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Determinants of Efficiency of Islamic Banks: Indonesian Evidence

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Abstract

This study attempts to investigate the efficiency of Islamic banks in Indonesia and its determinants over the period of 2004-2014. Eleven full Islamic banks were selected for the sample. This study employs the Data Envelopment Analysis (DEA) in first stage of the analysis based on two inputs (fixed assets and deposits) and one output (financing income). Panel data regression is then employed in the second stage of analysis. This study finds that the efficiency scores of Islamic banks in Indonesia range from 61.4% to 96.4% between 2004-2014 with an overall efficiency of 75.6%. Regression analysis suggests that the efficiency of Islamic banks in Indonesia is negatively influenced by factors suchs as GDP growth, exchange rate and trade freedom while positively related with profitability, financing intensity, capitalization and non-financing expenses.

Keywords: Islamic banks, efficiency, DEA, Indonesia

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1. Introduction

A banking system is important in providing an intermediation function to the economy and in channeling the funds from surplus units to deficit units. It is one of the most important instruments of the economy for the purpose of funds saving and the allocation of credit. The importance of banking system can also be seen in its role as a financial intermediary and an economic stimulation. A bank has the power to convert an idle fund into a productive fund by channeling those funds into productive sectors. In developing countries, the banking sector is seen as escalating significantly due to the undeveloped financial market or even the absence of the financial market. Thus, for the emerging countries, the banking system is regarded as the backbone of the economic system. The robustness of the banking system is crucial in developing countries as to maintain a good economic system.

Indonesia, as one of the developing countries, is experiencing a rapid development of the Islamic banking sector. A recent survey states that 196 Islamic Financial Institutions (IFIs) are in operation in Indonesia (Source: Central Bank of Indonesia, 2014) and these include Islamic banks, Islamic business units and Islamic rural banks. Table 1 shows that Islamic banks in Indonesia recorded significant improvement in terms of assets, third-party funds and financing for the period of 2009-2014. The total assets of Islamic banks have increased from Rupiah 66,090 billion as at end-2009 to Rupiah 272,343 billion as at end-2014 which reflects a 312% times increase. Realising the significant improvement of Islamic banks and the unique operation of Islamic banks comparative to the conventional, the Central Bank of Indonesia has issued The Central Bank of Indonesia Regulation No. 09/1/PBI/2007 concerning the rating system for the commercial banks based on *Syariah* principles. The regulation is aimed to access the soundness level of Islamic banks in Indonesia and to mitigate the risk of banking crisis that might occur. The encouraging report on the development of Islamic banks is the main motivator for the Islamic banks in Indonesia to continuously contribute significantly to the economic growth in Indonesia (Abduh and Omar, 2012).

Table.1. Total Assets and Financing of Islamic Banks in Indonesia

	2009	2010	2011	2012	2013	2014
Total Asset	66090	97619	146467	196018	242276	272343
Third Party Fund	52271	76036	115415	147512	183534	217858
Total Financing	46886	68181	102655	147505	184122	199330
Non-Performing Financing to Total Financing Ratio	4.01%	3.02%	2.52%	2.22%	2.62%	4.33%
Financing to Deposit Ratio	89.70%	89.67%	88.84%	100.00%	100.32%	91.50%

Source: Central Bank of Indonesia, 2015

Despite its encouraging development, the Islamic banks in Indonesia are facing two main challenges. Firstly, the external factor such as the monetary crisis. The most damaging financial crisis recorded in the Indonesian history was a financial crisis in 1997-1998. It started when the value of Rupiah dropped steeply in July 1997 and created catastrophic damage to most of the banks in Indonesia and the whole economic system. Responding to the crisis, on the 3rd September 1997, the Indonesian government issued a policy to provide a liquidity support scheme which was known as *Bantuan Likuiditas Bank Indonesia* (BLBI) to 48 banks that have a liquidity problem to appease public panic. The government also came up with a declaration where sixteen banks were ctegorized as banks in liquidation (*Bank Dalam Likuidasi*), four banks as Banks Taken Over (BTO), ten banks to stop their operational activity (*Bank Operasi Beku*) while 39 banks were bounded to do certain activities (*Bank Beku Kegiatan Usaha Tertentu*). The Muamalat Indonesia Bank, the only Islamic bank in Indonesia during that period, was also affected by the crisis. During that time, the ratio of non-performing loans sharply increased to 60% of the total financing. The bank also bore losses by Rupiah 105 billion. Fortunately, in 1999, the Islamic Development Bank in Jeddah agreed to buy the shares of the Bank Muamalat so that it reinforced the capital of the Bank Muamalat and has become one of the main factors for the survival of the bank during the crisis of 1997 – 2000.

Responding to the financial crisis, on 30th April 1997, the Central Bank of Indonesia has put a set of regulations on the operation of banks in Indonesia, which was known as the decree of the Governor of Central Bank of Indonesia. The decree specifically explains the procedure of assessment on the soundness level of commercial banks. The issuance of this decree provides an insight for the central bank to assess and categorize the commercial banks in Indonesia into four groups which are: Healthy, Quite Healthy, Less Healthy, and Unhealthy. This step is crucial for the central bank to manage any risk associated with the banking system and its deviation. Unfortunately, it was not enough to avert the financial crisis in 1997 – 1998. Indonesia learnt the hardest lesson from this crisis. Knowing the effect of banking crisis to the whole of the Indonesian economy, the government thus issued a regulation in 2001. The regulation focussed on how to structurize the banking system in Indonesia to make it manageable, healthy and consequently can create a sound banking system in Indonesia. Several acts were also issued by the central bank to maintain the soundness of the banking institutions. Among the important act was The Act of the Financial Safety Net and this is to prevent such crisis from hitting Indonesia again in the future.

Secondly, in term of competition, the Islamic banks in Indonesia are facing a great competition from the conventional banks. Although the Islamic banks have comparatively experienced higher growth rate, the gap between the market share of conventional banks and of the Islamic banks is very wide. Up to March 2015, the market share of Islamic banks was 4.63%, leaving 95.37% controlled by the conventional banks. In addition, in term of financial performance, the conventional banks have performed bettter compared to the Islamic banks. As at January 2016, the conventional banks recorded a 2.51% return on assets (ROA), whereas the Islamic banks were only 1.01%. As for the Capital Adequacy Ratio (CAR), 21.75% was recorded for all conventional banks in Indonesia with the Islamic banks only 15.11% (Central Bank of Indonesia, 2014).

Hence with those challenges, it is important to examine the performance of Islamic banks in which this study attempts to examine, especially the underlying factors affecting the performance, as it will affect the decision-making process of the government and Islamic banks in Indonesia. One of the indicators of the performance that has been increasingly used by researchers around the globe is the level of efficiency. It is because efficiency is an essential element that Islamic banks need as it will determine the profitability of Islamic banks (Werner and Moormen, 2009). Through efficiency measurement, the efficiency of Islamic banks in utilizing its resources to produce products and generate income can be ascertained. In general,

resources of Islamic banks include expenses, deposits, and assets while, the outputs consist of financing income, non-financing income and financing.

Literature documents stipulate that there are three methods to measure the efficiency of a bank i.e. ratio approach, parametric approach and non-parametric approach. Ratio approach is based on the measurement of financial ratios such as the ROA and ROE while the parametric approach includes the Stochastic Frontier Approach (SFA), Thick Frontier Approach (TFA) and the Distribution-Free Approach (DFA). The Data Envelopment Analysis (DEA) and the Free Disposal Hull (FDH) are other methods to measure the efficiency level under the category of parametric approach. This study employs the DEA to measure the efficiency level of Islamic banks as it is claimed to be superior to other methods (Sufian and Haron, 2009; Kumar and Gulati, 2008).

Despite ample studies that have been conducted on the efficiency of Islamic banking in Indonesia, empirical studies that analyze the influence of banks-level characteristics and macroeconomic variables is still very limited. Hence the aim of this study is to fill the gap in the literature by examining the influential factors (macro and bank-level) and trade freedom on Islamic banks' efficiency in Indonesia during the period of 2004-2014. This study employs the DEA to ascertain the efficiency level of the Islamic banks and follows by a panel regression analysis to measure the relationship between the identified factors and banks efficiency.

2. Literature Review

Firdaus and Hosen (2013) examine the efficiency level of Islamic banks in Indonesia and measure the influencing factors by using the DEA. The study also analyzes the performance of the Islamic banks from 2010 and 2012 by using the proposed measurement performance by the Central Bank of Indonesia and integrates it with the result from the DEA analysis. The study concludes that the Islamic banks in Indonesia fail to reach the optimum efficiency during the period under study. In addition, the study also proposes that the modification of capital, asset quality, earnings, liquidity, and the sensitivity to market (CAELS) were more accurate than the proposed capital, asset quality, management, earnings, liquidity and sensitivity to market (CAMELS) by the central bank in measuring the performance of Islamic banks. Another study by Hadad *et al*. (2008) investigates the efficiency of the Indonesian banks during the period of 2007 based on the DEA. The result of the study shows that the efficiency of the Islamic banks during the year 2007 was above the average efficiency score of the Indonesian banks.

Sufian and Habibullah (2012) investigate the efficiency level of the Indonesian banks during the period of 1999–2007 by using the DEA to measure the efficiency level of the Indonesian banks. They conclude that the technical and scale of production inefficiency is the main source of inefficiency rather than the inefficient use of resources within the managerial bank practices among the Indonesian banks. Hadad *et al.* (2012) in their study on Indonesian banks during the period of 2003-2007 conclude that most efficient banks in Indonesia during the period were the state-owned banks while the regional government-owned banks were inefficient. A more recent study by Zuhroh *et al*. (2015) examines the cost efficiency of Islamic banks in Indonesia by employing an SFA during the period of 2004-2010. They conclude that the Islamic banks were more efficient than the conventional banks in term of technical efficiency and the Islamic banks incurred lower average cost compared to its conventional counterparts.

3. Hypothesis Development

3.1 Return on Assets (ROA)

Return on assets ratio (ROA) is measured by the current year income divided by total assets. ROA is a measurement for profitability of the Islamic banks. It has been used as an independent variable in many studies on determinants of efficiency (see for examples, Ioanna *et al.*, 2013; Sufian and Habibullah, 2009; Saka *et al.*, 2012). According to Sufian and Habibullah (2009), ROA has a positive relationship with the efficiency of Islamic banks because banks with higher profitability will be more attractive to the depositors and are the best potential creditworthy borrowers relative to other less profitable banks. This argument motivates the bank to be more profitable and enhance its efficiency (Ioanna *et al*., 2013; Sufian, 2009; Sufian and Habibullah, 2009).

H1: There is a positive relationship between ROA and the Islamic banks' efficiency in Indonesia during the period understudy.

3.2 Non-Financing Expenses to the Total Assets Ratio

Non-financing expenses is measured by dividing the non-financing expenses over total assets. This ratio is used to give an insight to the variation in operating cost in the Islamic banks in Indonesia. It is expected that the high level of non-financing expenses to total assets ratio (NFE/TA) will negatively impact the performance and efficiency of Islamic banks because efficient banks are expected to operate at low NFE/TA ratio (Shawtari *et al*., 2015; Sufian, 2009; Sufian and Habibullah, 2009).

H2: There is a negative relationship between non-financing expenses to total assets ratio and the Islamic banks' efficiency in Indonesia during the period under study.

3.3 Total Financing to Total Assets Ratio

Total financing is the reflection of the ratio of total financing over total assets of the Islamic banks in Indonesia. The Islamic banks financings are assumed to be the main source of income and are expected to have a positive relationship to the efficiency of the Islamic banks (Isik and Hassan, 2003; Sufian, 2009; Shawtari *et al*., 2015).

H3: There is a positive relationship between total financing to total assets ratio and the Islamic banks' efficiency in Indonesia during the period understudy.

3.4 Equity to Total Assets Ratio

Total equity to total assets ratio is included in this study as Sufian (2009) states that lower capital ratio in banking will result to higher leverage thus, enhances the risk and greater borrowing cost. Sufian (2009) also notes that the equity to total assets ratio has a positive relationship to the efficiency of banks. They conclude that the more efficient banks, *ceteris paribus,* the more it uses equity compared to the other banks.

H4: There is a positive relationship between equity to total assets ratio and the Islamic banks' efficiency in Indonesia during the period understudy.

3.5 Growth of Gross Domestic Product

Following previous studies (Chen, 2009; Sufian, 2009; Johnes *et al*., 2014; Shawtari *et al*., 2015; Dell'atti *et al*., 2015; Al-Gasaymeh, 2016), this study uses growth of gross domestic product per capita (GDP). GDP per capita is measured by GDP divided by the mid-year population. Meanwhile, GDP is the nominal value of economic activity, which captures the value of finished goods and services of the Indonesian economy during the period of study.

Chen (2009), Sufian (2009), Johnes *et al*. (2014), Shawtari *et al*. (2015) and Al-Gasaymeh (2016) find a positive relationship between GDP and bank's efficiency. This is due to the higher GDP contributing to the increase of the demand on the banking sector services. In contrast, a lower GDP will decrease the efficiency of banking sector. This is because the slowdown of the economy would normally be followed by the increase of the ratio of non-performing financing to total financing.

H5: There is a positive relationship between growth of GDP and the Islamic banks' efficiency in Indonesia during the period understudy.

3.6 Inflation

Inflation is measured by the percentage of change of general price level of goods and service in Indonesia on yearly basis. This is a reflection of the marginal change of price index. Regarding the relationship of inflation to the efficiency of Islamic banks, there are evidences that the inflation has a negative relationship with the efficiency of the Islamic banks (Sufian and Habibullah, 2012; Chen, 2009; Al-Gasaymeh, 2016). A high level of inflation negatively affects the economy and the performance of financial industry. The increase of price of goods and services could indirectly raise the operational cost of the banking sector, which would then decrease the efficiency of the Islamic banks.

H6: There is a negative relationship between inflation and the Islamic banks' efficiency in Indonesia during the period understudy.

3.7 Exchange Rate

The exchange rate is measured by the value of Indonesian currency (Rupiah) against the US Dollar on yearly basis. According to Caner and Kontorovich (2004), a weak exchange rate of a local currency has a negative relationship with the efficiency of banks. This is because the depreciation of Indonesian currency could increase the non performing financing to total financing ratio which then will reduce the performance and efficiency of banks. The increase of non performing financing to total financing ratio could also make the banks to be more careful and strict in channeling its financing facility to loan borrowers. This will eventually contribute to the reduction of the efficiency of banks.

H7: There is a negative relationship between exchange rate and the Islamic banks' efficiency in Indonesia during the period understudy.

3.8 Trade Freedom

The index of economic freedom (Heritage, 2017) is measured by combining the measurement of the absence of tariff and non-tariff barriers, which influences the exports and imports of goods and services of a country. It is based on two sources of inputs, which are the trade-weighted average tariff rate and non-tariff barriers (NTBs). Naturally, the lower bound of the tariff rate will be set to zero percent, whilst, 50% percent rate will be set to be the upper bound. Then, the NTBs will be used as the penalty value that will subtract the value of the base score. The value of penalty score is charged to the following scale:

1. 20 - NTBs are used broadly across many goods and services and/or act to actively retard the significant amount of international trade.
2. 15 – NTBs are used largely across many goods and services and/or act to retard a majority of potential international trade.
3. 10 – NTBs are used to protect certain goods and services and/or retard some international trade
4. 5 – NTBs are uncommon, used to protect few goods and services and/or retard few international trades.
5. 0 – NTBs are not used to impede any international trades.

To the best of our knowledge no evidence of study examining the impact of trade freedom index to the efficiency of bank has been documented in the literature. The empirical evidence is only found to be reported on the relationship of the economic freedom to the efficiency of banking sector. Economic freedom index is measured by using 10 specific freedoms and one of them is trade freedom. Sufian and Habibullah (2012) suggest that the overall economic freedom exerts a negative relationship with the efficiency of the Islamic banks.

H8: There is a negative relationship between trade freedom index and the Islamic bank's efficiency in Indonesia during the period of 2004-2014.

4. Data and Methodology

4.1 Data

Based on the yearly data from 2004-2014, this study employs the DEA to analyze the efficiency level of the Islamic banks in Indonesia. The sample in this study covers all operating Islamic banks during the period of 2004-2014 except the Tabungan Pembangunan Negara Syariah Bank (BTPNS) which was operating only in 2014 during the period of analysis. Therefore, in total, 11 Islamic banks were analyzed in this study. As some banks are established much later years compared to others, this study hence utilizes an unbalanced panel data set. The period is chosen as the study intends to capture the efficiency of Islamic banks in Indonesia during the periods that includes the global financial crisis of 2008.

4.2 Methodology

4.2.1 First Stage: DEA Analysis

Selection of Variables

The selection of inputs and outputs is vital in the DEA method because it will determine the result of efficiency. In general, there are two approaches in order to choose the variables used in the DEA, namely the production approach and the intermediation approach (Coelli *et al*., 1998).

Firstly, as suggested by Benston (1965), in the production approach, the bank is viewed as an institution that provides and produces products to customers. The inputs based on this approach include physical variables (e.g. labour and materials) or other associated costs. Therefore, in the production approach, the physical inputs are viewed as the object that helps in producing service of the bank because it is needed to perform transactions, process financial documents, or provide advisory and counseling services to customers. The output sets under this approach are the services offered by the bank to the customers. The measurements are the number and type of transactions, documents processed or specialized services provided over a given period. According to Berger and Humprey (1997), the production approach is more suitable for the purpose of identifying the efficiency level of bank branches. It is under the assumption that the branches of almost all banks will focus on the process of customers' documents and funding. The second approach, the intermediation approach is pioneered by Sealey and Lindley (1977). Under this approach, the bank will be viewed as the institution that intermediates the deficit unit and surplus unit. This approach sees the bank as financial intermediaries using labour, capital and deposits that will be used to create loans and other investment asset and income.

This study uses the intermediation approach, firstly considering we are studying the entire banks, not branches, and the very nature of the Islamic banks that function as financial intermediary. Second, Indonesian banking industry's state of development has breached the fundamental level of banking sector but not as complicated and sophisticated as well developed, more mature, banking system where the products are widely diversified, fully engaged in derivatives markets, and highly involved in structured product (Hadad *et al*., 2012).

There is one rule that is required to be satisfied in determining a total number of input and output that can be used in the DEA according to Cooper *et al*. (2002). The simple rule is as follows:

$$n \geq max\ \{m*s,\ 3(m + s)\}$$

Where n is the total DMU's used in the study; m is the number of input; and s is the number of output. Following the given rule, the total input + output that will be used in this study is three with two outputs and one input. Following the previous studies (see for examples, Ahmad and Luo, 2015; Shawtari *et al*., 2015;Abdul-Wahab and Haron, 2017), the set of output variables is financing income (y1) and the input variables to produce the output (x1) deposits and (x2) fixed asset.

4.2.2 Second Stage: Panel Data Regression Analysis

Panel data regression analysis is conducted to provide a comprehensive view of the factors that are influencing the efficiency scores that have been estimated previously. Based on previous studies, the efficiency scores have a significant relationship with a set of specific variables. To be more precise, these variables are divided into two categories. The first category will be the internally related factors of Islamic banks (bank specific) and the second is a set of macroeconomics variables. The relationship is defined as:

$$EFF_{it} = \beta_0 + \beta_1 ROA_{it} + \beta_2 NFETA_{it} + \beta_3 TFTA_{it} + \beta_4 ETA_{it} + \beta_5 GDP_t + \beta_6 INF_t + \beta_7 EXCR_t + \beta_8 TFI_t + \varepsilon_{it} \quad (1)$$

Where EFF = Efficiency of Islamic banks, generated from DEA, ROA= Return on Total Asset, NFETA = Non-Financing Expenses to Total Asset Ratio, TFTA = Total Financing to Total Asset Ratio, ETA = Equity to Total Asset Ratio, GDP = Gross Domestic Product, INF = Inflation, EXCR = Exchange Rate, TFI = Total Freedom Index and ε = error term

This study employs the Pooled Ordinary Least Square (OLS), Fixed Effect (FE) and Random Effect (RE) models. The best model among the three panel regression is then used to explain the above relationship. This study employed all the three tests, namely the Chow (F-Test), Breusch and Pagan Lagrangian Multiplier Test (BP-LM) and Hausman Test in selecting the most appropriate model for this study.

The FEM is estimated based on within effect estimation method. The FE and RE are expressed as follow.

$$EFF_{it} = (\alpha + u_j + \lambda_t) + \beta_1 X_{1it} + \beta_2 X_{2it} + \cdots \ldots \ldots + \beta_k X_{kit} + \varepsilon_{it} \quad (2)$$

where $\varepsilon_{it} = u_j + \lambda_t + v_{it}$; u_j and λ_t denotes the individual and time effects respectively.

$$EFF_{it} = \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} + \cdots \ldots \ldots + \beta_k X_{kit} + \varepsilon_{it} \quad (3)$$

where u_j and λ_t denotes the individual and time effects respectively, together they represent that each bank is having different intercepts.

Table 2. Dependent, Indepent, and Control Variable of the Study

Variable	Variable Name
Dependent Variable	
EFF	Efficiency
Independent Variable	
Bank Specific Characteristics	Return on Total Asset
	Non-Financing Expenses to Total Asset Ratio
	Total Financing to Total Asset Ratio
	Equity to Total Asset Ratio
Macroeconomic Variables	Inflation
	Exchange Rate
	Gross Domestic Product Growth
Trade Freedom	Trade Freedom Score

5. Result and Analysis

5.1 Technical Efficiency of Islamic Banking Industry in Indonesia

The result of the average of DEA efficiency scores of Islamic Banks in Indonesia from 2004 until 2014 based on the constant return to scale is presented in Figure 1.

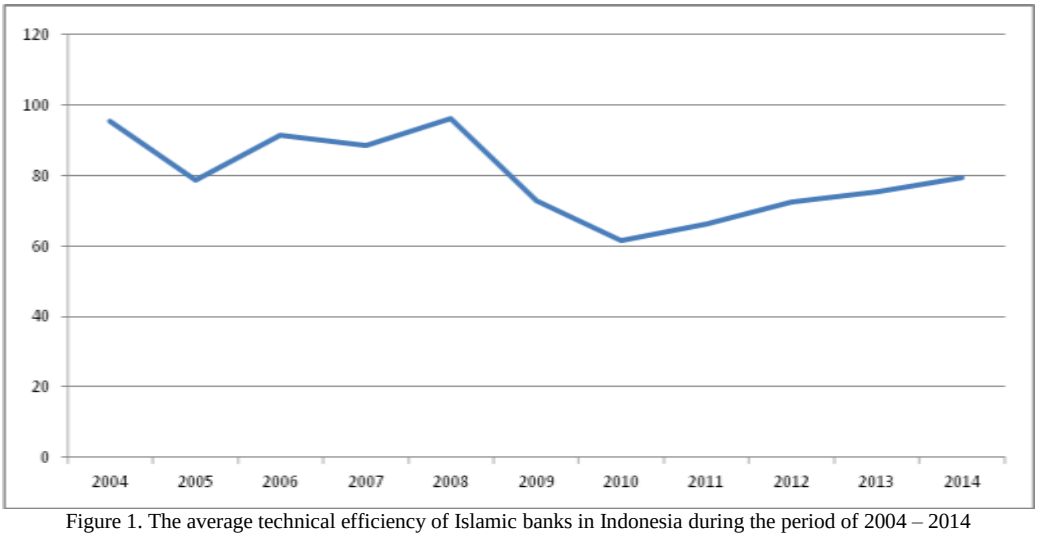

Figure 1. The average technical efficiency of Islamic banks in Indonesia during the period of 2004 – 2014

Figure 1 presents the stability and trend of the efficiency scores of the Islamic banks in Indonesia during the period of the study. It presents the result of the average score of efficiency using the bootstrap DEA based on a constant return to scale (CRS). It shows that the overall efficiency of the Islamic banks is fluctuated. The efficiency scores ranged from 61.4% to 96.4% with the average efficiency of 75.6% during the study period. It can be concluded that the Islamic banks in Indonesia performed well in carrying out its main function as the intermediary institution between the deficit units and surplus units despite with an average waste of input of about 0-24.4 per cent.

The waste of the input of the Islamic banks in Indonesia is depicted maybe because the Islamic banks focus their financing in micro, small, and medium enterprises rather than large enterprises. The lack of capital and deposits of the third party is the main reason why the Islamic banks in Indonesia cannot facilitate large corporate financing. The incapability for the Islamic banks to enter into the big market has influenced its ability to transform its capital and deposit from the third party into financing which later influences its profitability.

There was a remarkable point where the average efficiency level declined significantly. The technical efficiency level of Islamic banks decreased from 95.5% in 2004 to 78.55% in 2005. This decrease in technical efficiency is perhaps due to the Indonesian economy being pressured by the external economics disturbance then. The main concern is the increasing global oil price that drives the government to raise the oil price in Indonesia. The policy has led the surge of the inflation in the economic system and has created instability in the macro economy. The conditions force the central bank to increase local interest rate, which affects the performance of the Islamic banks. The rise of local interest rate causes the marginal rate of financing facilities or saving facilities of the Islamic banks to rise, which at the end decreases the performance and efficiency of the Islamic banks. At the same time, the increase of inflation has affected the financing facility of the Islamic banks. The evidence can be seen from the non-performing financing (NPF) ratio of Islamic banks in 2005. NPF ratio rose from 2.35% in 2004 to 2.8% in 2005 (Source: Central Bank of Indonesia, 2014), which also affected the efficiency of Islamic banks.

The surge in oil price and the increase of Bank Indonesia's interest rate (BI rate) creates a domino effect of the global risk situation, at the end of which, influences the Islamic banks' efficiency at that particular time. Those factors mentioned above may lead the Islamic banks in Indonesia giving extra prudential steps, such as, being more selective in providing financing facility and by placing investment in safer investment tools. Since the Islamic banks are being more prudent, the law of "low risk-low return" would take place. The incomes of Islamic banks will be lesser, and it will decrease its efficiency level. It can be seen from the reduction of return on assets ratio in 2005 (year-on-year). This condition leads to the deceleration of profitability of the Islamic banks. The return on assets ratio declined from 1.41% in 2004 to 1.35% in 2005.

The most noticeable changes in the performance of the Islamic banks during the period of 2004-2014 were the significant increase of efficiency level at the period of global crisis in 2008. Not only having the significant increase in 2008, but also apparently obtaining the highest level of efficiency during the period under study. The Islamic banks did not seem to be affected by the global economic crisis, which caused many big banks, including Lehman Brothers, to become insolvent. In fact the performance of Islamic banks seems to increase when the others decrease.

Other indicators of performance also supported the result of the DEA analysis. As observed from the data collected from the central Bank of Indonesia, the ROE of the Islamic banks was 53.98% in 2007 and the percentage increased and reached 62.05% at the end of 2008. Then, the non-performing financing ratio of the Islamic banks, which was 4.05% in 2007 surprisingly declined and fell to 3.95% in 2008. Focusing on the retail sector, which includes micro and small enterprise, would be the main factor that caused the insignificant influence of the 2008 financial crisis to the Islamic banks in Indonesia. In addition, Islamic banking financing activities which are still dominated by the financing on domestic economic activities contributes to strengthen the resilience of the Islamic banking from the impact of the global financial crisis.

Starting its downtrend performance in 2009, the efficiency of the Islamic banks in Indonesia unfortunately reached its lowest level during the period of 2010. On the contrary, the development of the Islamic banks in terms of certain aspects increased significantly. The total assets of the Islamic banks as at December 2010 reached Rupiah 97,519 trillion or increased by 47.6% from the preceding year, which is the most significant growth for the last five years from 2010. The same way goes with the growth of the third party funds which recorded 45.5% growth in 2010, higher than its preceding year which was 41.9%. In addition to that, the total financing of the Islamic banks also showed significant improvement with 45.4% raise.

Another performance indicator of the Islamic banks in Indonesia during the period of 2009-2010 showed a downtrend performance. The return on equity ratio showed a decreasing trend from 26.09% in 2009 to 17.58% in 2010. The Islamic banks also experienced a 2.59% raise from 1.42 on 2008 to 4.01% on 2009 on its non-performance financing ratio. It is of our opinion that the establishment of new Islamic banks in 2009 and 2010 could be the main factor that contributed to the collective downgrade of the

efficiency level during the period of 2011. The new established Islamic banks required some time to adapt with the business environment and maximize the function of its resources to become fully potential. This is evidenced by the downtrend of financing to deposit ratio, from 103.65% in 2009 to 89.67% in 2010.

Table 3. Efficiency of individual bank by year during 2004-2014 based on Constant Return to Scale

Bank/Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Mean
BCAS								95.75	88.85	68.38	87.17	85.03
BJBS								100	60.46	78.77	64.73	75.99
BNIS								23.42	72.68	81.22	99.74	69.26
BVS								32.39	64.99	56.35	72.68	56.6
MBS								100	100	81.03	100	95.25
BPS							31.21	58.95	67.53	61.4	100	63.81
BRIS						68.85	56.23	62.62	67.32	84.21	73.12	68.72
BSB						48.55	55.33	45.13	56.57	63.82	66.87	56.04
BMS		45.6	100	100	96.19	100	100	100	100	100	100	94.17
BMI	100	100	100	100	100	75.11	61.39	51.03	57.59	54.89	50.89	77.35
BSM	91.1	90.07	74.08	65.97	93.06	71.29	64.49	58.59	61.7	100	58.49	75.35

Notes: BCAS (Bank Central Asia Syariah), BJBS (Bank JABAR Banten Syariah), BNIS (Bank Negara Indonesia Syariah), BVS (Bank Victori Syariah), MBS (MayBank Syariah), BPS (Bank Panin Syariah), BRIS (Bank Rakyat Indonesia Syariah), BSB (Bank Syariah Bukopin), BMS (Bank Mega Syariah), BMI (Bank Muamalat Indonesia), BSM (Bank Syariah Mandiri).

Table 3 demonstrates the efficiency of the Islamic Banks in Indonesia during the period of 2004-2014 based on the constant return to scale on individual basis. Based on the efficiency scores, there are some banks that have a perfect score of efficiency in some years and there are also some banks that do not achieve perfect efficiency score. Bank Syariah Bukopin, Bank Rakyat Indonesia Syariah, Bank Victoria Syariah, Bank Negara Indonesia Syariah and Bank Central Asia Syariah, were banks that could not attain the perfect efficiency score. This suggests that those banks could produce more outputs with the same input that they had, given improvement in efficiency level. Meanwhile, banks which have a perfect score include Bank Syariah Mandiri in 2013, Bank Muamalat Indonesia in 2004-2008, also Bank Mega Syariah during the years of 2006, 2007, and 2009-2014, as well as Bank Panin Syariah in 2014, MayBank Syariah in 2011 and 2012, and finally, Bank JABAR Banten Syariah in 2011.

On average, the efficiency scores derived from all the Islamic banks throughout the years was not very satisfying as it was less than 100%. As presented in Figure 2, the average of technical efficiency score for each Islamic bank in Indonesia from the periods over 2004 until 2014 was not encouraging. Based on the evidence showed in Figure 2, out of 11 operating Islamic Banks, there are only two Islamic banks, which obtained a nearly perfect score of technical efficiency, which are MayBank Syariah and Bank Mega Syariah, which gained 95.26% and 94.18% respectively. Among others, MayBank Syariah has the best average of efficiency score under the CRS DEA analysis. Bank Muamalat Indonesia, which is the oldest Islamic bank in Indonesia, holds the fourth best on the average of the technical efficiency score. Meanwhile, Bank Muamalat Indonesia has an average of 77.35% efficiency score over the period of study.

Bank Syariah Mandiri (BSM), which is the largest Islamic bank in term of assets based on the financial report of 2014, surprisingly only managed to achieve the sixth highest on the average of technical efficiency level. While the other Islamic banks, such as BCA Syariah, Bank JABAR Banten (BJB) Syariah and MayBank Syariah, which are established earlier with a smaller asset base compared to the BSM, have better technical efficiency scores.

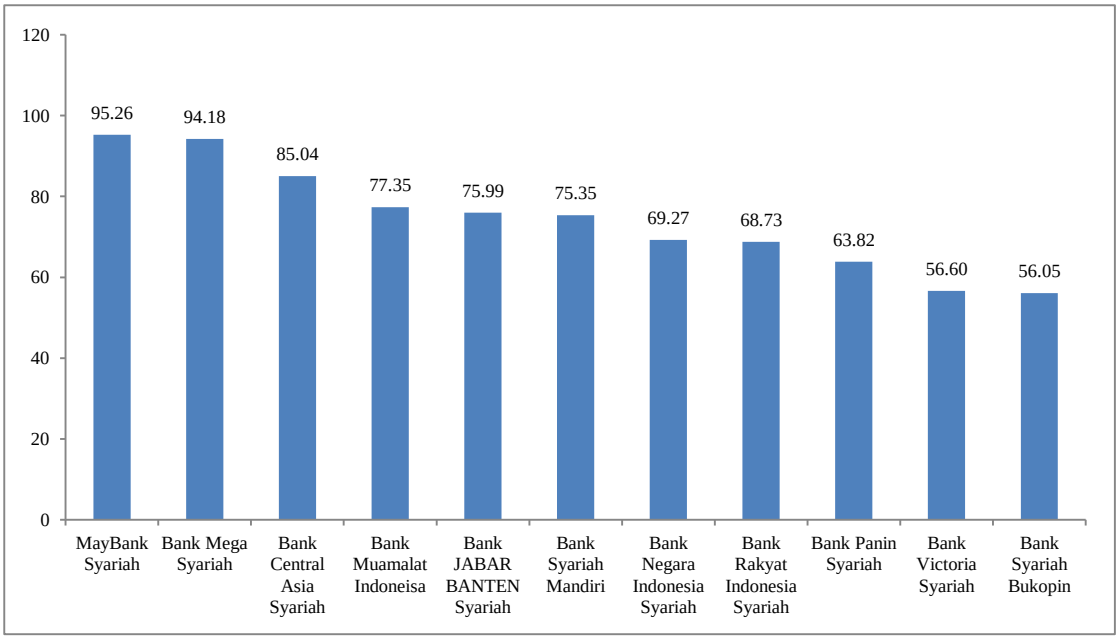

Figure 2. Average of Technical Efficiency Score for Each Islamic Banks in Indonesia

This means that although BSM has a better level of assets, which in the banking industry are very important for the business, compared to other banks established earlier, the ability of BSM to convert the deposit of third parties and fixed assets into financing income is lower. Another possible reason for this is because the BSM has a longer period of service than the others, which includes the period of crisis in 2004 and 2008, while the other Islamic banks in Indonesia were established after the 2008 crisis.

5.2 Determinants of Efficiency

Table 4. Determinants of Efficiency

Efficiency **Explanatory Variables**	**Pooled OLS**	**Fixed Effects**	**Random Effects**	**VIF**
ROA	6.8727** [3.53]	5.5477*** [2.53]	6.8727*** [3.77]	1.33
Non-financing expenses to total assets ratio	3.0137*** [3.52]	2.3045** [2.36]	3.0137** [3.76]	1.42
Total Financing to total assets ratio	0.8741*** [3.67]	1.2109** [4.18]	0.8740** [3.92]	1.40
Equity to total assets ratio	0.5938*** [2.84]	0.2855 [0.57]	0.5938 [3.03]	1.49
Trade Freedom	-3.2712** [-2.09]	-2.3795*** [-1.55]	-3.2712*** [-2.23]	1.28
GDP growth	-9.4652** [-2.44]	-6.9538 [-1.79]	-9.4652** [-2.60]	1.25
Inflation	1.1188 [0.97]	0.2585*** [0.23]	1.1188** [1.03]	1.78
Exchange rate	-17.4812** [-2.15]	-18.2553 [-2.18]	-17.4812 [-2.29]	2.37
Constant	417.0354 [2.59]	331.4646 [2.07]	417.0354 [2.76]	
Chow (F-test)		1.84		
B-P LM Test (χ^2)			0.00	
R^2	0.5340	0.6953	0.5340	
Adjusted R^2	0.4719	0.5367	0.4719	
F-stat	8.5953***	5.3760***	8.5953***	

Notes: ***/**/* denotes significant at 0.01, 0.05 and 0.10 levels respectively. The Chow (F-test) statistic refers to the null: POLS is a better model; B-P LM test (χ^2) statistic refers to the null: POLS is a better model. Multicollinearity test in the dataset is performed

and no multicollinearity problem is found in the data since the variance inflation factor (VIF) of variables are less than 10 for efficiency as the dependent variable, reported above.

5.3 Interpretation and Analysis

The pooled OLS is the best model after performing the necessary tests i.e. Chow (F-Test) and B-P LM test that state H_0: Pooled OLS is a better model. The empirical findings presented in Table 4 shows a negative relationship between Trade Freedom (TRF) and efficiency of Islamic banks (p=0.05). The greater the barrier of the international trade in the form of the raise of tariff on export and import commodities, the more it tends to enhance the performance of the Islamic banks. The great barrier of international commodity trade is crucial to a developing country like Indonesia as it protects the developing business environment from cheap and more competitive products coming from foreign countries. Low or no tariff rate for international trade will increase the competitiveness of product in Indonesia. In a developing country like Indonesia, the no tariff rate policy could cause the local industry to go bankrupt as it cannot withstand the imports from foreign industry, which possess more capital, advance products, comprehensive and efficient management and skilled labour, as compared to the local industry in Indonesia, which is still lacking.

Imports from foreign countries, especially from the developed countries, which are much cheaper and more attractive, could create price instability as it will create new price equilibrium. The impact would be devastating, especially for the local products to compete and eventually could cause the local products to be eliminated from the market. The collapse of local industries will give a negative impact for the Islamic banks since the majority of the financing portion of Islamic banks goes to working capital sector. The Islamic banking statistic in 2014 published by Financial Service Authority states that the working capital portion constitutes the biggest portion of the Islamic banks financing in December 2014.

Regarding the impact of GDP growth, the findings conclude that the GDP growth is negatively impacting the efficiency of Islamic banks in Indonesia (p=0.05). The empirical result indicates that the growth in GDP tends to decrease the efficiency of Islamic banks. According to Staikouras and Wood (2004), higher GDP tends to attract investors to establish new banks, both new local banks or new foreign banks, thus the competition will be higher. Banks operating in countries that have higher GDP growth tend to compete with other banks which would result in more competitive profit margin (Pasiouras and Kosmidou, 2007; Řepková, 2015). Another explanation is that it may reflect the positive association between the economic activity to the bank cost, such as wage and capital cost which is normally risen in the situation when the economic performance is escalating (Perera, Skully, and Wickramanayake; 2007). According to the International Monetary Agency (IMF) World Economic Outlook (2016), in 2015, Indonesia achieved the16th biggest GDP around the world. Another interesting fact is Indonesia achieved the 8th biggest GDP based on the purchasing power parity (PPP). As mentioned above, the performance of the banks could have a negative relationship with the GDP of a country. Looking at the facts that Indonesia currently achieved the 8th biggest GDP based on PPP, therefore, it suggests that the efficiency of the Islamic banks in Indonesia tends to decrease by the higher value of GDP. This finding is supported by Sufian *et al*. (2016).

As for the impact of exchange rate to the efficiency of Islamic banks in Indonesia, the empirical result seems to suggest that the exchange rate has a negative and significant relationship with the efficiency of the Islamic banks (p=0.05). The result indicates that higher the exchange rate tends to decrease the efficiency of the Islamic banks. There are two possible explanations for this situation. First, the stable macroeconomic condition, especially the stability of Indonesian currency is fundamental, as the volatility of the Indonesian currency gives a bad impact on the economy of the country. The instability of exchange rate could bring high uncertainty for the international traders, thus brings high risk for them. The increase of the risk profile of the international traders increases their chance to default, which will then affect the performance of the Islamic banks, which provide financing to that sector. This is possible as the Islamic banks in Indonesia have a significant share of financing in the trade-financing sector. Second, ideally, the appreciation of exchange rate will give the most benefit to exporters with the increase of the profit margin. While the importer will have a bad effect as they have to pay more for the commodities that they bought from foreign countries. However, in the case of Indonesia, great dependency of import on raw materials, auxiliary materials, capital goods, and even the energy makes the situation worse. Therefore, when the Rupiah is under pressure, the exporter cannot have the maximum benefit as the cost of production is also rising as price of raw materials to produce goods, which is obtained from imports, increases. A large

portion of imported raw materials in domestic industries cause a structural problem in Indonesia and has been burdening the local economy. Therefore, the appreciation of Rupiah is not only burdening the importers, but also the exporters, which at the end will decrease the exports and imports and makes the international trade fall. Looking at the fact that the international trade industries exhibited a significant portion (48.3%) of the total GDP in Indonesia in 2014, the fallen of international trade industries justifies the downtrend of the Islamic banks efficiency.

With regards to the relationship of ROA with the efficiency of the Islamic banks, the empirical result shows a positive relationship (p=0.05). It indicates that the more profitable banks tend to be more efficient. The reason for this is that banks with a higher profitability will attract more customers than banks with less profitability. In addition to this is that the creditworthiness of profitable banks is greater than the less profitable banks which eventually boost the confidence of depositors. This will increase the deposit of the banks and provide ability to the banks to produce more output, thus, increases the efficiency level of the banks (Ioanna *et al*., 2013; Sufian, 2009; Sufian and Habibullah, 2009). This finding is supported by Sufian (2009), Sufian and Habibullah (2009), Saka *et al*. (2012), and Ioanna *et al*. (2013).

Concerning the relationship of NFETA with the efficiency level of Islamic banks, the findings seems to suggest that NFETA has a positive and significant relationship with the efficiency level of the Islamic banks (p=0.01). The empirical result indicates that higher NFETA increases the efficiency level of the Islamic banks. Sathye (2001) states that when the banks hire more highly qualified and skilled management and manpower, which would require higher salary. More professional management and manpower will cause non-financing expenses to increase, but it will be offset with the increase in the efficiency of Islamic banks. Secondly, the Islamic banks in Indonesia are operating in the environment that is highly potential to improve, especially in the financial sector. According to the financial literacy survey conducted by the Financial Service Authority (2013), financial literacy in Indonesia is 21.84%, which means that 78.16% of Indonesian people still need to be educated about the financial sector, which also represents the potential customers for the Islamic banks. Currently, 78.16% of Indonesian people mostly live in villages or remote areas with a lack of technology, implying a need for the banks to execute expansion by building branch offices and hiring more staff. The expansion of the Islamic banks to the areas that have high financial illiteracy could improve the efficiency of the Islamic banks.

The empirical result indicates that total financing reveals a positive relationship with the bank efficiency level (p=0.01). The findings indicate that the bank with higher total financing to total assets ratio exhibited a higher level of efficiency. A likely reason for this may be associated with the relatively efficient bank's ability to manage operations more productively. The ability of the bank's management to create a more productive operation enables them to operate with a low cost operation, thus allowing them to offer customers a more competitive financing package. Ultimately, banks will get a larger market share and produce more income through competing financing terms (Isik and Hassan, 2003; Sufian, 2009).

As for the equity to total assets ratio, result shows a positive relationship with the efficiency level of Islamic banks (p=0.01). This reveals that banks with higher equity to total assets ratio experienced higher level of efficiency. There are two plausible explanations for this relationship. First, higher equity will reduce the agency cost in the banks between the managers and the share-holders. Higher equity will boost the control of the share-holders over management. With the share-holders on top of the management, the controlling function would raise thus leads to the efficiency of the banks (Eisenbeis *et al*., 1999; Mester, 1996; Pančurová and Lyócsa, 2013). Second, a high capital ratio will boost the confidence of the depositors as it indicates that the banks are in a low risk position. In addition, banks which have increased their capital, will also raise its expected earnings by reducing its expected costs of financial distress, including bankruptcy (Berger, 1995; Sufian and Habibullah, 2012).

6. Conclusion

This study investigates the efficiency of the Islamic banks in Indonesia and its determinants during the period of 2004 – 2014. The efficiency scores of the Islamic banks in Indonesia ranged from 61.4% to 96.4% during the period understudy. The DEA analysis states that the overall efficiency of the Islamic banks in Indonesia is 75.6%. The Islamic banks, which have a perfect score during the period of study are Bank Syariah Mandiri in 2013, Bank Muamalat Indonesia in 2004-2008, Bank Mega Syariah during 2006, 2007 and 2009-2014, Bank Panin Syariah in 2014, MayBank Syariah in 2011 and 2012, and Bank JABAR Banten Syariah in 2011.

The empirical result shows that the GDP growth and the exchange rate have a negative relationship. The ROA, the non-financing to total assets ratio, the total financing to total assets ratio, and the equity to total assets ratio exhibit positive relationships with the efficiency of the Islamic banks. This study finds insignificant evidence to conclude the influence of inflation on the efficiency of Islamic banks in Indonesia during the period under study. Another interesting finding is the significant negative relationship between the trade freedom index and the efficiency of the Islamic banks. The intervention of governments in the trade sectors will indirectly enhance the efficiency of the Islamic banks. This study hence fills the gap in the literature by analyzing the efficiency level of the Islamic banks in Indonesia and its influencing determinants during the period under study.

This study has policy implications. At the banks' level, the Islamic banks in Indonesia should continue finding ways to enhance its efficiency from the current level by being more cost effective in its operation and to increase its product innovation in line with the objective of Islamic banks in fulfilling the *maqasid al-Syariah*. While for the regulator, a more conducive banking environment and incentives to the local Islamic banks should be developed further by the Indonesian regulator, in order to strengthen its position and maintain competitiveness in the banking industry.

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