Kajian Ekonomi & Keuangan

Measuring Efficiency of the Indonesian Islamic Banks

Mengukur Efisiensi Bank Syariah di Indonesia

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Abstract

Dalam beberapa tahun terakhir, jumlah Bank Umum Syariah dan Unit Usaha Syariah meningkat pesat. Tetapi, laba bersih bank-bank tersebut menurun signifikan pada tahun 2014. Di sisi lain, Bank Pembiayaan Rakyat Syariah yang memiliki tingkat pertumbuhan jaringan yang lebih rendah memiliki penurunan laba yang tidak signifikan. Oleh karena itu, penelitian ini bertujuan untuk mengestimasi tingkat inefisiensi dari Bank Umum Syariah dan Bank Pembiayaan Rakyat Syariah. Lebih lanjut, studi ini juga mengestimasi penyebab dari inefisiensi pada Bank Syariah. Terdapat dua kontribusi utama dari penelitian ini: studi ini membedakan Bank Syariah menjadi dua kategori dan mengidentifikasi penyebab dari inefisiensi. Metodologi yang digunakan dalam penelitian ini adalah analisis Stochastic Frontier dengan menggunakan data bulanan dalam periode 2009-2014. Terdapat beberapa temuan dari studi ini. Pertama, dana deposito memiliki peranan penting dalam menentukan kemampuan pembiayaan untuk kedua jenis bank tersebut. Kedua, terkait dengan inefisiensi, Bank Pembiayaan Rakyat Syariah selalu efisien dalam periode observasi studi, sedangkan Bank Umum Syariah memiliki tingkat efisiensi yang relatif lebih rendah. Ketiga, meningkatkan ROA yang memiliki nilai estimasi parameter yang negatif dan signifikan secara statistik adalah penting untuk mengurangi inefisiensi pada Bank Umum Syariah.

Abstrak

In recent years, the number of Islamic Commercial Bank and Business Unit increases significantly. Nevertheless, net profit of these banks decreased significantly in 2014. On the other hand, the Islamic Rural Banks which have slower growth of bank networks are able to manage insignificant profit reduction. Therefore, this study aims to estimate the level of inefficiency for both the Islamic Commercial banks and Islamic Rural Banks. Moreover, this study also estimates the determinants of inefficiency at the Islamic banks. There are two main contributions of this study: this study differentiates the Islamic banks into two categories and identifies causes of inefficiency. The methodology which is utilised in this study is the Stochastic Frontier Analysis based on monthly data in period 2009-2014. There are several main findings of this study. Firstly, the depositor's fund has an important role in determining the ability of financing for both types of bank. Secondly, regarding of inefficiency, the Islamic Rural Banks always efficient in the period of observation in this study, while the Islamic Commercial Banks have a lower level of efficiency relatively. Thirdly, increasing ROA which has negative and statistically significant estimated parameter is important to reduce inefficiency in the Islamic Commercial Banks.

1. INTRODUCTION

The enactment of Act No.21/2008 on Islamic Banking in the middle of 2008 aims to provide a better certainty and specific regulation on the Islamic banking sector which is not regulated under the Banking Act. Since then, the number of office and branch for both Islamic Commercial Banks and Islamic Rural Banks significantly had increased as presented in Figure 1 panel a. However, since earlier 2014, the number of Islamic bank's office and branch in Indonesia decelerated. For example, at the beginning of 2010, the Islamic Banking Sector, in particular, the Islamic Commercial Bank and Islamic Business Unit (ICBU) grew significantly in term of office and branch quantity. Nevertheless, from January 2014, the ICBU's growth rate got slower, and even the number of ICBU banks declined slightly in the late of 2014, contributing to a slowdown in 2015. The Islamic Rural Bank (IRB), on the other hand, has relatively stable growth rate.

Regarding of net income as a proxy of efficiency, Figure 1 panel b reveals that the ICBU reported precipitous declining on the net income in 2014 and 2015. The Islamic Banking Statistical data, which is provided by Bank Indonesia and later by Otoritas Jasa Keuangan (Indonesia Financial Services Authority), reveals that the net income for ICBU dropped by more than 40 per cent in 2014, from approximately 3,230 billion IDR to 1,733 billion IDR and slightly increased by around 3 per cent in 2015 to around 1,786 billion IDR. On the other hand, the IRB reported a similar downward trend in 2014 with smaller magnitude. The IRB indicated that in 2014, the net income was 121.95 billion IDR, decreases only 7.3 billion IDR or equal to 6 per cent decline compared to 2013. Nevertheless, in 2015, the IRB reported a net income at approximately 137.72 billion IDR or equivalent to 13 per cent increasing compared to previous year.

FIGURE-1: Recent Development in the Islamic Banking Sector

(a) The Number of Office and Branch (unit)

(b) Net Income (Billion IDR)
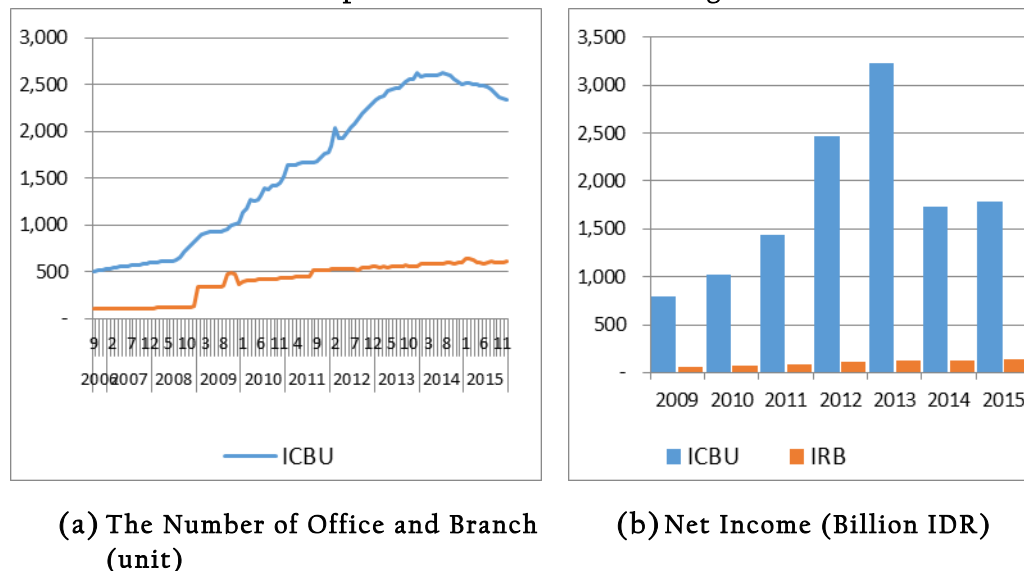
Source: Islamic Banking Statistic, Bank Indonesia

The recent statistics data which is explained briefly in previous paragraphs generates a question on the cause of these differences. In particular, why there is a different level of efficiency between these two groups of the bank. Currently, there are ample of empirical studies on the Islamic banking inefficiency in Indonesia, such as Wahab, Nadratuzzaman Hosen, & Muhari (2014), Pratikto & Sugianto (2011), Novarini (2008), Nugroho & Muharam (2011), Gumilar & Komariah (2011), Hadad, Hall, Kenjegalieva, Santoso, & Simper (2012),

Muhari & Hosen (2014), and Zuhroh, Ismail, & Maskie (2015). However, there is no study which identifies inefficiency from the intermediary function of the Islamic banking, including identification of the causes of inefficiency. Therefore, this study aims to examine the determinants of inefficiency in the ICBU and IRB. In particular, there are two objectives in this paper. First, this article tries to estimate the level of efficiency for these two categories by utilising the SFA approach from the period of 2009 to 2014. Second, this study attempts to identify causes of inefficiency in both categories. As mentioned in the previous section, the importance of inefficiency identification is to maximise bank's profits.

There are two mains contributions of this paper. Firstly, this study examines the causes of inefficiency for both the ICBU and IRB through the SFA approach. Currently, there are several empirical pieces of evidence which utilising SFA for Indonesian case, as mentioned earlier. Nevertheless, these studies did not analyse further on the causes of inefficiency. Secondly, this study differentiates between the ICBU and IRB due to the difference in scope of services and market share of each bank type.

The rest of this paper is organised as follow. The second section explores more on literature review, while in the third section, the methodology is presented. In this section, the rationale behind the Stochastic Frontier Analysis is explained. Furthermore, this section describes source and definition of data. In the fourth section, results and discussion are presented. In this part, the estimation results using the SFA is shown and followed by several possible causes of estimated results. Finally, the last section concludes.

2. LITERATURE REVIEW

Efficiency in the Islamic banking sector is important due to several reasons. Baten & Kamil (2010a) argue that measuring efficiency is essential for investors before deciding to invest or for lenders to lend. For example, the more efficient the bank is, the better usually it performs in investment as well as bank's performance and growth. Efficiency also is a major factor for the Islamic bank to compete with the conventional bank (Hasan, 2004). Similar to Hasan (2004), Hussein (2003) argues that the Islamic banking market still develops and faces several impediments such as asset and liability composition, financial engineering, settlement mechanism, and rating agencies. From macroeconomics point of view, Hussein (2003) claims that efficiency in the banking sector is important to serve financing demand from growing service sector, to face more globally linked system, and to improve managerial performance.

To estimate the level of efficiency in the banking sector, Hussein (2003) describes that there are several approaches, which are parametric such as the Stochastic Frontier Analysis (SFA) and non-parametric approach such as the Data Envelopment Analysis (DEA). Besides, Hadad, Hall, Kenjegalieva, Santoso, & Simper (2012) introduce a new approach which called 'SORM SBM' DEA to analyse the efficiency of Indonesian banks between 2003-2007, while Wanke, Azad, Barros, & Hassan (2016) utilise an Integrated Multicriteria Decision Making (MCDM) Approach. This study employs the SFA method due to author's familiarity. The SFA is a parametric approach and accounts for statistical noise which is an advantage compared to the DEA approach (Coelli, Rao, O'Donnell, & Battes, 2005).

There are several empirical studies on estimating the Islamic banking efficiency using the SFA. Tahir & Haron (2010), analysed 193 banks categorised under four main regions: Africa, Middle East, Europe and the Far East & Central Asia, claim that under the periods of 2003 to 2008, the level of efficiency for cost and profit are approximately 44 per cent and 41 per cent, respectively. These findings can be interpreted as the Islamic banking use 44 per cent of the available resources to deliver the banking services and generate around 41 per cent of potential profits, on average.

Mokhtar, Abdullah, & Al-Habshi (2006) examined efficiency in the Islamic banking sector in Malaysia in periods 1997 to 2003 and find that in general, the effectiveness of the Islamic banks is lower than conventional banks. For example, the technical and cost effectiveness of the Islamic banks are around 80 and 86 per cent respectively while the commercial banks are 83 and 87 per cent.

Irfan, Majeed, & Zaman (2014), who evaluate profitability and liquidity ratios to measure bank's performance in the South East Asia, claim that on average the level of efficiency of the Islamic banks in the South Asia is more than 90 per cent with respect to Return on Asset (ROA) ratio and Return on Equity (ROE). Regarding of the Net Profit Ratio, it is less efficient at approximately 77 per cent. Furthermore, they argue that demand for Islamic bank's service is necessary to increase the level of efficiency.

The primary reference of this study is Kablan & Yousfi (2011) who claims that the intermediation approach is preferable than the output approach since this method measures inputs and outputs which are in line with the profit and loss sharing principle in the Islamic banking. Moreover, under this approach, the bank has two important roles, as a manager of the Third Party Fund (TPF) such as demand savings, demand deposits, and time deposits and as an investor to obtain maximum profits in the markets. To compute the cost efficiency model, they use the price of inputs such as operational expenses as well as other expenses and interest expense. Moreover, Kablan & Yousfi (2011) use loans, net liquid assets, and total earning assets as proxies of output. To measure the inefficiency term, they use total assets as a proxy for bank size, ROA, and market share in the form of the ratio of deposits of the bank to total deposits in the whole banking system.

Based on 17 countries in Asia, Middle East, UK, and Africa, Kablan & Yousfi (2011) claim that the Islamic banks in Asia have the highest efficiency at around 84 per cent while the average efficiency for all observed countries is approximately 78 per cent. Moreover, they argue that the higher level of effectiveness in Asia is a result of significant reform in the financial system which promotes the Islamic banking sector in Malaysia and Pakistan. They also argue that the size of the bank is insignificant while ROA has more impact on efficiency. Furthermore, the market share has an adverse impact on efficiency. Similar to Kablan & Yousfi (2011), Baten & Kamil (2010b) who utilise profit as the dependent variable, argue that maximising profit is the main objective of the bank. Therefore, profit can be use as a measure of banking sector's performance.

Regarding of the Indonesian Islamic banking sector's efficiency, there are several studies utilise the DEA approach such as Wahab, Nadratuzzaman Hosen, & Muhari (2014) who observed conventional and Islamic banks efficiency during periods 2010 to 2012 and Pratikto & Sugianto (2011) who evaluates efficiency of the Islamic commercial banks before and after the Global Financial Crisis (GFC). On the other hand, there are several empirical pieces of evidence based on the SFA approach such as Novarini (2008), Nugroho & Muharam (2011), Gumilar & Komariah (2011), Muhari & Hosen (2014), and Zuhroh, Ismail, & Maskie (2015).

Firstly, Novarini (2008) who uses quarterly data from limited Islamic Business Units in periods of 2005 to 2007 for both private and government banks. She utilises SFA and uses profit as a variable to estimate the level of efficiency for the several Islamic Business Units. In addition, Novarini (2008) utilises BOPO (ratio of operational expenses to operational revenue) as another performance measurement.

Furthermore, Nugroho & Muharam (2011) evaluate efficiency for the Islamic Commercial Bank (BUS) and Islamic Business Unit (UUS) in periods 2005-2009. They claim that the BUS is more efficient than the UUS. In addition, Gumilar & Komariah (2011) with observation periods 2007 to 2009 for the BUS and UUS claim that on average the efficiency ratio is around 88 per cent.

In addition, Muhari & Hosen (2014), who observe quarterly data for 73 Islamic rural banks in periods June 2011 to March 2013, utilise three different methods such as SFA, DEA, and CAMEL. They claim that the IRB is less efficient to the Islamic commercial bank.

Finally, Zuhroh, Ismail, & Maskie (2015) evaluate the efficiency based on a cost function. In particular, they utilise total cost as the dependent variable while the output of credit and price of inputs such as labour, fund, and assets as the independent variables. They find that the firm size correlates positively with efficiency, in which larger size of companies will enable input utilisation with lower costs due to increasing productivity, higher trust from customers, and higher technology utilisation. However, they argue that the Islamic banking has a lower efficiency compared to the conventional banking. Similar to Zuhroh, Ismail, & Maskie (2015), a study which is conducted across 22 countries globally, confirm the finding that the Islamic banking is less efficient compare to the Conventional bank (Beck, Demirgüç-Kunt, & Merrouche, 2013). However, they also claim that in term of intermediary function, the Islamic banking has a better performance, with higher assets quality and capitalisation.

3. METHODOLOGY AND DATA

3.1 Methodology

This study utilises the Stochastic Frontier Analysis (SFA) to estimate parameters in the financing model of the ICBU and IRB as well as technical efficiency for each type of bank. The common equation for the frontier approach is:

$$lnQ_t = f(Z_t; \beta) + v_t - u_t \tag{1}$$

where Q_t is the output variable in the natural logarithm, $f(Z_t; \beta)$ represents a function consist of output determinants such as inputs in price, quantity, or volume (Z_t) and β which is estimated by using SFA is a vector of unknown parameters. The term u_i captures technical inefficiency, which assumed to be non-negative truncations of normal distribution with mean μ and variance σ_u^2. The error term (v_i) is assumed to be distributed normal with mean zero and variance σ_v^2 and captures other random factors (Coelli et al., 2005).

From microeconomics perspective, Mankiw (2011) argues that the objective of a firm is to maximise profit as well as to minimise cost. Therefore, in order to maximise profit, the firms should increase the revenue at an optimal level and reduce the cost at a minimum level. Similar to this theory, the Islamic banks' performance which can be measured by the level of profitability as suggested by Baten & Kamil (2010b) is determined by how optimum the bank can maximise its profit with subject to the cost function. Regarding of this study, the Islamic bank is assumed to maximise the financing capability to the real sector by optimally utilises the capital, labour, and technology.

The model in Equation 2 is modified from Kablan & Yousfi (2011) who utilise the intermediation approach. In this approach, it is assumed that the output of the Islamic banks, which is proxied by the amount of financing, is the result of several inputs such as labour which is proxied by the operational expenses and non-operational expenses, and capital which is proxied by the amount of depositors' fund. Therefore, Equation 2 models the business process in the bank from the intermediation approach, where the third party fund such as depositors' fund is used as a capital for the bank to produce various products in the Islamic banking sector. In other words, the bank acts as an intermediary agent in the financing market who channels the collected fund to the customers.

$$lnFinancing_t^i = \alpha + \beta_1 lnOpExp_t^i + \beta_2 lnOtherExp_t^i + \beta_3 lnDeposit_t^i + v_t^i - u_t^i \tag{2}$$

where: i is the ICBU or IRB, t is equal to 1,2,3,..., 72, lnFinancing_t^i is amount of financing of bank i in time t, lnOpExp_t^i is the operational expenses of bank i in time t, lnOtherExp_t^i is the other expenses of bank i in time t, lnDeposit_t^i is the third party fund in bank i in time t. As one requirement to estimate SFA, all the variables are transformed into natural logarithm form. The terms v_t^i and u_t^i are the error terms and the technical inefficiency respectively with distribution of $v_i \sim iidN\ (0, \sigma_v^2)$ and $u_i \sim iidN\ (0, \sigma_u^2)$ which implies that v and u are independently and identically distributed normal random variables with zero means and variances σ_v^2 and σ_u^2 respectively (Coelli et al.,2003).

Furthermore, as suggested by Coelli et al. (2005), $\sigma^2 = \sigma_v^2 + \sigma_u^2$ and $\lambda^2 = \sigma_u^2 / \sigma_v^2 \geq 0$. If $\lambda = 0$ then it can be interpreted, as there is no technical inefficiency and implies that SFA is not necessary.

Baten & Kamil (2010a) claim that the Stochastic Frontier Methodology is based on assumption that there is a gap between the potential and actual output of a firm. Therefore, Coelli et al. (2005) claim that the technical efficiency (TE), which is defined as ratio of actual and potential output, can be defined as:

$$TE_i = \frac{\exp\ (x_i'\beta + v_i - u_i)}{\exp\ (x_i'\beta + v_i)} = \exp\ (-u_i) \tag{3}$$

Hence, the expected value of TE is between 0 and 1. If a firm is at the optimum efficiency level, the value is equal to one and vice versa.

In this study, following Kablan & Yousfi (2011), the inefficiency function is defined as:

$$u_t^i = f(\ lnSize_t^i, RelDep_t^i, ROA_t^i) \tag{4}$$

where $size_t^i$ is the total assets of bank i in time t as a proxy of bank's size, $RelDep_t^i$ is the ratio of the TPF of bank i to the whole TPF in the banking sector in time t, and ROA_t^i is Ratio of Return to Assets of bank i in time t.

There is two stages estimation in this study. The first step is to estimate the parameters on Equation 2 in order to extract the inefficiency term. As the u_t^i is obtained, the second step is to regress the inefficiency term with a function of several variables as presented in Equation 4. All the estimation process utilises the STATA version 11 software.

3.2 Data

This study uses monthly data which covers both the Islamic Commercial Bank and Islamic Business Unit (ICBU) and Islamic Rural Bank (IRB) from periods January 2009 to December 2014. The main source of data is extracted from the Islamic Banking Statistical data which is provided by Bank Indonesia[2]. Observations in this paper are aggregated into the ICBU and IRB since more details data on the individual bank is not published by Bank Indonesia. The detail for each variable as presented in Table 1.

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[2] Since 31st December 2013, all the data and information regarding of banking sector is transferred to OJK as mentioned at http://www.bi.go.id/id/statistik/perbankan/syariah/Default.aspx.

TABLE-1: Definition and Source of Variables

Variable	Definition	Source
lnFinancing	Aggregate Financing including Mudharaba, Musharaka, Murabaha, Salam, Istishna, Ijara, Qardh, and others. Measured in billion IDR, deflated by CPI, and transformed into natural logarithm	Condensed Balance Sheet of ICBU and IRB, Bank Indonesia
lnDeposit	Depositors Fund, which covers iB Demand Deposit-Wadia, iB Saving Deposits -Wadia and Mudharaba, and iB Time Deposits-Mudharaba from 1 month to more than 12 months. Measured in billion IDR, deflated by CPI, and transformed into natural logarithm	
lnSize	Fixed assets and equipment. Measured in billion IDR, deflated by CPI, and transformed into natural logarithm	
lnOpExp	Operating expenses, covers bonus Wadiah Deposit expense, foreign exchange transaction expense, Ijarah asset recovery cost, premium, labour cost, education and training, research and development, leasing, promotion, taxes (exc. Income tax), maintainance and recovery fixed assets and inventory, depreciation, decrease value in securities, and others. Measured in billion IDR, deflated by CPI, and transformed into natural logarithm	Condensed Income Statement of ICBU and IRB, Bank Indonesia
lnOtherExp	Non operational expenses. Measured in billion IDR, deflated by CPI, and transformed into natural logarithm	
ROA	Return on Asset which is defined as the ratio of net income to total assets. This ratio is the proxy of ability to generate profit from assets including current and fixed asset.	Financial Ratios of ICBU and IRB, Bank Indonesia
RelDep	Relative Depositors Fund to total Depositors Fund in the whole banking sector. Total Depositor fund is defined as private deposits in Commercial and Rural Banks.	CEIC
CPI	Consumer Price Index is rebased to 2007 based year since started from January 2014 the CPI is rebased on the year 2012. The rebased index is from January to December 2014, obtained by multiplying the 2012 based index to adjustment value which is generated by dividing the 2007 based CPI to 2012 based CPI.	BPS

Source: Author's compilation.

4.   RESULTS AND DISCUSSION

4.1 Results

The statistic summary for the variables in this study as described in Table 2. In general, the mean value of the natural logarithm of lnFinancing and lnDeposit are almost identical which implies that in order to fulfil the demand for financing from the market, both banks rely on the depositors' fund significantly. Moreover, the cost of operation and non-operational are higher in the ICBU at around 1½ and 3 times respectively compared to the IRB. Regarding of the fixed assets value, the ICBU has 1.5 times greater than the IRB. Nevertheless, the IRB, on average, has a relatively smaller market share in term of amount of deposits with higher ROA.

TABLE-2: Statistical Summary

Variable	ICBU				IRB			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
lnFinancing	11.201	0.470	10.422	11.768	7.635	0.341	7.010	8.082
lnOpExp	7.700	0.941	5.220	9.255	4.699	0.844	2.460	5.936
lnOtherExp	7.583	0.751	5.517	8.701	2.570	0.826	0.433	4.625
lnDeposit	11.225	0.456	10.413	11.827	7.384	0.355	6.770	7.837
lnSize	6.823	0.469	5.945	7.853	4.084	0.324	3.570	4.587
RelDep	0.039	0.010	0.022	0.054	0.001	0.000	0.001	0.001
ROA	0.017	0.005	0.001	0.025	0.029	0.005	0.022	0.050

Source: Author's calculation.

Based on the SFA estimation with a half-normal distribution model, the estimated results for the ICBU and IRB are presented in Table 3. For the ICBU, in general, all the estimated parameters are as expected. The sign for expenses for both the Operational Expenses and Other Expenses are negative in signs which imply that the higher expenses will reduce the amount of financing to the market. While the lnDeposit variable has a positive in a sign which means that the more depositor deposits fund into the bank, the higher capability of market financing. On the other hand, the IRB has all positive sign parameters. The expenses, which should be negative, are positive in sign. This finding implies that as the expenses increasing, the financing to the market increasing as well.

TABLE-3: The SFA Estimation Results

Dependent Variable: lnFinancing	ICBU Coef. (Std.Err.)	IRB Coef. (Std.Err.)
lnOpExp	-0.001	0.021
	(0.008)	(0.010) **
lnOtherExp	-0.002	0.003
	(0.009)	(0.009)
lnDeposit	1.020	0.931
	(0.011)***	(0.014)***
Cons	-0.168	0.656
	(0.100) *	(0.088)
sigma_v	0.011	0.028
	(0.004)	(0.002)
sigma_u	0.069	0.001
	(0.007)	(0.040)
sigma2	0.005	0.001
	(0.001)	(0.000)
lambda	6.319	0.021
	(0.009)	(0.040)
Likelihood-ratio test of sigma_u=0:		
chibar2(01)=	12.870	0.000
Prob>=chibar2 =	0.000	1.000

Note: * denotes significancy at 10%, *** denotes significancy at 1%.
Source: Author's estimation

Table 3 also reveals that the value of sigma_v (σ_v^2) and sigma_u (σ_u^2) are positive for both the ICBU and the IRB with main difference is in the ICBU has more dominant sigma_u compared to sigma_v. As a result, the lambda value which is defined in the previous section is different for both banking segmentation. The lambda for the ICBU is positive significantly at 6.32 while for the IRB the value is relatively smaller at around 0.025. Nevertheless, the positive value of lambda implies that there is technical efficiency and the SFA approach can be applied in this study.

However, the Likelihood ratio test for sigma_u reveals significant differences. The ICBU passes the Likelihood ratio test which implies that the hypothesis of sigma_u is equal to zero is cannot be accepted which implies that there is significant inefficiency in the ICBU. On the other hand, the IRB fails to pass the test which implies that there is no inefficiency in the IRB. This result can explain why the estimated parameters for the IRB are all positive in sign since the IRB already achieves maximum efficiency which will be revealed further in the technical efficiency estimation in the discussion section.

TABLE-4: The Inefficiency Estimation Results

Dependent Inefficiency	Variable:	ICBU Coef. (Std.Err)	IRB Coef. (Std.Err)
lnSize		0.019 (0.045)	0.000 (0.000) ***
RelDep		-1.378 (1.976)	0.128 (0.018)***
ROA		-2.387 (0.863) ***	0.000 (0.000)
Cons		0.014 (0.236)	0.001 (0.000) ***
F (3,68)		3.440	17.530
Prob >F		0.022	0.000
Adj R Squared		0.093	0.411

Note: *** denotes significance at 1%.
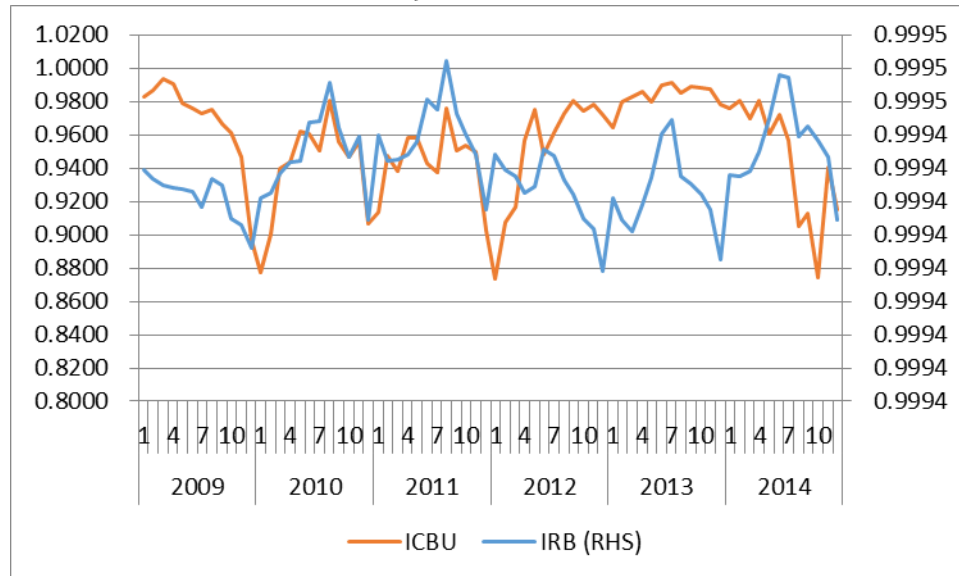
Source: Author's estimation

Regarding of inefficiency estimation, Table 4 reveals that the results in Table 3 still consistent for both the ICBU and IRB. The ICBU with relatively lower adjusted R-Squared value has all estimated parameters' sign as expected. The lnSize has a positive value which implies that the more invested fixed assets and equipment increases inefficiency while on the other hand, the value of RelDep and ROA are positive which can be interpreted as if the bank receive more deposits fund and can generate more profit, inefficiency decreases. Nevertheless, only the ROA's parameter is significant at 1 per cent while others are not significant even at the level of 10 per cent. The results for the IRB's inefficiency estimation reveals contrast results. All the estimated parameters have positive value even for the RelDep and ROA which implies that the more the IRB receive deposits and profit, the bank is less efficient.

4.2 Discussion

The empirical evidence in the previous part raises an important issue, why the IRB has a relatively higher level of efficiency compared to the ICBU. Figure 2 reveals that the IRB, in the observed periods, has almost perfect scores for efficiency with a value of the TE approximately equal to 0.99 while the ICBU has a minimum value at around 0.87 and a maximum value at

0.99. Moreover, the Likelihood ratio test for sigma_u, which accepts the null hypothesis, reveals that the IRB is already at an efficient level. These study findings are different to Muhari & Hosen (2014) who argue that the IRB's level of efficiency at around 78.33 per cent which is lower than the Islamic commercial bank at approximately 94.61 per cent.

FIGURE-2" Technical Efficiency for the ICBU and IRB

Source: Author's calculation

FIGURE-3: Differences in Labour
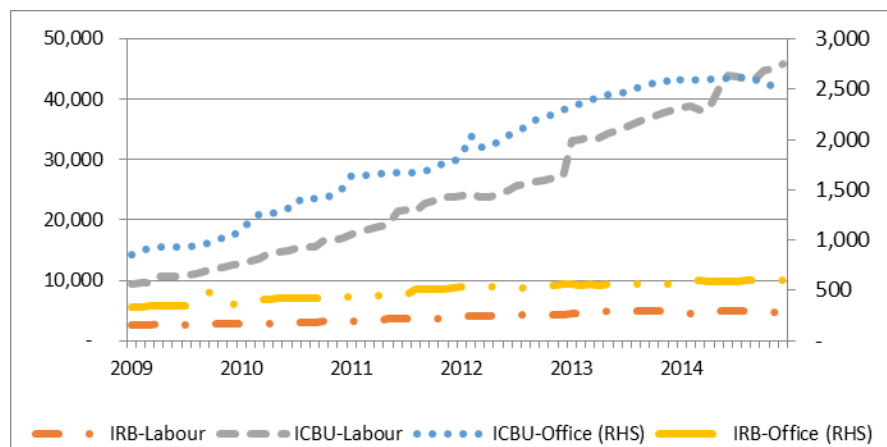
Source: Islamic Banking Statistic, Bank Indonesia

Figure 2 reveals that the TE for the ICBU in the periods of 2009 to 2011 has a similar pattern. The TE usually increases in the middle of the year before the precipitous decline in the end of the year. Nevertheless, in the last three years, the pattern changed, in particular in 2014. The TE reduces significantly started from June 2014 from 0.97 to 0.91 in December 2014 or declining around 5.86 per cent. Novarini (2008) claims that there are several causes of lower efficiency in the Islamic Business Unit (IBU). First, the measurement of effectiveness correlates to profit and loss. If the profit higher by minimising input costs, the bank will be more efficient. Second, the labour cost is a major factor in determining the level of efficiency. In her research, the IBU only scores in the range of 18 to 30 per cent in 2005 and 17 to 34 per cent in 2007 on average.

One dominant component of the operational expenses in the ICBU is the labour expenses which accounts by more than 60 per cent of total expenses in 2014 as presented in Figure 7 (Appendix). Figure 3 reveals that even though the number of ICBU's office and branch decreases in the recent years, the number of ICBU employee increases. On the other hand, the IRB has a relatively stable number of worker. In January 2009, there was approximately 2500 worker in the IRB, grew only by 0.83 to December 2014 at around 4700 workers. Compared to ICBU, the growth is relatively slower which the ICBU has significant labour growth rate at 5.15 times. For example, in 2009 there were around 6 thousand workers, increasing significantly to 41 thousand workers in late 2014. The result in Table 3 confirms that increasing the number of the ICBU's worker will result in lower the financing capacity.

FIGURE-4: Islamic Bank Financing and Third Party Fund (in Billion IDR)
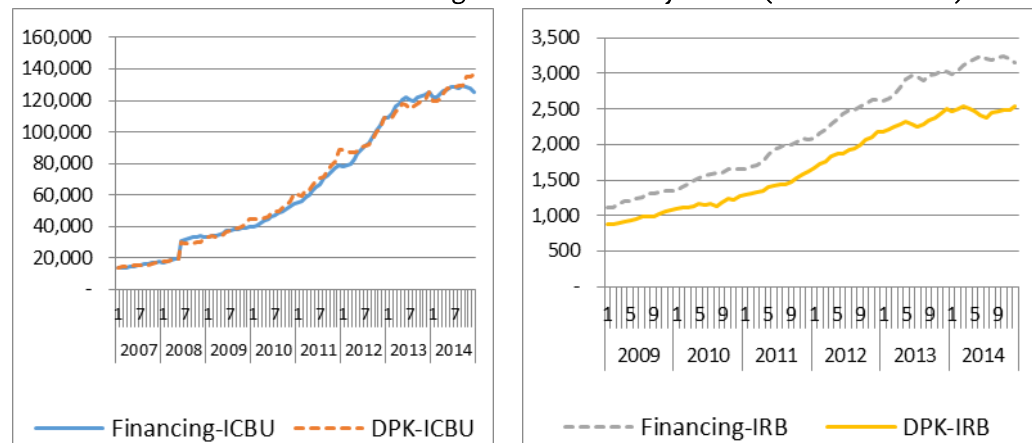
Source: Islamic Banking Statistic, Bank Indonesia

As mentioned in the previous section, the bank has an intermediary function in the financial sector which implies that bank collects fund from depositors and channels the fund through financing in various areas such as agriculture, industrial, and service sectors. Figure 4 reveals that there is a significant level of the Third Party Fund (TPF) utilisation between the ICBU and IRB. Figure 4 also exposes that the ICBU's TPF is almost inline to the ICBU's financing which implies that the ICBU relies significantly on the depositor's fund as a main source of funding. The estimation results in Table 3 are consistent with an estimated parameter which has a value approximately 1.02 and implies that for every 1 per cent increasing in the depositor fund, the financing increases by 1.02 per cent.

FIGURE-5: Fixed Assets and the Growth Rate
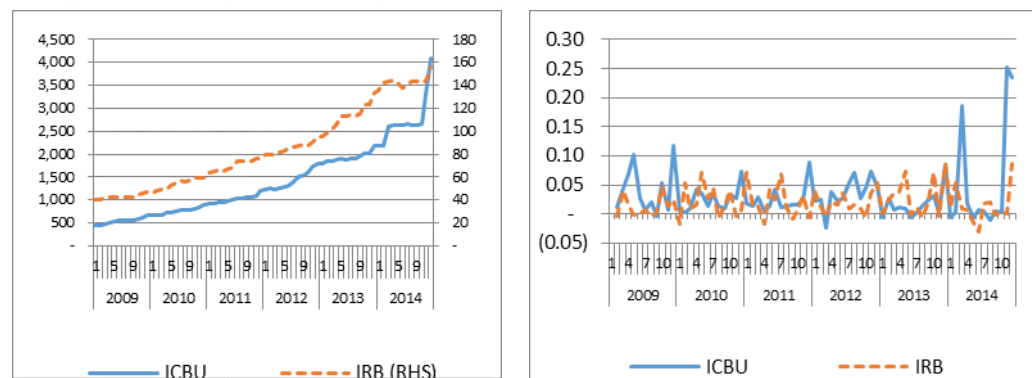
    (a)   Fixed Assets (deflated, billion IDR)   (b)   Growth Rate of Fixed Assets (percentages)
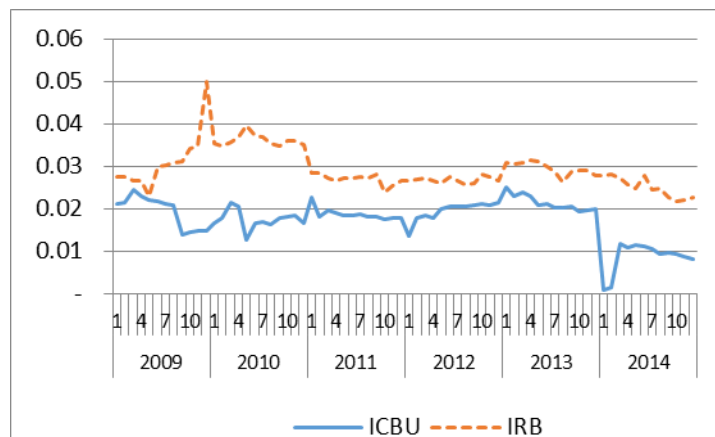
Source: Islamic Banking Statistic, Bank Indonesia

On the other hand, the IRB is more efficient in managing the inputs, such as the operational and non-operational expenses as well as the depositor's fund, has all parameters positive and significant. Figure 4 also reveals that with less amount of TPF or DPK, the IRB can finance more in the market which is might be one of a possible explanation of the IRB's efficiency in the observation periods.

Nevertheless, the IRB has a higher proportion of financing account at around 70 per cent while the ICBU has around 50 per cent of total assets (Figure 7 Appendix). Therefore, the quality of financing assets is important for both banks which can be measured in the ratio of Net Performing Financing (NPF). The IRB has relatively higher NPF ratio even though still less than 10 per cent. Decomposing the NPF for both banks reveals that the lost NPF category is more dominant by more than 50 per cent for both bank types. Including the doubtful NPF category, the percentage are higher which accounts by more than 60 to 70 per cent from total NPF.

Regarding of the inefficiency determinants, the estimated results in Table 4 reveals that the ICBU, which has lower TE, has positive estimated parameter for lnSize variable which implies that increasing the value of fixed assets and equipment will increase inefficiency. This empirical result is consistent with the statistical data from Bank Indonesia which is presented in Figure 5. Figure 5 reveals that on average, the ICBU has higher fixed assets growth rate relative to the IRB. For example, in the early of 2014, the rate of increase of the ICBU fixed assets reached almost 20 per cent and even higher in late 2014 at around 25 per cent. On the other hand, the IRB's growth rate of fixed assets is less than 10 per cent in observation periods. This finding on the bank size variable is consistent to Hussein (2003) who claims that there are several characteristics of the efficient banks such as foreign ownership, a smaller share of total assets to the market, and less investment in the fixed assets relative to total assets.

FIGURE-6: ROA Ratios for ICBU and IRB

Source: Islamic Banking Statistic, Bank Indonesia

The other determinant of inefficiency in Equation 4 is the amount of depositors' fund. The estimated parameters for RelDep are negative and insignificant which implies attracting more deposits to the bank will reduce inefficiency. Figure 4 describes that in some point of time, the TPF exceed the financing amount which implies that the capital input for the ICBU to create financing less efficient. This finding is similar to Kablan & Yousfi (2011) who claim that the ratio of bank deposits to total deposits in the banking system has a negative sign and significant.

Regarding of ROA's parameter, it has a negative and significant parameter which implies that increasing the ROA will reduce inefficiency. Since the ROA is a ratio of net income to

total assets, increasing profit or decreasing asset will increase the ROA and further reduces inefficiency. In other words, the ICBU does not generate optimal profit or accumulates to many assets. This finding is consistent to Kablan & Yousfi (2011) who claim that the ROA has significantly negative sign parameter and Irfan et al. (2014) who argue that increasing the number of offices will reduce the ROA and hence reduce efficiency.

Figure 6 reveals that ROA for the IRB is relatively higher than the ICBU's. For example, the IRB's ROA is fairly stable at around 2 to 3 per cent for each year, while on the other hand, the ICBU's ROA decreased significantly in early 2014 from around 2 per cent to less than 1 per cent and leveled at around 1 per cent afterward.

Figure 7 (Appendix), which decomposing the ROA for both banks into revenues, expenses, and total assets, reveals that the composition of the total assets for both banks are relatively different. The ICBU has approximately 50 per cent assets on the financing, 30 per cent on the inter-office assets, and 10 per cent on the deposits in the Bank Indonesia. The IRB, on the other hand, has dominant financing assets composition by more than 70 per cent.

The second component of ROA is the net income. Both banks also have a relatively different composition for the revenues and expenses. For instances, in the several months in the late of 2014, the ICBU's income from non-operating activities shrinked significantly and off-set by increasing the proportion of the profit sharing account. However, the composition of the IRB's revenue relatively unchanged. The operating revenue is dominant at around 70 per cent of total generated revenues. Regarding of the expenses side, the ICBU has a significant proportion of the non-operating expenses[3] by more than 40 per cent in the earlier of 2009 and decreased to around 20 per cent in the late of 2014. The IRB, on the other hand, has relatively smaller non-operating expenses. In short, decomposing the ROA into revenues, expenses, and total assets reveals that the ICBU and IRB have significant differences which might to some extent explains different level of efficiency for both banks.

4.3 Study Limitations

There are numerous limitations of this study. First, this study is not able to evaluate the inefficiency for each bank for both the ICBU and IRB due to the restriction of data access. The Bank Indonesia database on the Islamic Banking Statistical data provides the aggregated data for the whole Islamic banks. By having more detail data, the estimation should be more precise since each bank has several unique characteristics. Second, this study only utilises the SFA approach in periods 2009 to 2014 which is a very limited time of observations. The data for the ICBU is available since around 2006. However, the data for the IRB is limited and only available from 2009. Longer periods of observations should generate more robust estimation's results.

5. CONCLUSIONS

The main objective in this study is to estimate inefficiency determinants for the ICBU and IRB in Indonesia over the period of 2009 to 2014 by utilising the SFA approach. The results, in general, reveal that the ability of the Islamic banks to finance the production sectors significantly depends on a number of depositors fund in the bank. This third party fund is essential for the banks to provide more capital for the financial market to serve increasing demand for financing.

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[3] The non-operating expenses are defined differently for each bank. The Islamic BCA Bank reports the non-operating expenses such as loss of assets and bonds selling. The Muamalat Bank reports as zakat and infaq, while the Bank Syariah Mandiri reports this account as sanction and fine accounts.

Nevertheless, there are several significant differences between the ICBU and IRB. Firstly, the IRB is relatively more efficient than ICBU which is due to not only relatively smaller scope of services but also higher utilisation rate of the depositor fund. The SFA approach reveals that the level of efficiency in the IRB almost equal to 1 which implies that the banks are efficient in transforming the capital and labour into the financing capability. Secondly, the ICBU has relatively higher growth on an employee in the observed periods which implies that the ICBU has increasing operational expenses during 2009 to 2014 significantly.

Regarding of the inefficiency determinants, only the ROA is statistically significant for the ICBU. The ROA has a negative sign, which implies indirectly that there are two ways to increase efficiency, which is to increase profit as well as reduce costs or to reduce the amount of investment in the fixed assets. In addition, this study points out that there is difference composition of the total assets, revenues, and expenditures which might cause a different level of efficiency for both banks.

In short, the policy makers in the Islamic banking sector should be aware of the steep reduction in the profit since profit not only measures the gap between the income and costs but also indicates the level of efficiency in the bank. Focusing more on profit maximisation as well as expenses reduction should be able to increase the degree of efficiency in the banks. Moreover, efficient process in the bank will, in the long run, increases the ability of the bank to finance more in the real sectors which will support the main objective of sustainable economic development in the broader scope.

6. REFERENCES

Baten, A., & Kamil, A. (2010a). A stochastic frontier model on measuring online bank deposits efficiency. *African Journal of Business Management*, *4*(12), 2438–2449. Retrieved from http://www.academicjournals.org/ajbm/pdf/pdf2010/18Sept/Baten and Kamil.pdf\nhttp://www.academicjournals.org/AJbM/PDF/pdf2010/18Sept/Baten and Kamil.pdf

Baten, A., & Kamil, A. A. (2010b). Measuring online Bank profit efficiency : A stochastic frontier analysis. *The 6th IMT-GT Conference on Mathematics, Statistics and Its Applications (ICMSA2010)*, (October), 336–350.

Beck, T., Demirgüç-Kunt, A., & Merrouche, O. (2013). Islamic vs. conventional banking: Business model, efficiency and stability. *Journal of Banking and Finance*, *37*(2), 433–447. http://doi.org/10.1016/j.jbankfin.2012.09.016

Coelli, T. J., Rao, D. S. P., O'Donnell, C. J., & Battes, G. E. (2005). *An introduction to efficiency and productivity analysis* (Vol. 41). New York: Springer. http://doi.org/10.2307/2531310

Gumilar, I. S. P., & Komariah, S. (2011). Pengukuran Efisiensi Kinerja dengan Metode Stochastic Frontier Approach Pada Perbankan Syariah. *Jurnal Bisnis Dan Manajemen*, *7*(2), 93–122.

Hadad, M. D., Hall, M. J. B., Kenjegalieva, K. A., Santoso, W., & Simper, R. (2012). A new approach to dealing with negative numbers in efficiency analysis: An application to the Indonesian banking sector. *Expert Systems with Applications*, *39*(9), 8212–8219. http://doi.org/10.1016/j.eswa.2012.01.145

Hasan, Z. (2004). *Measuring Efficiency of Islamic banks:criteria, methods, and social priorities. Review of Islamic Economics.*

Hussein, K. A. (2003). *Operational efficiency in Islamic banking: the Sudanese experience. Working Paper No. 1, Islamic Research and Training Institute Islamic Development Bank.*

Irfan, M., Majeed, Y., & Zaman, K. (2014). The Performance and Efficiency of Islamic Banking in South Asian Countries. *Economia Seria Management*, *17*(2), 223–237.

Kablan, S., & Yousfi, O. (2011). *Efficiency of Islamic and Conventional Banks in Countries with Islamic Banking* (MPRA Paper No. 32951). http://doi.org/10.5897/JAERD12.088

Mankiw, N. G. (2011). Principles of Economics, 5th edition. South-Western Cengage Learning.

Mokhtar, H. S. A., Abdullah, N., & Al-Habshi, S. M. (2006). Efficiency of Islamic Banking in Malaysia: a Stochastic Frontier Approach. *Journal of Economic Cooperation*, *27*, 37–70. http://doi.org/10.1108/08288660810851450

Muhari, S., & Hosen, M. N. (2014). Tingkat Efisiensi Bprs Di Indonesia: Perbandingan Metode Sfa Dengan Dea Dan Hubungannya Dengan Camel. *Jurnal Keuangan Dan Perbankan*, *18*(2), 307–328.

Novarini. (2008). *Efisiensi Unit Usaha Syariah dengan Metode Stochastic Frontier Analysis (SFA): Derivasi Fungsi Profit dan BOPO*. Universitas Indonesia.

Nugroho, R. A., & Muharam, H. (2011). *Analisis Perbandingan Efisiensi Bank Umum Syariah (BUS) dan Unit Usaha Syariah (UUS) dengan Metode Stochastic Frontier Analysis (Periode 2005-2009)*. Universitas Diponegoro. http://doi.org/10.1017/CBO9781107415324.004

Pratikto, H., & Sugianto, I. (2011). Kinerja Efisiensi Bank Syariah Sebelum dan Sesudah Krisis Global Berdasarkan Data Envelopment Analysis. *Jurnal Ekonomi Bisnis*, *16*(2), 108–117.

Tahir, I. M., & Haron, S. (2010). Cost and profit efficiency of Islamic banks : international evidence using the stochastic frontier approach. *Banks and Bank Systems*, *5*(4), 78–83.

Wahab, A., Nadratuzzaman Hosen, M., & Muhari, S. (2014). Komparasi Efisiensi Teknis Bank Umum Konvensional (Buk) Dan Bank Umum Syariah (Bus) Di Indonesia Dengan Metode Data Envelopment Analysis (Dea). *Al-Iqtishad: Vol. VI No. 2, Juli 2014*, *VI*(1), 179–194.

Wanke, P., Azad, M. A. K., Barros, C. P., & Hassan, M. K. (2016). Predicting efficiency in Islamic banks: An integrated multicriteria decision making (MCDM) approach. *Journal of International Financial Markets, Institutions and Money*, (Mcdm). http://doi.org/10.1016/j.intfin.2016.07.004

Zuhroh, I., Ismail, M., & Maskie, G. (2015). Cost Efficiency of Islamic Banks in Indonesia – A Stochastic Frontier Analysis. *Procedia - Social and Behavioral Sciences*, *211*, 1122–1131. http://doi.org/10.1016/j.sbspro.2015.11.150
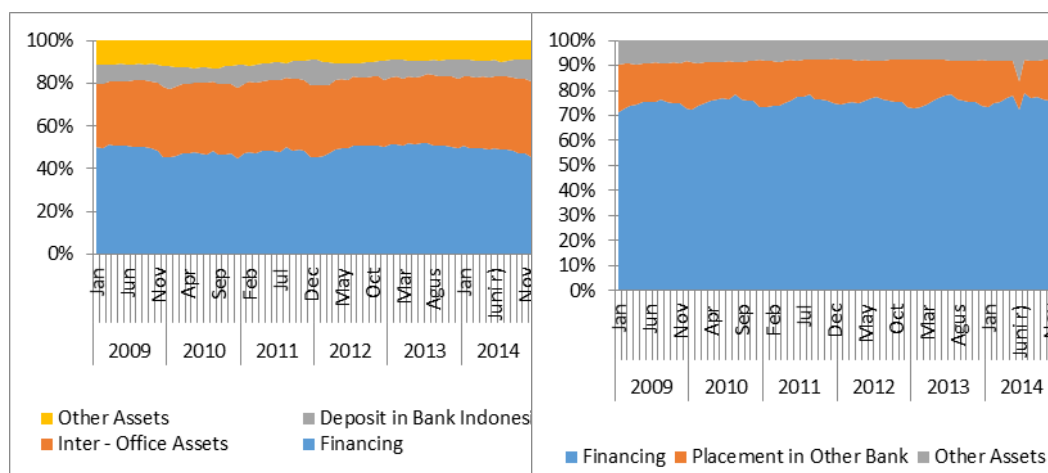
APPENDIX

FIGURE-7 Assets, Revenues, and Expenses Trends for ICBU and IRB

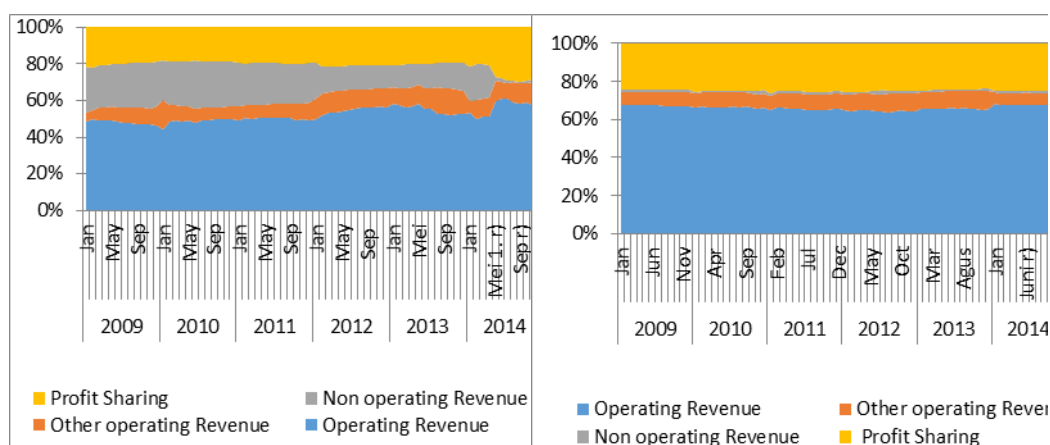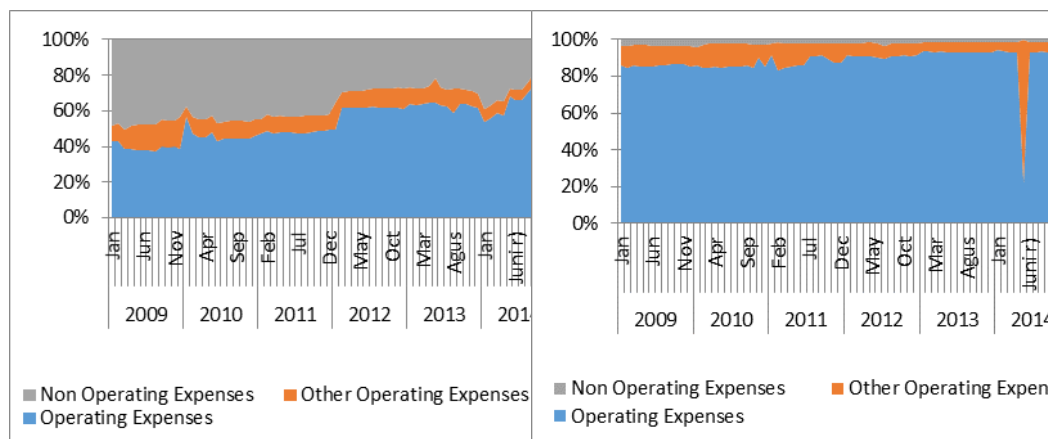 **ICBU**   **IRB**

Assets

Revenues

Expenses

Source: Islamic Banking Statistic, Bank Indonesia