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Financial Reforms and Technical Efficiency: A Case Study of Islamic Commercial Banks in Indonesia*

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Abstract

The purpose of this study is to analyze and compare Islamic commercial banks and Islamic banking units with the stochastic frontier analysis (SFA) method during 2014–2018. The data in research using Islamic commercial banks and Islamic banking units. There are 10 Islamic commercial banks and 5 Islamic banking units that meet the criteria of purposive sampling. The calculation of efficiency level using the SFA method with the function of production shows that Islamic commercial banks and Islamic banking units always experience an increase in efficiency every year with the average level of efficiency of Islamic commercial banks being 0.43994, while the average rate of efficiency of Islamic banking units is slightly higher at 0.47654. This shows that Islamic banking units are slightly more optimal in generating total financing in the period 2010–2014. The test results using Independent Sample T-Test can be concluded that there is no difference in the efficiency value between Islamic commercial banks and Islamic banking units. Operating costs are not significant and have a positive effect on the total financing; total assets have a significant effect and a positive impact on total financing; labor costs are not significant and have a negative effect on total financing.

Keywords: Stochastic Frontier Approach, Operating Costs, Labor Costs, Financing, Total Asset

JEL Classification Code: G21, A22, D12, N25

1. Introduction

Banks play an important role in the financial system and the economy. Banks act as financial intermediaries because they stand between savers and borrowers. As a key component of the financial system, banks allocate funds from savers to borrowers in an efficient manner.. The high level of public trust in a bank shows that the bank has carried out its role well. There are two types of banks operating in Indonesia, namely conventional banks and Islamic banks. From the end of 2008 until the beginning of 2009, there was a global economic crisis that hit various parts of the world including Indonesia. The immediate or proximate cause of the crisis in 2008 was the failure or risk of failure at major financial institutions globally. This crisis caused domestic banks to experience shocks. Over the short term, the financial crisis of 2008 affected the banking sector by causing banks to lose money on mortgage defaults, interbank lending to freeze, and credit to consumers and businesses to dry up. The impact of the global crisis on the banking sector was deeply and since the start of the crisis, the market capitalization of global banks had fallen by more than half (Sudarsono et al., 2020). The interest rate is both a cause and effect of the level of production, which makes it very difficult to manage at a macroeconomic level. This is because access to money is both what drives an economy and an effect of its ups and downs. High-interest rates can stifle the general level of production in the economy.

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In Indonesia, the development of dual banking systems will certainly raise questions regarding the performance and health of each bank, given the current competitiveness of banks. Bank performance and health are important for related parties, for example, owners or managers of banks, communities, and of course the Bank Indonesia who acts as a supervisor for all banks in Indonesia (Rime & Stiroh, 2013). In dual banking system, Islamic banks have to be competitive to survive. One of the keys to competitiveness is efficiency (Berger et al., 2009). Various approaches can be used to measure the efficiency such as using financial ratios, using a regression approach, and a frontier approach. But the approach to financial ratios and regression has the disadvantage of not being able to calculate many inputs and outputs, while the frontier approach has the advantage of being able to calculate many inputs and outputs (Laksana, 2017).

All activities carried out by the community are always related to money, and money is always related to the world of banking. Basically, banking in Indonesia is currently divided into two forms, namely Conventional Banks and Islamic Banks. Islamic banks began operating in Indonesia in 1998, even though they were established in 1992. The development of sharia-based banks shows that the Islamic economy has developed in Indonesia (Ascarya & Yumanita, 2008).

The development of Islamic banks in Indonesia increasingly challenging with more banks offering products and services based on Islamic principles. The large number of Islamic banks operating in Indonesia, especially in the form of Islamic commercial banks and Islamic banking units offering various products and services does not mean they do not cause problems (Salehi et al., 2014). The existence of intense competition between conventional banks and Islamic banks makes it necessary for banks to be able to manage their finances well to provide what customers need, in this case, financing (Laksana et al., 2017). Islamic banks need to prepare and equip themselves to deal with the challenges ahead to be at the forefront of Islamic banking. In the provision of financing, we must see the efficiency factor, whether the financing provided is in accordance with the ability of the bank or not. Provision of financing without regard to efficiency will result in the profitability of a bank (Azma et al., 2018)

Efficiency according to Weill (2014) is about making the best possible use of resources. Efficient firms maximize outputs from given inputs, and so minimize their costs. By improving efficiency, a business can reduce its costs and improve its competitiveness. Shaferi et al. (2018) and Sarker (1999) defined efficiency as a comparison between output and input. The efficiency of a bank will provide added value to the bank and customer trust in the bank will increase which will result in the bank's profit level also increasing. This study aims to analyze and compare the Islamic commercial banks and Islamic banking units using the stochastic frontier analysis (SFA) method.

2. Literature Review

2.1. The Stochastic Frontier Approach (SFA)

A considerable number of studies in evaluating banking efficiency has widely used SFA (Farajnejad & Lau, 2017), and especially the both of profit and the cost of efficiency (Sealey, 1977; Samad et al., 1999). The SFA methodology is among the host of methods that have been used to measure banking sector efficiency. The SFA incorporates random errors. The functional form of the model needs to be defined in advance. The output of a company is a function of inputs, inefficient and random errors which are predefined as well as the error term distribution. The SFA method allows the modeling of factors that could impact an organization but not controllable by the same. The above advantages render the Translog function more suitable for the evaluation of the banking system premised on its multi-criteria character. The assumption of linear homogeneity in input prices is imposed by normalizing total costs and input prices by one input price. The method achieves this by the introduction of the random error term in the specification of the frontier efficiency model (Rime & Stiroh, 2013).

The SFA starts with a standard cost or gain function and estimates the minimum cost or maximum gain frontier for the entire sample from balance sheet data. The efficiency measure for a specific bank observation is its distance from the frontier. For the estimation of the cost and gain frontier functions this study follows the standard literature and uses the translog functional form (Bos & Kolari, 2005). In a three-input, three-output translog setting, assume that the deterministic kernel $c\,(y_i, w_i; \beta)$ of the multiple-output cost frontier takes the log-quadratic translog functional form, and then the stochastic cost frontier model can be written as follow:

$$\ln E_i \geq \beta_0 + \sum_m \alpha_m \ln y_{mi} + \sum_n \beta_m \ln w_{ni} + \frac{1}{2}\sum_m \sum_j \alpha_{mj} \ln y_{ji}$$

$$+\frac{1}{2}\sum_n \sum_k \beta_{nk} \ln w_{ni}\ \ln w_{ki} + \sum_n \sum_m \gamma_{nm} \ln w_{ni} \ln y_{mi} + v_i$$

$$= \beta_0 + \sum_m \alpha_m \ln y_{mi} + \sum_n \beta_n \ln w_{ni} + \frac{1}{2}\sum_m \sum_j \alpha_{mj} \ln y_{mi} \ln y_{ji}$$

$$+\frac{1}{2}\sum_n \sum_k \beta_{nk} \ln w_{ni} \ln w_{ki} + \sum_n \sum_m \gamma_{nm} \ln w_{ni} \ln y_{mi} + v_i + u_i$$

Where

$E_i = w_i^T x_i = \sum_n w_{ni}\, x_{ni}$ is the expenditure incurred by producer i,

$y_i = (y_{1i}, \ldots, y_{Mi}) \geq 0$ is a vector of output produced by producer

$i, w = (w_{1i}, \ldots, w_{Ni}) > 0$ is a vector of input faced by producer

$i, c = (y_i, w_i; \beta)$ is the cost frontier common to the all producers,

β is a vector of technology parameters to be estimated,

v_i is the two-sided random-noise component, and

u_i is the nonnegative cost inefficiency component of the composed error term $\varepsilon_i = v_i + u_i$

$k = 1, \ldots.., N$

Rather than utilising standard profit function, this study follows Berger and Mester (1997) by employing alternative gain function. Humphrey and Pulley (1997) introduced the alternative gain frontier to bridge the gap between a cost frontier and a gain frontier. An alternative gain frontier is defined as:

$$\pi^A (y, w; \beta, \delta) = \max \{p^T y - w^T x : g (p, y, w; \delta) = 0, D_0 (x, y; \beta) \leq 1\}$$

Where the endogenous variables are (p, x) and the exogenous variables are (y, w).

D_0 (x, y; β) is the output distance function and characterizing the production technology structure, and g (p, y, w; δ) represents the producer's 'pricing opportunity set' act for the producer's which captures the producer's ability to transform exogenous (y, w) into endogenous product prices p.

According to Coelli et al. (1998) linear homogeneity was imposed in input (W) before taking logarithms. Efficiency cost for bank k at time t is:

$$CE_{kt} = \{[\exp(u_{KT})]^l \varepsilon_{KT}\}^{-1}$$

The measure takes on a value between 0 (fully inefficient) and 1 (fully efficient) and indicates how close a bank's costs are to the costs of a fully efficient bank under the same conditions based on its inputs, outputs, prices, and controlling variables. Gain efficiency also takes on a value between 0 and 1 and its definition is:

$$PE_{kt} = E[\exp(-u_{KT})]^l \varepsilon_{KT}]$$

Berger and Humphrey (1997) explain the difficulty of variable selection in the performance appraisal of banks. They argue that there is 'no perfect approach' on the explicit definition and measurement of banks' input and output. In variables selection, there are some restrictions on the type of variables since there is a need for comparable data and to minimize possible bias due to different accounting practices as, even in the same country, different banks might use different accounting standards. In this respect, the selection of variables affects the results of efficiency scores.

A variable to measure the bank's profitability is calculated by net income/total assets (ROA) (or net income/ equity (ROE)), and we used the ratio equity/total assets for 'Risk Taking Propensity'. Islamic banks restrain from taking/giving interests on loans/deposits to meet the Sharia principles and PLS. In Islamic banks (IB), the relationship between shareholders and investment accounts holders (IAH) is based on the principle of profit and loss sharing (PLS) considered as the cornerstone of Islamic banking intermediation (Mawardi, et al. 2020). PLS is a method of finance used by Islamic financial or Shariah-compliant institutions to comply with the religious prohibition on interest on loans that most Muslims subscribe to. Another variable that could affect the efficiency is market share. It is calculated by total deposits ratio of the bank/total deposits in the entire banking system (Mawardi, et al. 2020). It can increase the costs for banks in common and result in inefficiency of the bank.

3. Research Methods

The population in this study is Islamic commercial banks and Islamic banking units registered with Bank Indonesia. Determination of the sample in this study was using a purposive sampling technique that is sampling is carried out in accordance with the research objectives that have been determined. There are 10 Islamic commercial banks and 5 Islamic banking units that meet the criteria of purposive sampling. The type of data used is quantitative data. The data source used is secondary data obtained from the Financial Services Authority Publication Report and Central Bank Indonesia.

According to Akhtar (2007), an Islamic commercial bank is a bank that conducts banking activities based on Islamic/ Sharia principles. Islamic banking unit is a separate window within the Islamic commercial bank. The difference between an Islamic commercial bank and an Islamic banking unit lies in the form of a business entity, where an Islamic commercial bank is at the level of a conventional commercial bank, while the Islamic banking unit is exactly one level below the conventional commercial banks, that is similar to a branch/ unit of a conventional commercial bank concerned.

This difference makes the Islamic commercial banks and Islamic banking units have different authorities in determining the direction of the bank policy. In an Islamic banking unit, the policy is determined solely by the Islamic bank concerned, while in an Islamic banking unit, the policy is determined by the conventional commercial bank where the business unit is located. This can then have an impact on the performance of Islamic commercial banks and Islamic banking units. Hypotheses of this research:

H1: *Operational costs have a negative impact on the amount of financing.*

H2*: The amount of assets has a positive impact on the amount of financing.*

H3: *Labor costs have a negative impact on the amount of financing.*

H4: *There is a distinction in the efficiency value between the Islamic Commercial Bank and Islamic Commercial Bank Unit.*

4. Results and Discussion

Based on Table 1, Islamic commercial banks have an average efficiency value of 0.43994, and Islamic banking units have an average efficiency value of 0.47654. Therefore, it can be concluded that Islamic banking units have higher efficient values than Islamic commercial banks.

4.1. Results of Hypothesis Test

H1: *Operational costs have a negative effect on total financing.*

According to Table 5, we know that the tcount for operational costs is 1.56. It can be concluded that operational costs have no significant effect but have a positive impact on total financing due to the value of t count $\leq$ t table.

Table 1: Variable Definition and Formula Measurement

No	Variable	Definition	Formula	Measurement
1	Operating costs	Is a direct cost incurred by the bank for its operational activities. Included in the operational costs in this study are administrative costs, provision fees for reducing the value of foreclosed financing collateral, staffing costs and costs of financial institution pension fund office activities.	Operational cost = Total interest expense + other operating expensses	Ratio
2	Total assets	Assets are productive assets managed by the banks and these assets are obtained from sources of debt or capital.	Total assets = net assets + total debt	Ratio
3	Labor costs	Labor costs or personnel costs are salary costs, education fees and welfare benefits of Islamic bank employees belonging to the Islamic commercial banks and Islamic commercial bank units.	Labor costs = work time × wages	Ratio
4	Financing	Financing is a product of Islamic bank funds, both those belonging to Islamic Commercial Banks and Islamic banking units to the public, both individuals and legal entities by using muamalah contracts in units of millions of rupiah.	Total financing in Islamic banks	Ratio

Table 2: Efficiency Value of Islamic Commercial Banks

No	Bank name	Period				
		2014	2015	2016	2017	2018
1	Bank Sharia Mandiri	0.48540	0.49600	0.50652	0.51697	0.52733
2	Bank BNI Sharia	0.25654	0.26750	0.27859	0.28979	0.30108
3	Bank Muamalat	0.75742	0.76370	0.76985	0.77589	0.78180
4	Bank Mega Sharia	0.01337	0.01533	0.01749	0.01988	0.02251
5	Bank BRI Sharia	0.43320	0.44424	0.45523	0.46618	0.47707
6	BCA Syaria	0.56166	0.57135	0.58094	0.59043	0.59980
7	Bank Jabar BantenSharia	0.21364	0.22407	0.23469	0.24546	0.25639
8	Bank Panin Sharia	0.66671	0.67475	0.68266	0.69045	0.69810
9	Victoria Sharia	0.11907	0.12724	0.13571	0.14445	0.15346
10	Bank Bukopin Sharia	0.72377	0.73073	0.73757	0.74428	0.75087
	Average	0.43994				

Table 3: Efficiency of Islamic Islamic Commercial Banks Unit

No	Bank Name	Period				
		2014	2015	2016	2017	2018
1	BII Sharia	0.26719	0.27824	0.28941	0.30068	0.31203
2	BTN Sharia	0.74534	0.75186	0.75827	0.76455	0.77071
3	Danamon	0.80093	0.80626	0.81148	0.81658	0.82157
4	Bank Permata	0.00937	0.01086	0.01254	0.01440	0.01647
5	Bank DKI	0.49001	0.50056	0.51103	0.52143	0.53174
	Average	0.47654				

Table 4: Results Panel of Islamic Commercial Banks and Islamic Commercial Bank Units

Information	Coefficient	Standard-Error	*T*-Ratio
Constanta	1.3599972	1.8663741	0.72868416
Operating costs	0.31293544	0.20000029	1.5646749
Total Assets	0.73496162	0.1940684	3.7871267
Labor costs	–0.15648365	0.17797739	–0.87923329
log likelihood	–97.793803		

Table 5: Independent Sample *T*-Test

Levene's Test for Equality of Variances			*T*-test for Equality of Means						
	F	Sig.	*t*	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal Variance	1.704	0.196	–0.553	73	0.582	–0.0366	0.06613	–0.16840	0.09520
assumed equal			–0.520	40.93	0.606	–0.0366	0.07044	–0.17886	0.10566

Viewed from the coefficient, Operational Cost has a positive impact on total financing of 0.31, which means an increase in the amount of operational costs by 1%, will increase the total financing by 0.31%. Therefore, H1 is rejected.

H2: *The amount of assets has a positive impact on the amount of financing.*

According to Table 4, we know that the tcount for operational costs is 3.78. It can be concluded that total assets have a significant effect and a positive impact on total financing due to the value of *t* count ≥ *t* table. Viewed from the coefficient, total assets have a positive impact on total financing of 0.73, which means an increase in the amount of operational costs by 1%, will increase the total financing by 0.73%. Therefore, H2 is accepted.

H3: *Labor costs have a negative effect on total financing*.

According to Table 4, we know that the *t*-count for operational costs is –0.87. It can be concluded that labor costs have no significant effect but have a negative impact on total financing due to the value of the *t* count ≤ *t* table. Viewed from the coefficient, labor costs have a negative impact on the amount of financing of –0.15 which means an increase in the amount of labor costs by 1%, will reduce the total financing by 0.15%. Therefore, *t* H3 is rejected.

H4: *There is a distinction in the efficiency value between the Islamic Commercial Bank and Islamic Commercial Bank Units.*

According to Table 5, we know that the value of sig (0.196) > α (0.05) which means that it can be concluded that Islamic commercial banks and Islamic banking Units have the same variant. Because the two populations have the same variant, this study uses the assumption of Equality of Means on the basis of Equal Variances assumed. So, the average rate of efficiency between the Islamic Commercial Bank and Islamic banking Units is the same; this can be seen from the significance value (Sig.). Compared to the significance level of 5% (0.05), the significance value is 0.582 > 0.05. Therefore, H4 is rejected.

4.2. Discussion

Over the years in many countries, the Islamic banking sector has increased quickly, mainly in Asia such as Indonesia (Laksana, et al. 2020). The difference between an Islamic commercial bank and an Islamic banking unit lies in the form of a business entity, where an Islamic commercial bank is at the level of a conventional commercial bank, while the Islamic banking unit is exactly one level below the conventional commercial banks, that is similar to a branch/ unit of a conventional commercial bank concerned.

Islamic commercial banks and Islamic banking units have the same variant. Because the two populations have the same variant, this study uses the assumption of Equality of Means on the basis of Equal Variances assumed. So, the average rate of efficiency between the Islamic Commercial Bank and Islamic banking Units is the same; this can be seen from the significance value (Sig.). Compared to the significance level of 5% (0.05), the significance value is 0.582 > 0.05.

The calculation of efficiency level using the SFA method with the function of production shows that Islamic commercial banks and Islamic banking units always experience an increase in efficiency every year with the average level of efficiency of Islamic commercial banks being 0.43994, while the average rate of efficiency of Islamic banking units is slightly higher at 0.47654. This shows that Islamic banking units are slightly more optimal in generating total financing in the period 2010–2014. The test results using Independent Sample *T*-Test can be concluded that there is no difference in the efficiency value between Islamic commercial banks and Islamic banking units. This can be seen from the Sig (0.196) > α (0.05), so it can be concluded that the Islamic commercial banks and Islamic banking units have the same variant.

This difference makes the Islamic commercial banks and Islamic banking units have different authorities in determining the direction of the bank policy. In an Islamic banking unit, the policy is determined solely by the Islamic bank concerned, while in an Islamic banking unit, the policy is determined by the conventional commercial bank where the business unit is located. This can then have an impact on the performance of Islamic commercial banks and Islamic banking units. Several previous studies, stated that Islamic commercial banks are more efficient than Islamic banking units.

5. Conclusion

The purpose of this study is to analyze and compare Islamic commercial banks and Islamic banking units with the stochastic frontier analysis (SFA) method during 2014–2018. The population in this study is Islamic commercial banks and Islamic banking units. There are 10 Islamic commercial banks and 5 Islamic banking units that meet the criteria of purposive sampling.

The calculation of efficiency level using the SFA method with the function of production shows that Islamic commercial banks and Islamic banking units always experience an increase in efficiency every year with the average level of efficiency of Islamic commercial banks being 0.43994, while the average rate of efficiency of Islamic banking units is slightly higher at 0.47654. This shows that Islamic banking units are slightly more optimal in generating total financing in the period 2010–2014. The test results using Independent Sample *T*-Test can be concluded that there is no difference in the efficiency value between Islamic commercial banks and Islamic banking units. This can be seen from the Sig (0.196) > α (0.05), so it can be concluded that the Islamic commercial banks and Islamic banking units have the same variant. In addition, the results of the Sig (2-tailed) 0.582 > 0.05 value indicate that there are no differences in the efficiency value of Islamic commercial banks and Islamic banking unit. Operating costs are not significant and have a positive effect on the total financing; total assets have a significant effect and a positive impact on total financing; labor costs are not significant and have a negative effect on total financing.

In this study, the limitations of this study are that it only measures the level of production efficiency, has not measured the cost level, the efficiency value is still not maximal and the time period is still short, and the number of Islamic Commercial Banks and Islamic Islamic Commercial Banks Units is still limited. On the basis of these limitations, then for other parties or researchers, it is recommended to use a larger number of samples to obtain more optimal research results and describe the efficiency of Islamic banking as a whole using a cost function approach or other methods such as Distribution Free Analysis (DFA) for parametric and non-parametric Data Envelopment Analysis (DEA).

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