029 and domestic banks' average TFP change is 1.059. The efficiency results have asymptotic significances (2-tailed) score of 1.000 in the Mann-Whitney test. With 0.05 significance level, it means that there are no statistically significant differences between mean and median of foreign and domestic banks efficiency.

Sample's Monthly Malmquist Index Result

Figure 4 below shows the sample's monthly malmquist index result:

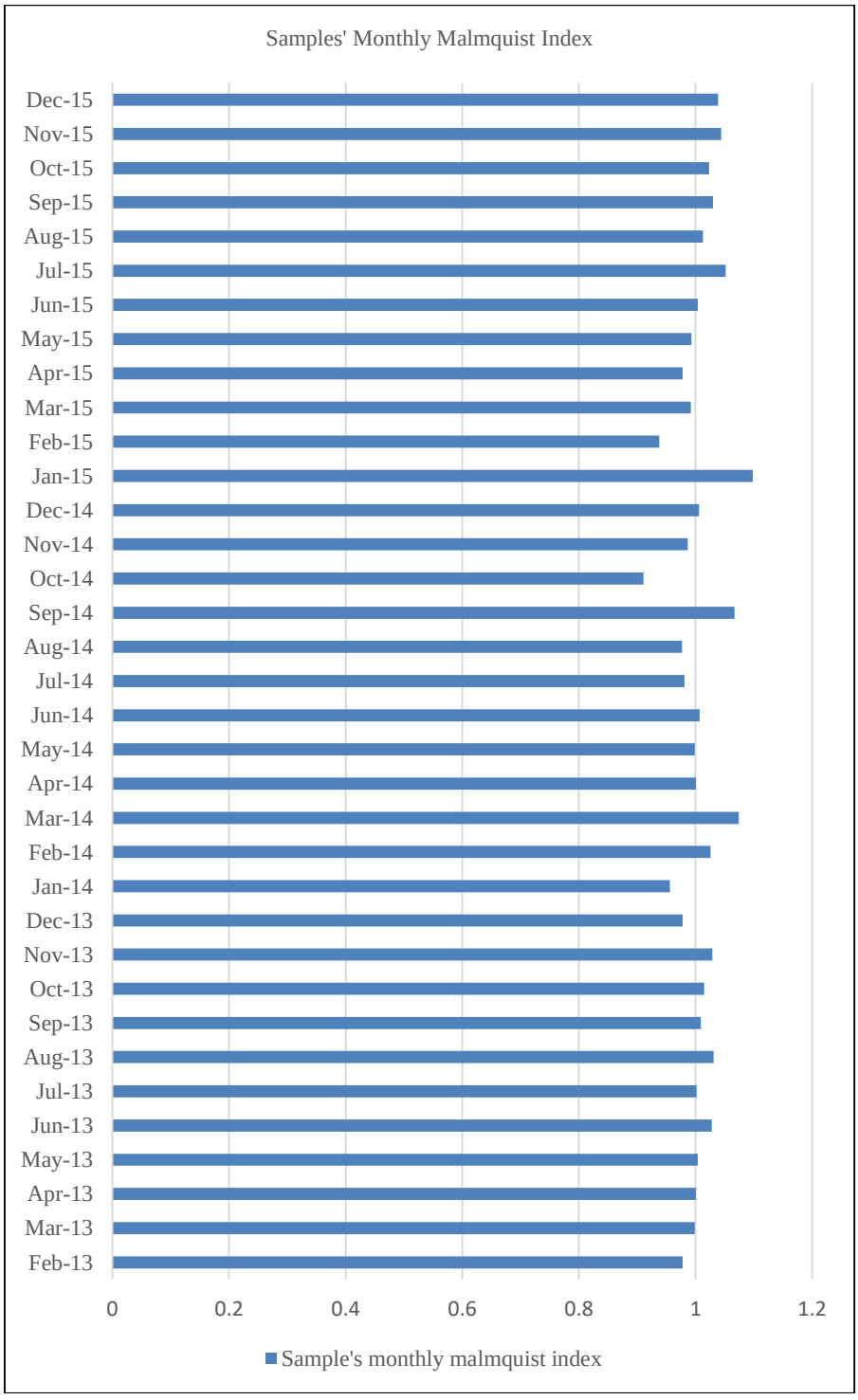

Figure 4 Sample's monthly malmquist index

Discussion

This study measures both foreign and domestic banks technical efficiency using input-oriented intermediation approach Variable Return to Scale (VRS) DEA method. Results from Mann-Whitney test show that although foreign banks' average technical efficiencies during 2013 until 2015 are always higher than their domestic peers' especially BUKU 3banks, there are no statistically

significant difference between the technical efficiency in both bank groups, meaning that both bank groups are operating almost at the same level.

Table 6 Summary of efficiency comparison between foreign and domestic banks

Bank Category	Year			Single-multi year
	2013	2014	2015	
Foreign banks	v			
No statistical differences		v	v	v
Domestic banks				

Note: (v) sign shows which category of bank is more efficient than the other

This study's result is not consistent with Berger et al. (1999) and Tze San et al. (2011) which find out that domestic banks are more efficient than foreign banks although the differences are not statistically different. However, the outcome of this research is parallel with Maloba (2012) and Putra (2013) where foreign banks average technical efficiencies are higher than the average technical efficiencies of domestic bank.

According to Putra (2013) there are several factors that backgrounds the lower efficiency of domestic banks. First is the amount of third party funds that is collected from the public by domestic bank is much more higher compared to foreign banks. The high amount of third party funds requires the bank to pay interest from the clients' deposit while foreign banks' third party funds is mainly from flow of funds and oversea investments. Second is related to branch offices of both banks. Domestic banks' branch offices are spread almost everywhere in Indonesia which require a lot of labor capital, that will ultimately lead to the swelling and inefficiency of the labor capital itself. On the other hand, foreign banks' offices are mainly located in big cities in Indonesia so the needs of labor capital is unlike domestic banks. Lastly, domestic banks investment activity is tend to be more risky compared to foreign banks. Domestic banks commonly transfer its funds to loans sector that has higher risk than other investments while foreign banks are more focus on transferring the funds into securities and interbank placements.

As for the malmquist index result, BUKU 3 domestic banks' average growth per year is higher than foreign banks. However, the result from Mann-Whitney test shows that there are no statistically significant differences between the malmquist index result for foreign and domestic banks, meaning that both bank groups performance are almost at the same level. Moreover, it can be seen from the samples' monthly malmquist index result that the sample's performances fluctuate during the analysis period.

Conclusion and Recommendation

A research of bank efficiency is substantial because financial institution definitely put up substantial contribution in every country's economic growth. Banking, has a crucial role as an intermediation institution in the era of free trade and globalization, either to mediate the deficit and surplus sector, or as agent of development. A bank has to take rational actions and efficiency is one factor that has to be reckoned. Based on the tests result, this study found that:

1. In aggregate, BUKU 3 foreign banks' average technical efficiency throughout the period is 1 or 100% and domestic banks' average technical efficiency is 0.973 or 97.3% meaning that from the DEA result, foreign banks are more efficient than domestic banks.
2. Despite the DEA result, in general Mann-Whitney test result shows that the efficiency results have asymptotic significances (2-tailed) score of 0.099 in the Mann-Whitney test.

With 0.05 significance level, it means that there are no statistically significant differences between mean and median of BUKU 3 foreign and domestic banks efficiency, meaning that both bank groups performance are almost at the same level. However, individual yearly efficiency measurement result shows that in 2013 there are statistically significant differences that foreign banks are more efficient than domestic banks

3. The malmquist index result presents that BUKU 3 domestic banks' average growth per year is higher than foreign banks. However, the result from Mann-Whitney test shows that there are no statistically significant differences between the malmquist index result for foreign and domestic banks, meaning that both bank groups performance are almost at the same level. Moreover, it can be seen from the samples' monthly malmquist index result that the sample's performances fluctuate during the analysis period.

From this study, the recommendations that can be suggested according to the result of the test are:

1. Banks' management teams especially banks with efficiency score <100% are expected to improve the optimization of the resources of the bank, whether by using input or output approach. Bigger number of incomes, loans or deposits but followed with higher expenditures does not always mean better efficiency performance. Good internal decisions and policies from each banks' management to respond to the current condition of the market are required.
2. Further research should create analysis by using bigger sample and time period. Moreover, other factors that affecting banks' efficiency performance such as number of employees, portfolio investments, etc. should be added as an extension of this study. Regression analysis such as Tobit Regression could also be included to find the relation of each variables towards the efficiency scores.

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