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# Improving The Islamic Banks Competitiveness Through Efficiency: Two-Stages DEA Analysis

**Irman Firmansyah**[1]
[1]*Accounting Department, Faculty of Economics and Business, Siliwangi University*

The Islamic banking industry is one of the important factors in economic development so it must have competitiveness to be able to win the competition. Therefore, to have strong competitiveness, the efficiency level of Islamic banks must continue to be optimized. This study aims to determine the efficiency level of Islamic banks and find the factors that influence it by considering internal and external factors. The results showed that only 14.42% of Islamic banks had experienced optimal efficiency even though this study found that efficiency had a positive effect on increasing competitiveness. Important variables that can improve efficiency are age and liquidity. Besides, the board of commissioners also provides its role in managing the level of liquidity to achieve optimal efficiency, but does not play a good role in long-standing banks. In contrast to the sharia supervisory board that has succeeded in carrying out its functions in banks that have long existed to improve efficiency, and vice versa does not play a role in strengthening the level of liquidity to increase efficiency. From external factors, gross domestic product is proven to weaken the relationship between age and liquidity with efficiency.

**Key Words: Efficiency; Performance; Islamic Bank; Two stages DEA**
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*Correspondence:
Irman Firmansyah
irmanfirmansyah@unsil.ac.id

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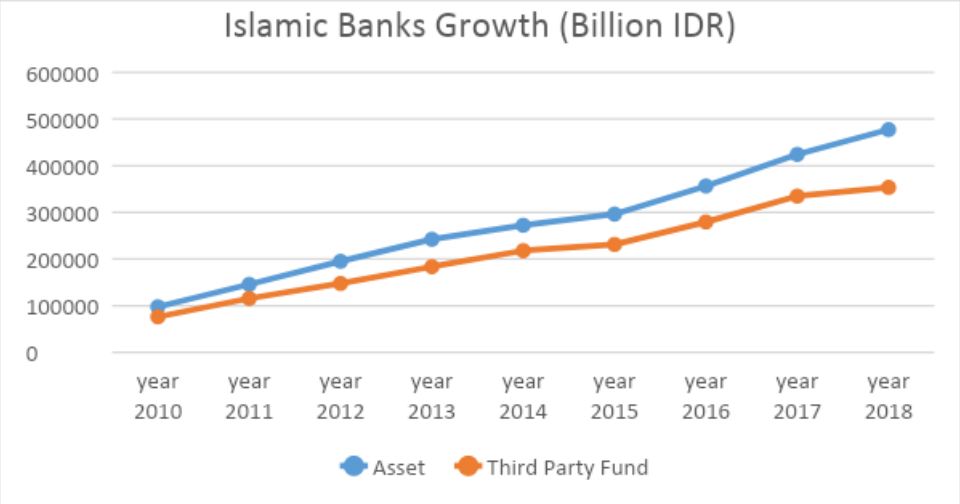
# INTRODUCTION

Currently, the opportunity for the development of Islamic financial institutions is wide open in Indonesia. This is triggered by the demographic bonus, where the middle class is growing rapidly. Therefore, Islamic financial institutions have many opportunities to meet the needs of the middle class both for saving, investing and using financial services, both Islamic banking and the non-Islamic financial industry.

Public awareness using Islamic finance needs to be built, which of course must be followed by improving the quality of services and management of Islamic financial services such as transparency, accountability, and ethics to create responsible finance and ease of access to Islamic finance for the wider community. If all the potentials of the sharia-based economy continue to be developed, the Indonesian nation will be optimistic that it will become the center of sharia financial development at the world level. Therefore, Islamic banking must have strong competitiveness to win national and international banking competitions through improving the quality and capacity of services.

Not only that, related to national economic development, but Islamic finance also has a strategic role, this is because (1) Islamic finance relies on noble values and polite business ethics by the traditions of the Indonesian Nation, (2) Islamic finance is one of a pillar in building the national economy, specifically related to the development of MSMEs and infrastructure financing (Khumaidi, 2015). Islamic finance has also been able to prove that in the past crisis, Islamic finance became a solution to strengthen the community's economy, so it is important to continue to maintain the growth of Islamic finance to be able to accelerate national economic growth.

**Figure 1:** Islamic Banks Growth (Billion IDR)




Source: Financial Service Authority (OJK)

In June 2018 Islamic banking market share was 5.7% and at the beginning of 2019, it had reached 5.94% of the total national banking. This figure shows that Islamic banking still has a huge opportunity to continue to grow and compete with conventional banking. But to achieve this, the Islamic banking industry must have a good performance that will show that Islamic banking has been successfully carried out and has high competitiveness. The competitiveness of the financial industry is demonstrated by the efficiency carried out by the company itself (Antonio, Ali, & Akbar, 2013). Therefore the importance of optimizing efficiency for Islamic banking has been proven by the large number of researchers analyzing efficiency in the last decade (Arshad, Gondal, & Talat, 2016).

To achieve optimal Islamic banking efficiency performance, the management and supervision functions which are part of the mechanism of good corporate governance (Chapra, M. Umer & Umar, 2002) need to be carried out properly so it is important to optimize the function of the board of directors, the board of commissioners and the sharia supervisory board, to achieve business success because it will control the potential of the company's resources.

There are also external factors that affect the company's financial performance, namely macroeconomic variables (Pratama, 2015). It is of course also important to know the impact on Islamic banking activities because external factors cannot be controlled by banks, so what banks must do is have a

way to anticipate the condition of macroeconomic variables so as not to hurt banks. There are two important variables, namely Gross Domestic Product (GDP) and Inflation. This variable is certainly predicted to influence the efficiency of Islamic banking performance in Indonesia because community activities in Indonesia are also determined by global economic conditions so that it will ultimately have an impact on the success of bank operations.

In addition to the important matters above, it is also necessary to identify the factors that influence the efficiency level of Islamic banking as a strategy to maintain its performance. According to the results of the collection of literature studies, several important factors that are thought to affect the financial performance of Islamic banks are bank size (Short, 1979; Smirlock, 1985), age (Arshad et al., 2016), liquidity (Khasharmeh, 2018; Miroga & Shimenga, 2019), and CAR (Charmler, Musah, Akomeah, & Gakpetor4, 2018; Kipruto, Wepukhulu, & Osodo, 2017).

After determining the factors that are predicted to affect financial performance, the next step is to place the variables of the board of directors, the board of commissioners and the sharia supervisory board which is a form of good corporate governance mechanism as a moderating variable. This is based on several studies that have been done previously that good corporate governance (GCG) has a goal to provide progress towards the performance of a company. Besides, macroeconomic variables (GDP and inflation) also cannot be controlled directly by the company (Adidu & Olanye, 2006) but their existence will certainly have an impact on the efficiency performance of Islamic banking.

In the end, this research was conducted to improve the competitiveness of Islamic banking in national banking competition through the identification of factors that influence efficiency performance and other factors that are thought to have a role. This is because good company performance reflects management efficiency in utilizing company resources, and will ultimately contribute to the country's economy (Naser & Mokhtar, 2004).

Then, in the next part, part II presents the literature review, part III methodology, part IV presents the results and research discussion, and part V is the conclusion.

# LITERATURE REVIEW

### Efficiency and Competitiveness of Sharia Bank

Islamic banks are financial institutions whose job is to collect public funds and channel them with certain mechanisms. Funds are collected through deposits and investments such as demand deposits, wadiah, savings, and time deposits, while the distribution of funds is carried out with several kinds of contracts such as murabahah, istishna, mudharabah, musyarakah, ijarah, and salam.

Because Islamic banks are intermediary institutions of those who have funds and those who need funds, Islamic banks have a strategic role in the country's economic growth. This strategic role that causes the sustainability of a bank's business needs to be maintained. To carry out its functions properly, efficiency must be maintained because it shows performance that will have high competitiveness.

Simply stated, according to Nopirin (1997), efficiency can mean the absence of waste. Efficiency is the ratio between output and input related to the achievement of maximum output with several inputs, which means that if the ratio of input-output is large, the efficiency is said to be higher, so that efficiency can be concluded namely the use of the best input in producing maximum output.

Meanwhile, Islamic banks that have competitiveness are Islamic banks that can attract customers in Indonesia and the world community, both in terms of innovative products, profit margins to customers, and competitive profit sharing (Basyarah, 2016). So that the greater the income earned by Islamic banks, the better their competitiveness. Therefore, Islamic banks must continue to optimize their efficiency to be able to compete with other banks. Several studies related to the efficiency, productivity, and performance of Islamic banks, for example, have been carried out by Rusydiana (2019), Rani et al., (2017), and Rusydiana et al., (2019).

### Factors Affecting Efficiency Performance

Bank size is an important factor in determining financial performance. Size is a scale, which can be classified according to various sizes. In banking, size is more likely to be seen from the total assets because the strength of banks in conducting their business is the total assets owned, while the assets are sourced from debt and own capital. Banks that have large assets are usually more flexible in obtaining financial performance compared to companies that have small assets. The research results of Alper & Anbar (2011), Abel & Roux (2016), Hidayat, I. P. and Firmansyah (2017), Almajali, Alamro, & Al-Soub (2012), Menicucci & Paolucci (2016), Short (1979), Smirlock (1985), Mehari & Aemiro

(2013), and Rashid & Kemal (2018) show that size has a positive effect on performance. This reinforces the statement of Hodori & Masih (2016) that the majority of studies explain that size has a positive relationship with performance.

The second factor that influences performance is age. Age is a measure where the time interval is measured from the time the bank started to stand until now. Banks that have a long life will have more knowledge and experience in carrying out operations so that they will be better able to control the company to improve company performance so that it will have a positive impact on performance (Arshad et al., 2016). This has been proven by several studies namely Batra (1999), Lumpkin & Dess (2001), Almajali et al. (2012), Alomari & Azzam (2017), and Batrinca & Burca (2014) which show the existence of a relationship positive between age and performance. This means that the greater the age, the better its performance.

The third factor affecting bank performance is liquidity. Liquidity is the ability to pay short-term debt, whereas, in Islamic banks, liquidity is calculated by dividing funds collected by funds channeled called Finance to Deposit Ratio (FDR). Several studies show that liquidity has a positive influence on performance, namely the research of Khasharmeh (2018), Miroga & Shimenga (2019), Mwaura (2015), and Odalo, Achoki, & Njuguna (2015).

The fourth factor that influences bank performance is the capital adequacy ratio or Capital Adequacy Ratio (CAR). CAR is the ability of banks in existing capital to cover possible losses in credit or trading securities. High and adequate capital adequacy is expected to improve the performance of Islamic banking. The results of Charmler et al. (2018), Kipruto et al. (2017), Mendoza & Rivera (2017), and Umoru (2016), studies found a relationship between capital adequacy ratio and financial performance determination.

In addition to the four factors above, other factors contribute to improving the financial performance of Islamic banks, especially the variable mechanism of good corporate governance consisting of directors, commissioners, and sharia supervisors. Associated with a practice that occurs in the field is the more boards of directors, the more variety of opinions that can encourage increased company performance, but the opposite condition can occur that the more boards of directors there will be a lot of interests that disrupt corporate performance. Other facts on the ground that management policies in running a company are certainly quite influenced by the presence of the board of commissioners in overseeing their work. According to Chtourou, Bedard, & Courteau (2001) the greater the number of boards, the better the mechanism for monitoring company management. However, in practice, it causes job irregularities that can interfere with company performance, even though the board of commissioners has to keep the company from leaving operational procedures with the aim that the company has good performance. This condition must trigger the company that management should be encouraged to work better through the supervision of the board of commissioners. Likewise, with the existence of a sharia supervisory board, the bank will always be monitored so that all products and transactions carried out to comply with Islamic sharia. Even though the sharia supervisory board (SSB) has to oversee the suitability of products with Islamic principles, it could also happen that the existence of SSB will improve the financial performance of Islamic banks.

The results of the research related to the effect of GCG implementation on performance is the research of Klapper, Leora F., & Love (2002) found that there is a positive relationship between corporate governance and company performance. The explanation shows that the board of directors, the board of commissioners, and the sharia supervisory board are factors that contribute to the management's role in running the business.

There are also external factors that are important variables determining the improvement of Islamic bank performance, namely macroeconomic variables consisting of gross domestic product (GDP) and inflation. That is caused by the increase in inflation that will continuously have an impact on the failure of the company's operations (Davis, 1995; Robson, 1996; Wadhwani, 1986). In addition to inflation, Athanasoglou, Brissimis, & Matthaios (2005) and Egbunike & Okerekeoti (2018) research that explains that GDP also influences performance. Both inflation and GDP are conditions that cannot be controlled by Islamic banks but have an impact on the operations of Islamic banks.

# METHODOLOGY

## DATA

This study uses sharia commercial bank data that has financial statements published in the period 2010 to 2018 with purposive sampling, as well as macroeconomic data from Bank Indonesia and the Central Statistics Agency. A description of the research data is presented in table 1 below:

**Table 1:** Data Description

| Variable | Indicator | Symbol |
|---|---|---|
| Bank Size | Natural logarithm of total asset | Ln_Asset |
| Bank Age | Long-standing until now | Age |
| Liquidity | Finance to Deposit Ratio | FDR |
| Capital | Capital Adequacy Ratio | CAR |
| Board of Director | Amount of Board of Director | Dir |
| Board of Commissionaires | Amount of Board of Commissionaires | Com |
| Sharia Supervisory Board | Amount of Sharia Supervisory Board | SSB |
| Efficiency | Input (Operational Expense, Third Party Fund, Total Asset), output (Operational Income, Financing) | EFF |
| Competitiveness | Operational Income/Total Asset (shows total asset turnover) | C |
| Macroeconomic | Inflation and Gross Domestic Product | INF, GDP |

Source: SPSS output, data processed

**Efficiency Analysis**

This analysis is used to find the efficiency level produced by Islamic banks in Indonesia. Efficiency analysis uses Data Envelopment Analysis (DEA) so that the results of the analysis not only find the efficiency level of each bank but also solutions are obtained so that Islamic banks reach optimal efficiency levels. Charnes, Cooper, & Rhodes (1978) developed the DEA model with the constant Return to Scale (CRS) method and developed by Banker, Charnes and Cooper with the variable Return to Scale (VRS) method, finally known as CCR (Charnes-Cooper-Rhodes) and BCC (Banker-Charnes-Cooper). DEA is a procedure specifically designed to measure relative efficiency using multiple inputs and multiple outputs, where the combination of inputs and outputs is not possible. Relative efficiency is the efficiency of a company compared to other companies in a sample using the same type of input and output.

Data Envelopment Analysis (DEA) will calculate the value of hs, where hs is the efficiency value of each Islamic banking period. Data Envelopment Analysis maximizes the value of *hs*, where *hs* is the sum of the multiplications of output *i* weight with the number of output *i* in the Islamic banking period *s*.

$$h_s = \frac{\sum_{i=1}^{m} u_i\, y_{is}}{\sum_{j=1}^{n} v_j\, x_{js}}$$

where:
*hs* = efficiency of bank s, *m* = output bank *s* observed, *n* = input bank *s* observed, *yis* = a number of output *i* produced by bank *s*, *xjs* = number of input *j* used by bank *s*, *ui* = weight output *i* generated by bank *s*, *vj* = weight of input *j* given by bank *s* and *i* is calculated from 1 to *m* and *j* is calculated from 1 to *n*.

The equation above shows the use of one input variable and one output. Efficiency ratio (*hs*), then maximize with the following constraints:

$$\text{Maximizing } h_s = \frac{\sum_{i=1}^{m} u_i y_{is}}{\sum_{j=1}^{n} v_j x_{js}}$$

$\leq 1$ ; r = 1, ....., N.
Where $u_i$ and vj $\geq 0$

From this equation, where N represents the number of Islamic banks in the sample and r is the type of bank that is sampled in the study. The first inequality explains that the ratio for other economic activity units is not more than 1, while the second inequality is positive. Ratio figures will vary from 0 to 1. Islamic banks are said to be efficient, if they have a ratio of close to 1 or 100 percent, conversely if close to 0 indicates a lower bank efficiency. To analyze this technical efficiency using MaxDea ver 6.6.

**Regression Analysis**

At this stage a regression analysis will be conducted to find answers to the objectives of this study. The basic model of ordinary least square (OLS) multiple regression analysis can be formulated as follows:

$$\mathbf{EFF = a + \beta_1\, ln\_Size + \beta_2\, Age + \beta_3\, FDR + \beta_4\, CAR + \beta_5\, Dir + \beta_6\, Com + \beta_7\, SSB + \beta_8\, INF + \beta_9\, GDP + e} \quad (1)$$

The model is intended to determine the effect of size, age, liquidity, and CAR, as well as other variables that serve as moderation variables on the efficiency performance of Islamic banks. While the second model is to find out the role of internal factors (board of directors, board of commissioners, and sharia supervisory board) and external factors (inflation and GDP) in influencing the relationship between size, age, liquidity, and CAR with the efficiency performance of Islamic banks, an analysis is carried out moderation regression.

The basic model of moderation regression analysis can be formulated as follows:

$$EFF = a + \beta_1 \ln\_Size + \beta_2 Age + \beta_3 FDR + \beta_4 CAR + \beta_5 Dir + \beta_6 Com + \beta_7 SSB + \beta_8 INF + \beta_9 GDP + \beta_{10} (Dir^* \ln\_Size) + \beta_{11} (Dir^*Age) + \beta_{12} (Dir^*FDR) + \beta_{13} (Dir^*CAR) + \beta_{14} (Com^* \ln\_Size) + \beta_{15} (Com^*Age) + \beta_{16} (Com^*FDR) + \beta_{17} (Com^*CAR) + \beta_{18} (SSB^* \ln\_Size) + \beta_{19} (SSB^*Age) + \beta_{20} (SSB^*FDR) + \beta_{21} (SSB^*CAR) + \beta_{22} (INF^* \ln\_Size) + \beta_{23} (INF^*Age) + \beta_{24} (INF^*FDR) + \beta_{25} (INF^*CAR) + \beta_{26} (GDP^* \ln\_Size) + \beta_{27} (GDP^*Age) + \beta_{28} (GDP^*FDR) + \beta_{29} (GDP^*CAR) + e \quad (2)$$

The next analysis is a simple regression to determine the effect of efficiency on the competitiveness of Islamic banks, then the basic model is as follows:

$$C = a + \beta_1 EFF + e \quad (3)$$

To analyze this regression model using SPSS software.

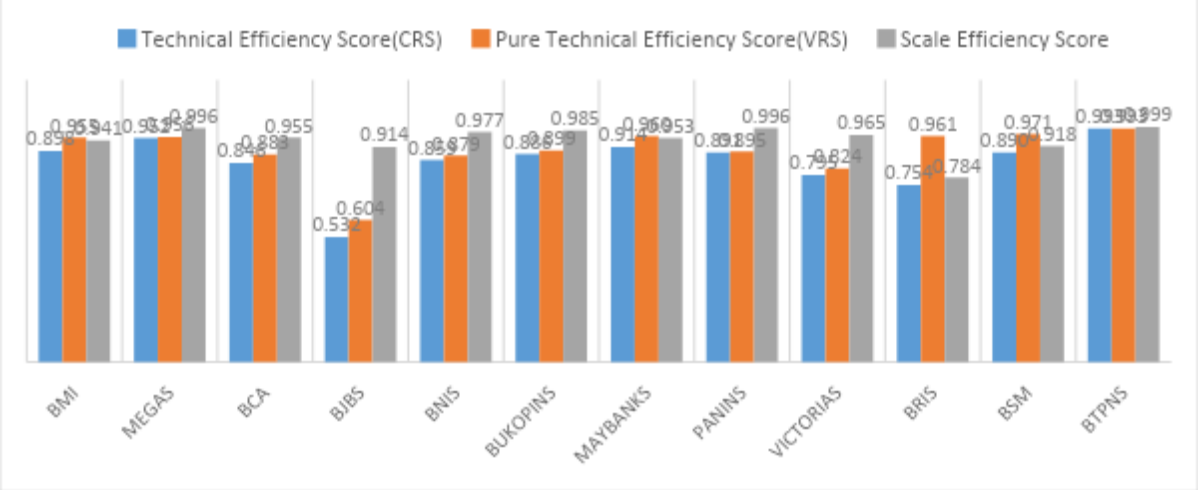
# RESULT AND DISCUSSION

The results of data collection in accordance with the required criteria, obtained 12 Islamic commercial banks namely Bank Muamalat Indonesia, Bank Mega Syariah, Bank BCA Syariah, Bank BJB Syariah, Bank BNI Syariah, Bank Bukopin Syariah, Maybank Syariah, Bank Panin Syariah, Bank Victoria Syariah, Bank BRI Syariah, Bank Syariah Mandiri, and Bank BTPN Syariah.

**Efficiency Analysis**

The analysis was conducted on all sample data, namely sharia commercial banks in Indonesia from 2010 to 2018 using data envelopment analysis (DEA), namely analyzing efficiency, resulting in an average efficiency level is as follows:

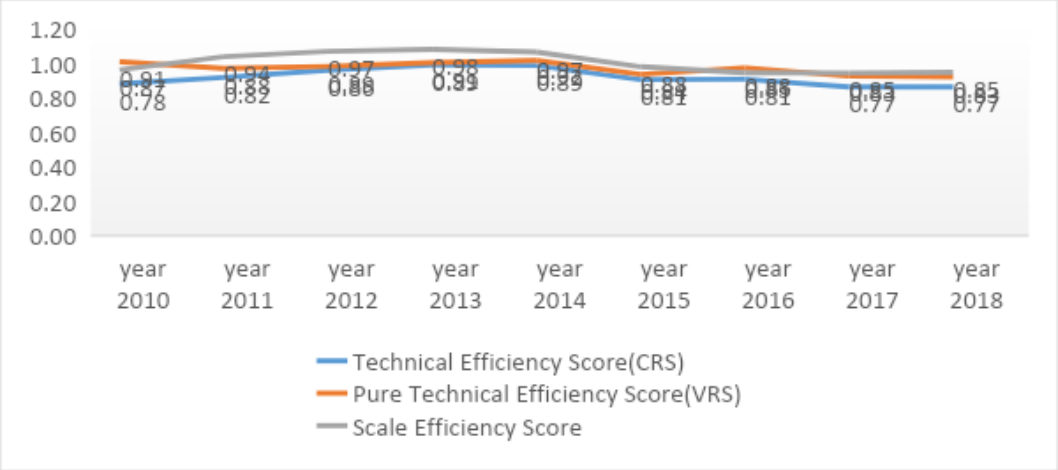
**Figure 2:** Average of Efficiency Level Each Banks




Source: DEA Output, data processed

Figure 2 explains that there are no Islamic banks that have consistently perfect levels of efficiency from 2011 to 2018, both technical efficiency, pure technical efficiency, and scale efficiency. Therefore, no Islamic bank can achieve consistency in managing its funds to be used as optimal output. The sharia bank that has the lowest efficiency level is BJB Syariah with an average efficiency of 0.532 or 53.2% while the highest average efficiency is BTPN Syariah of 0.993 or 99.3%. Meanwhile, to see the average efficiency level each year can be seen in Figure 3:

**Figure 3:** Average of Efficiency Level of Each Period




Source: DEA Output, data processed

Figure 3 shows the average efficiency level fluctuates from year to year, but from 2014 to 2018 it tends to decrease. This situation can certainly be a problem if the efficiency level is a determining factor in the competitiveness of Islamic banks. Therefore, it is necessary to know the effect of efficiency on competitiveness through further analysis to ensure the importance of managing funds to achieve optimal efficiency. The highest average level of technical efficiency occurred in 2013 and 2014 that was 0.890 or 89.0%, while the lowest average efficiency occurred in 2017 and 2018 which was 0.770 or 77.0%. With the pure technical efficiency approach, the highest efficiency level in 2014 is 0.920 or 92.0%, and the lowest efficiency is in 2017 and 2018 which is 0.830 or 83.0%. With the efficiency scale approach, the highest efficiency level occurred in 2013 which was 0.980 or 98%, and the lowest efficiency occurred in 2017 and 2018 which was 0.850 or 85.0%.

The next analysis is to find out in detail the list of Islamic banks regarding the efficiency level so that the actual conditions will occur in each Islamic bank. Table 2 explains in detail all Islamic banks with their respective conditions according to the approaches of technical efficiency, pure technical efficiency, and scale efficiency.

**Table 2:** Efficiency Level of All Islamic Banks

| DMU | Technical Efficiency Score (CRS) | Pure Technical Efficiency Score (VRS) | Scale Efficiency Score | RTS |
|---|---|---|---|---|
| BMI_2018 | 0,752 | 0,797 | 0,943 | Decreasing |
| BMI_2017 | 0,881 | 1,000 | 0,881 | Decreasing |
| BMI_2016 | 0,919 | 0,960 | 0,958 | Decreasing |
| BMI_2015 | 0,899 | 1,000 | 0,899 | Decreasing |
| BMI_2014 | 0,866 | 1,000 | 0,866 | Decreasing |
| BMI_2013 | 0,992 | 1,000 | 0,992 | Decreasing |
| BMI_2012 | 0,965 | 1,000 | 0,965 | Decreasing |
| BMI_2011 | 0,884 | 0,892 | 0,991 | Decreasing |
| BMI_2010 | 0,924 | 0,945 | 0,977 | Decreasing |
| MEGAS_2018 | 0,865 | 0,873 | 0,991 | Decreasing |
| MEGAS_2017 | 0,826 | 0,836 | 0,988 | Decreasing |
| MEGAS_2016 | 0,922 | 0,923 | 0,999 | Decreasing |
| MEGAS_2015 | 1,000 | 1,000 | 1,000 | Constant |
| MEGAS_2014 | 1,000 | 1,000 | 1,000 | Constant |
| MEGAS_2013 | 0,999 | 1,000 | 0,999 | Decreasing |
| MEGAS_2012 | 0,985 | 1,000 | 0,985 | Decreasing |

| | | | | |
|---|---|---|---|---|
| MEGAS_2011 | 0,972 | 0,974 | 0,998 | Decreasing |
| MEGAS_2010 | 1,000 | 1,000 | 1,000 | Constant |
| BCAS_2018 | 0,937 | 1,000 | 0,937 | Decreasing |
| BCAS_2017 | 0,939 | 0,974 | 0,964 | Decreasing |
| BCAS_2016 | 0,936 | 0,951 | 0,984 | Decreasing |
| BCAS_2015 | 0,926 | 0,937 | 0,988 | Decreasing |
| BCAS_2014 | 0,931 | 0,940 | 0,991 | Increasing |
| BCAS_2013 | 0,886 | 0,893 | 0,992 | Increasing |
| BCAS_2012 | 0,768 | 0,792 | 0,969 | Increasing |
| BCAS_2011 | 0,688 | 0,749 | 0,918 | Increasing |
| BCAS_2010 | 0,601 | 0,708 | 0,848 | Increasing |
| BJBS_2018 | 0,640 | 0,790 | 0,810 | Decreasing |
| BJBS_2017 | 0,666 | 0,879 | 0,758 | Decreasing |
| BJBS_2016 | 0,703 | 0,957 | 0,734 | Decreasing |
| BJBS_2015 | 0,263 | 0,266 | 0,989 | Increasing |
| BJBS_2014 | 0,251 | 0,253 | 0,990 | Decreasing |
| BJBS_2013 | 0,467 | 0,474 | 0,985 | Increasing |
| BJBS_2012 | 0,381 | 0,385 | 0,990 | Increasing |
| BJBS_2011 | 0,413 | 0,428 | 0,966 | Increasing |
| BJBS_2010 | 1,000 | 1,000 | 1,000 | Constant |
| BNIS_2018 | 0,852 | 0,880 | 0,968 | Decreasing |
| BNIS_2017 | 0,840 | 0,864 | 0,973 | Decreasing |
| BNIS_2016 | 0,886 | 0,911 | 0,972 | Decreasing |
| BNIS_2015 | 0,937 | 0,962 | 0,974 | Decreasing |
| BNIS_2014 | 0,931 | 0,953 | 0,976 | Decreasing |
| BNIS_2013 | 0,919 | 0,937 | 0,980 | Decreasing |
| BNIS_2012 | 0,859 | 0,875 | 0,981 | Decreasing |
| BNIS_2011 | 0,773 | 0,782 | 0,989 | Decreasing |
| BNIS_2010 | 0,736 | 0,749 | 0,982 | Decreasing |
| BUKOPINS_2018 | 0,881 | 0,887 | 0,993 | Decreasing |
| BUKOPINS_2017 | 0,850 | 0,888 | 0,957 | Decreasing |
| BUKOPINS_2016 | 0,949 | 1,000 | 0,949 | Decreasing |
| BUKOPINS_2015 | 0,996 | 1,000 | 0,996 | Decreasing |
| BUKOPINS_2014 | 0,966 | 0,969 | 0,997 | Decreasing |
| BUKOPINS_2013 | 0,986 | 0,986 | 1,000 | Decreasing |
| BUKOPINS_2012 | 0,866 | 0,872 | 0,992 | Decreasing |
| BUKOPINS_2011 | 0,834 | 0,836 | 0,998 | Decreasing |
| BUKOPINS_2010 | 0,643 | 0,655 | 0,982 | Increasing |
| MAYBANKS_2018 | 1,000 | 1,000 | 1,000 | Constant |
| MAYBANKS_2017 | 0,798 | 0,803 | 0,994 | Decreasing |
| MAYBANKS_2016 | 0,899 | 0,974 | 0,923 | Increasing |
| MAYBANKS_2015 | 1,000 | 1,000 | 1,000 | Constant |
| MAYBANKS_2014 | 1,000 | 1,000 | 1,000 | Constant |
| MAYBANKS_2013 | 0,933 | 0,933 | 1,000 | Decreasing |
| MAYBANKS_2012 | 1,000 | 1,000 | 1,000 | Constant |
| MAYBANKS_2011 | 0,879 | 0,934 | 0,941 | Increasing |
| MAYBANKS_2010 | 0,720 | 1,000 | 0,720 | Increasing |
| PANINS_2018 | 0,891 | 0,895 | 0,996 | Decreasing |
| PANINS_2017 | 0,957 | 0,963 | 0,994 | Decreasing |
| PANINS_2016 | 0,953 | 0,991 | 0,962 | Decreasing |
| PANINS_2015 | 1,000 | 1,000 | 1,000 | Constant |

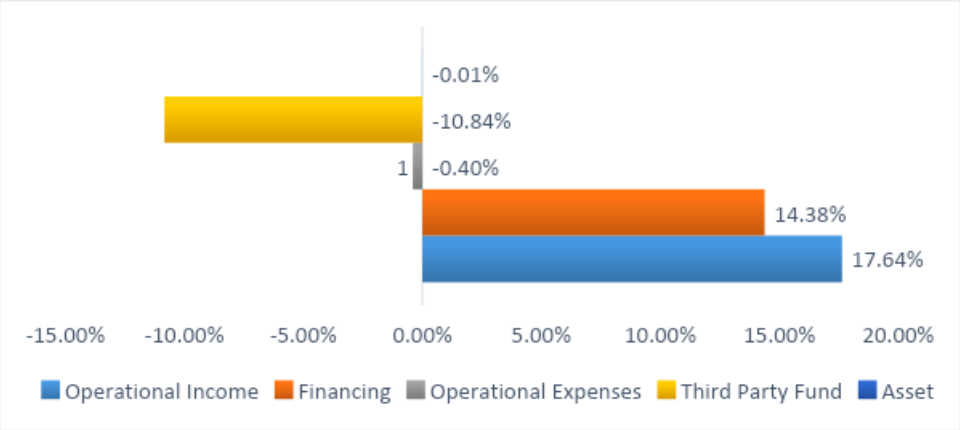
| | | | | |
|---|---|---|---|---|
| PANINS_2014 | 1,000 | 1,000 | 1,000 | Constant |
| PANINS_2013 | 0,844 | 0,846 | 0,998 | Decreasing |
| PANINS_2012 | 1,000 | 1,000 | 1,000 | Constant |
| PANINS_2011 | 0,918 | 1,000 | 0,918 | Increasing |
| PANINS_2010 | 0,581 | 1,000 | 0,581 | Increasing |
| VICTORIAS_2018 | 0,795 | 0,824 | 0,965 | Increasing |
| VICTORIAS_2017 | 0,858 | 0,891 | 0,963 | Increasing |
| VICTORIAS_2016 | 0,913 | 0,933 | 0,978 | Increasing |
| VICTORIAS_2015 | 0,964 | 1,000 | 0,964 | Increasing |
| VICTORIAS_2014 | 0,930 | 0,974 | 0,955 | Increasing |
| VICTORIAS_2013 | 0,788 | 0,834 | 0,945 | Increasing |
| VICTORIAS_2012 | 0,635 | 0,750 | 0,846 | Increasing |
| VICTORIAS_2011 | 0,647 | 1,000 | 0,647 | Increasing |
| VICTORIAS_2010 | 0,357 | 1,000 | 0,357 | Increasing |
| BRIS_2018 | 0,754 | 0,961 | 0,784 | Decreasing |
| BRIS_2017 | 0,758 | 0,881 | 0,860 | Decreasing |
| BRIS_2016 | 0,816 | 0,968 | 0,843 | Decreasing |
| BRIS_2015 | 0,848 | 0,948 | 0,894 | Decreasing |
| BRIS_2014 | 0,934 | 1,000 | 0,934 | Decreasing |
| BRIS_2013 | 0,978 | 1,000 | 0,978 | Decreasing |
| BRIS_2012 | 0,977 | 0,996 | 0,980 | Decreasing |
| BRIS_2011 | 0,979 | 1,000 | 0,979 | Decreasing |
| BRIS_2010 | 0,962 | 0,979 | 0,982 | Decreasing |
| BSM_2018 | 0,842 | 1,000 | 0,842 | Decreasing |
| BSM_2017 | 0,838 | 0,990 | 0,847 | Decreasing |
| BSM_2016 | 0,859 | 0,970 | 0,886 | Decreasing |
| BSM_2015 | 0,884 | 0,970 | 0,911 | Decreasing |
| BSM_2014 | 0,889 | 0,964 | 0,922 | Decreasing |
| BSM_2013 | 0,948 | 1,000 | 0,948 | Decreasing |
| BSM_2012 | 0,972 | 1,000 | 0,972 | Decreasing |
| BSM_2011 | 0,886 | 0,914 | 0,969 | Decreasing |
| BSM_2010 | 0,896 | 0,928 | 0,966 | Decreasing |
| BTPNS_2018 | 1,000 | 1,000 | 1,000 | Constant |
| BTPNS_2017 | 1,000 | 1,000 | 1,000 | Constant |
| BTPNS_2016 | 0,965 | 0,967 | 0,997 | Increasing |
| BTPNS_2015 | 1,000 | 1,000 | 1,000 | Constant |
| BTPNS_2014 | 1,000 | 1,000 | 1,000 | Constant |

Source: DEA Output, data processed

From table 2, the analysis is enough to look at the Technical Efficiency Score (CRS) and RTS columns. Therefore, it can be seen that Islamic banks that have achieved optimal efficiency are Mega Syariah Bank in 2010, 2014 and 2015, BJB Syariah Bank in 2010, MayBank Syariah in 2012, 2014, 2015, and 2018, Panin Syariah Bank in 2012, 2014 and 2015, BTPN Syariah Bank in 2014, 2015, 2017 and 2018, while the rest have not yet reached efficiency. For companies that have not reached efficiency can be seen in the Return to Scale (RTS) column which shows the current conditions. 'Increasing' means that Islamic banks are in a condition of increasing efficiency, while 'Decreasing' indicates that Islamic banks are experiencing a decrease in efficiency.

Overall to achieve optimal levels of efficiency, improvements are needed. DEA analysis can show improvements for Islamic banks to achieve optimal efficiency (see figure 4).

**Figure 4:** Total Potential Improvement




Source: DEA Output, data processed

Based on Figure 4, improvements that can be made by Islamic banks in Indonesia as a whole to achieve optimal levels of efficiency, namely total assets are too large so they can be reduced by 0.01%, third party funds have not been maximally channeled so that it can be reduced by 10, 84%, too much operating expenses so that it can be reduced by 0.4%, financing must be increased by 14.38%, and operating income must be increased by 17.64%.

**Linear Regression Analysis**

The first step is testing the quality of the data to meet the classical assumptions to ensure that the data can be used for regression analysis. The results of the analysis can be seen in table 3.

**Table 3:** Classic Assumption Test

| Testing | | Result | | | Decision |
|---|---|---|---|---|---|
| Normality | Kolmogorov-Smirnov Test | Asymp. Sig. (2-tailed) | | 0,050 | Normal |
| Heteroscedasticity | Glejser Test | Sig. ln_Size | | 0,474 | good |
| | | Age | | 0,068 | good |
| | | FDR | | 0,075 | good |
| | | CAR | | 0,255 | good |
| | | Dir | | 0,068 | good |
| | | Com | | 0,990 | good |
| | | SSB | | 0,051 | good |
| | | INF | | 0,206 | good |
| | | GDP | | 0,731 | good |
| Multicollinierity | Collinearity Statistics | VIF: | | TOL: | |
| | | Ln_Size | 3,237 | Ln_Size 0,309 | good |
| | | Age | 4,049 | Age 0,247 | good |
| | | FDR | 2,082 | FDR 0,480 | good |
| | | CAR | 2,247 | CAR 0,445 | good |
| | | Dir | 2,498 | Dir 0,400 | good |
| | | Com | 3,118 | Com 0,321 | good |
| | | SSB | 2,104 | SSB 0,475 | good |
| | | INF | 1,343 | INF 0,745 | good |
| | | GDP | 2,304 | GDP 0,434 | good |

Source: SPSS Output, data processed

After all data is declared good, proceed with the analysis of model 1. At this stage, the effect of size, age, liquidity, and capital adequacy ratio on the efficiency performance of Islamic banks will be tested. It also tested the influence of internal factors and external factors on the efficiency performance of Islamic banks.

Table 4 is the first model SPSS output:

**Table 4:** Analysis of Model 1

| | | F | Sig. |
|---|---|---|---|
| F-test | | 7,253 | ,000 |
| | | T | Sig. |
| Eq. 1 | Ln_Size | 1,838 | ,071 |
| | Age | 4,834 | ,000 |
| | FDR | 2,930 | ,005 |
| | CAR | -1,016 | ,313 |
| | Dir | -,377 | ,708 |
| | Com | -3,594 | ,001 |
| | SSB | -4,234 | ,000 |
| | INF | ,605 | ,548 |
| | GDP | -3,249 | ,002 |

Source: SPSS Output, data processed

The results of regression analysis of model 1 obtained the significance value of the F test is less than 0.05 so that the model used is declared good and feasible to proceed to the t-test. The first analysis shows that age and liquidity are factors that influence the efficiency of Islamic banks (significance less than 0.05). Both have a positive influence so that the longer the Islamic bank is established and operating, the more efficient the Islamic bank is, and the better the liquidity, the more efficient the Islamic bank will be.

At present sharia commercial banks in Indonesia have a diversity of ages. The oldest sharia bank is Muamalat Bank, which has 27 years old, while the youngest sharia bank is BTPN Sharia which is 6 years old. The longer the Islamic bank is established, it will have good managerial skills which will certainly be better in managing its resources to be used as maximum output because professionalism and knowledge in the field will increasingly understand. That is what will be the capital to increase efficiency. The results of this study are consistent with Almajali et al. (2012), Alomari & Azzam (2017), Batra (1999), Batrinca & Burca (2014), Charmler et al. (2018), and Lumpkin & Dess (2001) which show that age will have a positive impact towards improving performance.

Likewise, Islamic bank liquidity is very important to be maintained, because liquidity as measured by the finance to deposit ratio (FDR) shows the ability of Islamic banks in channeling funds. The more liquid the Islamic bank is, the easier it will be to channel funds in the form of profit sharing and buying and selling financing, so that in the end it will increase revenue. An efficient bank is a bank that has a higher output than its input. This study reinforces some previous studies, namely Khasharmeh (2018), Miroga & Shimenga (2019), Mwaura (2015), and Odalo et al. (2015) which prove that liquidity has a positive impact on performance.

Other findings indicate that the size (total assets) and capital adequacy ratio (CAR) does not indicate an influence on the performance of Islamic banks according to the proposed model. So that the size of the assets owned by Islamic banks is not a variable that determines their efficiency performance. Banks that should have large assets are superior in managing their funds, but this is not a guarantee, given that the majority of assets owned by Islamic banks are sourced from third party funds or external debt which results in the burden of repayment.

Similarly CAR has not been able to prove as a variable that determines the efficiency performance of Islamic banks. The capital adequacy ratio has not been an important factor in determining the efficiency level of Islamic banks, because what is more important is experience in managing funds so that funds owned by Islamic banks can be channeled properly. So the results of this study differ from previous studies conducted not on Islamic banks (Charmler et al., 2018; Kipruto et al., 2017; Mendoza & Rivera, 2017; Umoru, 2016). Therefore, it can be concluded that what is more important in determining the efficiency level of Islamic banks is not assets or CAR but age and liquidity.

Furthermore, related to internal factors that the board of commissioners and the sharia supervisory board are negative factors, while the board of directors has no influence. While from external factors, GDP has a negative effect while inflation does not affect. Before

explaining these findings, the results of the second model analysis are first examined.

The second model aims to examine internal variables (number of boards of directors, number of boards of commissioners, number of sharia supervisory boards) and external variables (inflation and gross domestic product) in their role to improve financial performance. The results of the analysis can be seen in table 5.

Table 5 summarizes the results of the processed MRA output with the interaction method regarding the testing of moderating variables so that it can be seen the significance of the interaction results of the variable number of directors, number of commissioners, number of sharia supervisory boards, inflation and gross domestic product with independent variables.

Therefore, the 95% confidence level can be explained:

1. The number of boards of commissioners strengthens the relationship between liquidity and efficiency, and weakens the relationship between age and efficiency
2. The number of sharia supervisory boards strengthens the relationship between age and efficiency and weakens the relationship between liquidity and efficiency
3. Gross domestic product weakens the relationship between age, liquidity, and efficiency.

From these findings, the existence of the board of commissioners can strengthen the relationship between liquidity and efficiency. So the board of commissioners has a significant role in carrying out Islamic bank operations. The liquidity ratio has a positive effect on efficiency will be strengthened by the relationship of the board of commissioners so that the more the number of the board of commissioners, the better because the board of commissioners has managed to oversee the operations of Islamic banks so that work becomes more efficient because it is following the objectives.

**Table 5:** Analysis of Model 2

| F-test | F | Sig. |
|---|---|---|
| | 3,038 | 0,001 |

| | Variable | T | Sig. | Conc. |
|---|---|---|---|---|
| Eq. 2 | Dir*Size | ,592 | ,557 | |
| | Dir*Age | -,585 | ,561 | |
| | Dir*FDR | -,984 | ,330 | |
| | Dir*CAR | -,774 | ,443 | |
| | Com*Size | ,683 | ,498 | |
| | Com*Age | -,898 | ,374 | Pure moderator |
| | Com*FDR | 1,393 | ,170 | Pure moderator |
| | Com*CAR | -1,078 | ,286 | |
| | SSB*Size | -,891 | ,377 | |
| | SSB*Age | ,307 | ,760 | Pure moderator |
| | SSB*FDR | -,436 | ,665 | Pure moderator |
| | SSB*CAR | 1,222 | ,228 | |
| | INF*Size | -,550 | ,585 | |
| | INF*Age | 1,552 | ,127 | |
| | INF*FDR | 1,264 | ,213 | |
| | INF*CAR | 1,411 | ,165 | |
| | GDP*Size | -1,386 | ,172 | |
| | GDP*Age | -2,045 | ,047 | Quasi moderator |
| | GDP*FDR | -,641 | ,525 | Pure moderator |
| | GDP*CAR | ,749 | ,458 | |

Source: SPSS Output, data processed

But other results found that the board of commissioners weakened the relationship between age and efficiency. The more boards of commissioners at a long-established Islamic bank, the weaker the relationship will be. This means that the number of board of commissioners is suitable if the number is large for newly established Islamic banks because of the need for tighter supervision, while long-established Islamic banks do not need a large board of commissioners because it will reduce efficiency (see table 4).

Unlike the board of commissioners, the sharia supervisory board (SSB) strengthens the relationship between age and efficiency. SSB is important for Islamic banks that have long been established, because the longer the age of Islamic banks, the variety of products, networks, offices, assets, and more customers, so it requires supervision in compliance with Islamic law. This finding can map that the number of sharia supervisory boards should be greater in Islamic banks that have long been established because they are related to Islamic sharia compliance, while the number of board of commissioners that is more suitable for newly established Islamic banks is related to management supervision.

Another finding is that the Islamic supervisory board weakens the relationship between liquidity and efficiency. The more SSB in Islamic banks, the weaker the relationship between liquidity and efficiency. SSB is the board that is tasked with overseeing the level of management compliance in obeying Islamic rules not to oversee compliance with bank operations. So if there are transactions that are of high value, it is feared that some are not by Islamic law, so the sharia supervisory board will oversee it. Therefore, there will be management irregularity in doing their work. Management will maximize revenue, while SSB will monitor it so that it does not violate Islamic rules.

Meanwhile, gross domestic product (GDP) as an indicator of macroeconomic variables weakens the relationship between age and liquidity and efficiency. Islamic banks that have a long-standing age are adversely affected by GDP. Aside from being a moderating variable, GDP also has a negative direct effect on the efficiency level (see table 4). GDP is a condition that shows the number of products produced by the community, so that the greater the GDP, the better the macroeconomic conditions. This situation will certainly cause a decrease in the demand for financing by the public to Islamic banks so that Islamic banks' income can decrease, while the DPK can increase because customers make savings, deposits or current accounts so that there is a decrease in efficiency.

Having known the determinants of efficiency, the effect of efficiency on the competitiveness of Islamic banks will be tested. Then a simple regression analysis is shown which is shown in table 6.

**Table 6:** Simple Regression Analysis

| Model | | T | Sig. |
|---|---|---|---|
| 1 | (Constant) | 2,105 | ,039 |
| | EFF | 2,066 | ,042 |

Source: SPSS Output, data processed

From table 6 it is known that the significance value of 0.042 (less than 0.05) with a positive coefficient, which means that efficiency has a significant positive effect on competitiveness. The more efficient the Islamic bank, the better the asset turnover and will generate more revenue. This is in accordance with the results of Karim (2001) which states that the more efficient a bank is, it will have superior competitiveness. Whereas banks that fail to operate efficiently will be controlled by other efficient banks (Priyanto, 2006). Therefore, this study proves that efficiency is a very important factor to be considered by Islamic banking because it has an impact on increasing competitiveness. The more optimal the efficiency level obtained, the competitiveness of Islamic banks will be better so they can compete with other banks.

# CONCLUSION

This study found empirical evidence that the importance of Islamic banks in achieving optimal efficiency because efficiency will support competitiveness to compete with other banks. In fact, the efficiency level in the 2010-2018 study period was only 14.42% so that the importance of efficiency levels in increasing competitiveness was not followed by the number of efficient Islamic banks, therefore improvements were needed to achieve optimal efficiency levels by reducing assets by 0.01%, third party funds can be reduced by 10.84%, operating costs can be reduced by 0.4%, financing must be increased by 14.38%, and operating income must be increased by 17.64%.

The results of the analysis found that the efficiency of Islamic banks is largely determined by their age because it has a more professional management and

long experience. Besides, liquidity is also another factor that determines increased efficiency, because the more liquid the funds owned, the more flexible banks are in channeling funds. The supervisory function has been carried out well by the board of commissioners, especially in maintaining the liquidity of Islamic banks, but does not have a good role for banks that have long been established. Unlike the sharia supervisory board which actually helps improve efficiency for banks that have long been established.

From external factors, GDP that shows a good economic condition weakens banks that have a long life and liquidity is also disrupted in increasing efficiency because when the economy is good, the company always keeps funds in the bank and not lending. As a result, the bank has a lot of funds while not comparable with the distribution of funds resulting in a decrease in the efficiency level.

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