The Measurement of Efficiency of Sharia Banks in Indonesia: Two-Stage Data Envelopment Analysis (DEA)

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ABSTRACT

This research was conducted to measure the efficiency of sharia banks in Indonesia. The study utilized two stages analisys, with the first stage employing the Data Envelopment Analysis (DEA) method, and the second stage conducting an analysis using the Tobit Method to determine the influence of market competition, market share, Net Stabel Funding Ratio (NSFR), CAR, ROA, and BOPO variables on its independent variable, which is efficiency. This research utilized panel data from sharia banks in Indonesia. The findings of this study provide a deeper understanding of the factors influencing the efficiency of sharia banks, and the results can serve as a basis for formulating policies that support the growth of a more efficient sharia banking industry. Several variables that affect sharia banks in Indonesia are market share, NSFR, CAR, ROA, and BOPO. However, variables such as the Lerner Index and ROA do not have a significant impact on the level of efficiency.

Keywords   :   Sharia Banks; Market Share; NSFR; CAR; ROA; BOPO

ABSTRAK

Penelitian ini dilakukan untuk mengukur efisiensi bank syariah di Indonesia. Penelitian ini menggunakan dua tahap analisis, dimana tahap pertama menggunakan metode Data Envelopment Analysis (DEA), dan tahap kedua melakukan analisis dengan menggunakan Metode Tobit untuk mengetahui pengaruh variabel persaingan pasar, pangsa pasar, Net Stable Funding Ratio (NSFR), CAR, ROA, dan BOPO terhadap variabel independennya, yaitu efisiensi. Penelitian ini menggunakan data panel dari bank-bank syariah di Indonesia. Temuan dari penelitian ini memberikan pemahaman yang lebih mendalam mengenai faktor-faktor yang mempengaruhi efisiensi bank syariah, dan hasilnya dapat menjadi dasar dalam merumuskan kebijakan yang mendukung pertumbuhan industri perbankan syariah yang lebih efisien. Beberapa variabel yang mempengaruhi bank syariah di Indonesia adalah pangsa pasar, NSFR, CAR, ROA, dan BOPO. Namun, variabel seperti Lerner Index dan ROA tidak memiliki pengaruh yang signifikan terhadap tingkat efisiensi.

Kata Kunci   :   Perbankan Syariah; Persaingan Pasar; NSFR; CAR; ROA; BOPO

INTRODUCTION

The sharia banking industry in Indonesia has been growing rapidly in recent years. The development of this industry has made the measurement of efficiency of sharia banks important in evaluating their performance and ability to optimize their resources. The measurement of efficiency in sharia banks is crucial as it provides insights into how a bank can optimize its resources to better performance. This is important in benefiting society as both depositors and financing customers, because by providing benefits to depositors, financial institutions help people manage and store their funds safely, provide access to profitable financial products, and help in long-term financial planning.

On the other hand, providing benefits to customers, financing allows people to gain access to the funding needed to support their economic activities, such as business financing, investment, or consumer needs that can drive local and national economic growth. So, benefiting both groups of customers not only improves their individual well-being, but also potentially improves economic stability and prosperity in general. The number of sharia banks has been consistently increasing during this period, further strengthening the urgency of measuring efficiency in the sharia banking industry.

Various methods can be used in evaluating the efficiency of banks, one of them is Data Envelopment Analysis (DEA), which is a non-parametric method. This method allows us to measure the efficiency of banks objectively and compare it with other banks in the same industry. By seeing and understanding the importance of measuring efficiency on the sharia banking in Indonesia. The research is expected to provide a better understanding of the performance of Sharia banks and produce findings of factors affecting the level of efficiency, as well as provide valuable insights for practitioners and decision-makers in the Sharia banking industry.

The measurement of the efficiency of sharia banks also has broad implications in the context of the competition of the banking industry. In a highly competitive industry, sharia banks need to have a high level of efficiency to remain competitive in the face of competition. By understanding the factors that can affect efficiency such as market competition, market share, net stable funding ratio, capital adequacy ratio, return on asset and BOPO. The sharia bank can identify areas where the sharia bank can improve its performance and optimize the use of its resources.

Maudos (1998) found that market share did not sufficiently represent efficiency in the Spanish banking industry. The results obtained support the modified efficiency structure hypothesis, because although efficiency is the main factor determining profitability, market strength (as reflected in the market share variable), also affects profitability. On the other hand, Bhatti, and Hussain (2010) explained in their research that there was a positive relationship between profitability and concentration on commercial banks in Pakistan. Empirical findings suggest that market concentration determines the profitability of Pakistani commercial banks. Therefore, the study concludes that there is a negative relationship between competition and profitability in Pakistan commercial bank companies.

According to Zou, et al. (2011), there is a positive correlation between bank concentration and equity return, while the relationship between bank efficiency and Equity return tends to be negative in the U.S. state banking market. Based on Tan and Floros (2018), the relationship between efficiency and liquidity risk has varied outcomes. The study found a negative relationship between liquidity risk and efficiency, while credit risk and risk of inability to pay off debt were positively linked to efficiency. Tkachuk, et al. (2022) and Wahyudi, et al. (2021) observed th at competition prompted banks to focus on profit rather than efficiency.

While Al Arif and Rahmawati (2018) found that several variables, including the level of operational efficiency, the rate of failure to pay, for profits, and the rates of interest from conventional banks, impacted the market share in the Indonesian sharia banking industry. Overall, based on previous research literature, this study aims to fill the knowledge gap regarding the efficiency of Sharia banks in Indonesia. Data analysis was conducted by combining DEA and Tobit methods for the analysis of factors that impact on the efficiency, this is done because Tobit is suitable for an empirical approach to deal with censored data in strategy research. Therefore, the results of this analysis are expected to make a meaningful contribution to the understanding of the performance and potential for improving the efficiency of Sharia banking.

Thus, this research has an important significance in supporting the development of the Sharia banking industry, especially in Indonesia. With a better understanding of the level of efficiency of a sharia bank and the factors that influence it, it is expected that the industry can continue to grow sustainably, provide greater benefits to society, and play a stronger role in the national economy.

RESEARCH METHOD

According to Sidiq and Choiri (2019) research is a process in which a researcher compiles logical steps. The process is used to obtain valid and reliable data that can subsequently give accurate and correct conclusions. The design of research conducted in this study is quantitative research where it is defined as research that uses analysis with the help of statistics and numbers.

Creswell (2014) argued that quantitative research is an approach to objectively test a theory, it is done by testing the relationship between variables. Ultimately, these variables can be measured using an instrument, so that the quantity data can be analyzed using statistics. While Sugiyono (2015) quantitative method is a scientific approach that sees a reality that can be classified, concrete or real, observed and measured, the relationship between the variables has a nature of cause and effect where the analysis uses statistics and research data in the form of numbers.

It can be concluded that research is an objective activity of finding and developing, as well as conducting scientific testing based on a theories and principles that are systematically structured through an intensive process in the development of generalization. (Hadi, 1998). This research will quantitatively measure the level of efficiency in the public sharia bank and analyze what factors affect the sharia banks in Indonesia. This is important for the banking industry in the face of the fierce competition.

Research population came from all Sharia public banks in Indonesia in the period January 2010 to December 2019. Techniques for sampling with purposive sampler based on criteria with the status of a Shariah public bank active that operates in Indonesia in the period 2010 to 2019 which issues data annually in the period 2010 to 2019 as in table 1.

Table 1. Criteria for Sampling Research

Sampling Criteria	Total
Sharia Bank active in Indonesia period 2010 – 2019	14
Sharia Bank in Indonesia that does not issue annual data for the period 2010 – 2019	(4)
Final number of samples	10
Observation period	10
Total observation	100

Source: Data has been processed, 2023

Based on table 1, 10 (ten) sharia banks existing in Indonesia were selected, followed by sampling research in the period 2010-2019. Names of samples of sharia banks in the object of this research include 10 (ten) Sharia Bank in Indonesia, namely Bank Syariah Mandiri (BSM), Bank Victoria Syariah, Bank Negara Indonesia Syariah (BNIS), Panin Bank Syariah, Bank Muamalat Indonesia (BMI), Bank Jabar Banten Syariah, Bank Bukopin Syariah, Bank Mega Syariah, Bank Rakyat Indonesia Syariah (BRIS), Bank Central Asia Syariah during the period January 2010 to December 2019. Data in the research uses time series and cross-sectional data that are included in quantitative data. The research data sources are based on secondary data, which is a collection of various sources such as data streams, bankscope, and annual/financial reports of each bank.

In this study, the step is to select the input and output variables to measure the level of efficiency using the DEA. In the first stage of research using an intermediate approach such as has been used in the study of Rahmat Hidayat (2011) and Efendic (2009). The input variables (I) in this study include third-party funds (I1), fixed assets (I2), labour cost (I3) and overhead cost. (I4). Additionally, the variables used for output (O) are financing (O1), operating income (O2) and fee-based revenue (O3).

In the second stage, DEA measurement variables were analyzed using the Tobit model to analyze the level of efficiency influenced by a Sharia General Bank in Indonesia. While the independent variables used are the Lerner Index (X1), Market Share (X2), Net Stable Funding Ratio (X3), Capital Adequacy ratio (X4), Return on Asset (X5), operating expenses to operating income or BOPO (X6).

Analysis techniques in the context of research refer to the methods and procedures used to analyze the data that has been collected. The purpose of analytical techniques is to dig meaning, patterns, relationships, or conclusions that can be drawn from existing data. DEA is a method used to measure the relative efficiency of decision-making units that have multiple inputs and outputs. DEA is a non-parametric approach that compares units based on their ability to generate outputs considering the input used. DEA is used to measure the level of efficiency because it is more accurately used in banking to perform intermediation functions than using Sthocasthic Frontier Analysis. (SFA).

Further on the level of efficiency influenced by these factors, then will be used tobit regression model. The tobit model assumes that the regression method is used when there is a dependent variable that has a limit or in the censor (censored variable). In this study, the efficiency variable resulting from DEA became a dependent variable in the Tobit model. Such efficiency level variables have zero scores for some observations, while for other observations have varying scores.

The Tobit model also assumes that there is no significant autocorrelation, heteroskedasty, or multicolinearity in the data. Thus, the mathematical model to be used becomes reliable in the use of regression analysis methods in the economic and social fields. The research model for testing factors is in formula 1.

$$EFFit = \alpha + \beta_1 LIit + \beta_2 MSAit + \beta_3 NSFRit + \beta_4 CAPit + \beta_5 ROAit + \beta_6 BOPOit + \mu it \dots (1)$$

The notation in formula 1 represented by EFFit (x-efficiency & scale efficiency) as dependent variabel, α (alpha or constant/intercept in linear equation), β (coefficients on independent variable), μit (error term in linear equations), and all independent variable represented as is Liit (Lerner Index), MSAit (Market Share), NSFRit (Net Stable Funding Ratio), CAPit (Capital Adequacy Ratio), ROAit (Return on Asset), BOPOit (Operating Expenses to Operating Income).

RESULTS AND DISCUSSION

The results of data analysis on the level of efficiency of Sharia Banks in Indonesia presented on Table 2. Based on that result, overall Indonesian sharia banking has an average efficiency rate of 87%, which shows that sharia banks in Indonesia still have an inefficiency of 13%.

So, the sharia bank can be said not to perform optimally its intermediary function in processing input into output, because the value of efficiency on the sharial bank in Indonesia has not reached a hundred percent (100%). This is in accordance with the research conducted by Endri (2008). Therefore, to efficiency, the sharia bank in Indonesia must reduce its use of input by 13%.

Table 2. Sharia Bank Efficiency in Indonesia Period 2010-2019

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Bank Average
BNIS	0,75	0,82	0,82	0,97	0,93	0,88	0,92	0,94	0,94	0,97	0,89
PNNS	0,86	0,89	1,00	0,89	1,00	1,00	0,92	0,83	0,83	1,00	0,92
BRIS	0,68	0,68	0,80	0,78	0,80	0,87	0,96	0,96	1,00	1,00	0,85
MEGAS	1,00	0,85	0,85	0,93	1,00	0,93	0,75	0,68	0,70	0,76	0,85
BJBS	0,82	0,64	0,68	0,73	0,74	0,97	1,00	0,72	0,67	0,69	0,77
VCTRS	1,00	1,00	0,72	0,70	0,78	0,89	1,00	1,00	1,00	1,00	0,91
BSM	0,82	0,95	1,00	1,00	0,96	0,95	0,96	1,00	1,00	1,00	0,96
BKPNS	0,86	0,69	0,73	0,79	0,89	0,88	0,87	0,71	0,79	0,87	0,81
BMI	1,00	0,94	1,00	1,00	1,00	1,00	0,95	1,00	0,75	0,78	0,94
BCAS	0,93	1,00	1,00	0,66	0,74	0,66	0,67	0,77	0,82	0,83	0,81
Year Average	0,87	0,85	0,86	0,84	0,88	0,90	0,90	0,86	0,85	0,89	0,87

Source: Data has been processed, 2023

Based on table 2, on Indonesian Sharia banking, the highest average efficiency level was achieved by Bank Syariah Mandiri, five times the efficiency to the optimal point (value 1) in the research period, namely in 2012, 2013, 2017, 2018 and 2019. This is in line with the research conducted by Yumna (2020) that found Bank Syariah Mandiri as the most efficient bank among other Indonesian sharia banks.

Next, in figure 1 there are several Sharia banks with average efficiency scores close to optimal (score 1) during the observation period. Among the banks that have almost optimal efficiency levels are Bank Muamalat Indonesia which has an average of 0.94, Bank Panin Syariah has an average of 0.92 and Bank Victoria Syariah has an overall average of 0.091. Bank BJB Syariah has the lowest efficiency score with an average of 0.77 among other Indonesian sharia banks during the study period which shows that the bank is still unable to allocate the input or resources available optimally.
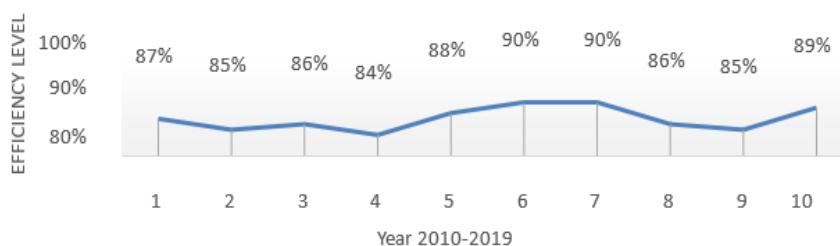
Source: Data has been processed, 2023

Figure 1. Average Efficiency of Sharia Banks in Indonesia

Based on figure 1, the overall sharia bank in Indonesia during the period from 2010 to 2019 experienced fluctuations. The highest measurement of efficiency of sharia banks in Indonesia was achieved in 2015 and 2016 with the efficiency rate of 90% and the lowest efficiency level occurred in 2013 at 84%. If rated during the study period, based on the image, the sharia bank in Indonesia achieved an efficiency measurement rate of 87%. It can be concluded that the sharia bank in Indonesia has not been able to optimize the resources it has, because the achievement of the level of efficiency achieved is still not optimal, so there must be efforts to differentiate products in reaching market share.

The next analysis is to examine the factors affecting Sharia bank efficiency in Indonesia. In this stage, further research is carried out by analyzing factors that can influence the level efficiency of sharia banking using the Tobit model as in table 2 with the Stata 10 software application, this is called a two-stage DEA.

Table 3. Results of The Tobit Regression Model

	x-efficiency	scale efficiency
Constant	0.9193**	1.0786
Lerner Index	-0.0003	0.0002
Market Share	0.0089**	0.0088**
NSFR	0.0871	0.1981**
CAP	0.0021	-0.0076**
ROA	-0.0049	0.0035
BOPO	-0.0026**	-0.0032**

Source: Data has been processed, 2023
(*significance 10%, **significance 5%)

Based on the results of table 3, there are various variables that can have an impact, both positive and negative. Then these variables do not all have a significant influence, as there are also some variables in this study that are not influential. With the research that has been done using this Tobit model, it is seen that the Lerner Index variable has no significant influence. It can be said that market competition in Indonesia's sharia bank does not affect the level of efficiency of its resources. So, in the sharia bank when approaching the perfect competition market or monopoly only gives indications of the strength of the market.

Furthermore, market share variables have a significant and positive impact on the level of efficiency of sharia banks. This shows that the increase in the asset market in Indonesian sharia bank can increase the level of efficiency due to the presence of product differentiation. This indicates the efficiency obtained comes from the market share of each bank individually due to the existence of product differences until it can dominate the price (Ye et al. 2010).

The variable Net Stable Funding Ratio (NSFR) has a significant and positive impact on the variable level of efficiency. Thus, with the presence of internal liquidity security in the bank, the management is increasingly cautious in issuing its financing that works to reduce the risk of achieving the level of efficiency. Therefore, management must do liquidity management properly and correctly so that the efficiency of the bank remains awake.

On the variable Capital Adequacy Ratio (CAR) explains that there is a significant and negative impact on efficiency. This is because there are people who prefer low-risk banks than those with high risk but profitable. (Firdaus and Hosen, 2013). In addition, the higher the capital capacity, the more profound will be the ability of the sharia bank to face the risks in the future so that the performance is assessed more efficiently (Hidayati, et al. 2017).

Meanwhile, the Return on Asset (ROA) variable explains that this variable does not significantly affect the level of efficiency since many Sharia banks have high returns on assets, not necessarily said to have optimal efficiency. The results of this study are consistent with previous studies by Elizabet, et. al (2012), Rahman and Rosman (2013).

The latter is a variable (BOPO) or operating expenses to operating income indicating that the variable significantly negatively affects the level of efficiency of sharia banks. It can be concluded that if there is an increase in the variable BOPO then there will be a decrease in the level of efficiency. This is according to the results of the study conducted by Abdullah (2003).

CONCLUSION

This study shows some findings. First, 10 (ten) Sharia banks in Indonesia in the overall efficiency level have a fluctuating trend and tend to be unstable during the survey period. Then if viewed based on individual results, the efficiency rate of Bank Syariah Mandiri is the highest among other banks with a value of 100 and Bank BJB Syariah has the lowest average efficiency level among others with the value of 77%. As for the average efficiency rate of the entire Sharia Bank in Indonesia with a value of 87%, there is still an inefficiency of 13%.

Secondly, using a Tobit regression model, it can be concluded that the Lerner Index variable has no significant influence on the level of efficiency. The market share variable has a significant positive impact in explaining the level of efficiency. Variable Net Stable Funding Ratio (NSFR) has a significant positive impact on the level of efficiency. The variable Capital Adequacy Ratio (CAR) has a significant negative impact on the level of efficiency. The variable Return on Asset (ROA) does not significantly affect the level of efficiency. Variable operating expenses to operating income has a significant and negative impact on the level of efficiency. So, the variables that have a significant influence on the level of efficiency are the market share variables, NSFR, CAR, ROA and BOPO. The variables that do not significantly affect the level of efficiency are the Lerner Index and ROA.

The efficiency level of Islamic banks in Indonesia is still unstable and tends to fluctuate. To enhance efficiency, an increase in the resources owned by Islamic banks is necessary. Factors such as the feasibility of capital, financing ratios, market share, and control of operational costs need to be carefully considered. Additionally, strengthening risk management to address the impact of external factors and potential economic uncertainties, along with other proactive approaches, should also be explored through further research.

RECOMMENDATIONS

More study on Islamic banking in Indonesia is necessary to fill this knowledge gap. Future studies might look at Islamic banks in different countries, how technology affects their efficiency, and how managerially oriented qualitative analysis helps with this. Assessing the performance of Islamic banks requires taking into account several external elements, such as regulatory changes, economic situations, and the effect of technology on customer behavior.

The crucial but sometimes overlooked facets of Islamic finance need more research. The findings of this research should help regulators loosen up on restrictions pertaining to Islamic banking in an effort to encourage its growth. To progress Islamic financial services, it is necessary to spread Islamic teachings, support technology developments in

this field, and stimulate the creation of new Islamic commodities. Pursuing long-term economic success should take a back seat to initiatives to promote sustainable finance and increase Islamic governance and compliance.

It is imperative that Islamic financial institutions support sustainable projects if they want to elevate the Islamic banking industry. In an effort to make Islamic banks more dependable and efficient, these suggestions seek to increase the number of individuals in Indonesia who have access to financial services.

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