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Abstract

This study aims to examine the efficiency of the Islamic banking industry: a comparison of the COVID-19 period and the new normal era in Indonesia. This study uses Data Envelopment Analysis (DEA) applications that use Variable Return to Scale (VRS) to see the ability of banks to manage input and output variables, especially total financing in Islamic banking in Indonesia. The results of this study show that the average efficiency level of Islamic banks in Indonesia fluctuated during the period before COVID-19 until the New Normal Era. Interestingly, this study found that the overall efficiency level of Islamic banking in Indonesia shows an increasing trend in 2022.
with an average efficiency value of 0.66. However, from 2019 to 2020 it experienced a very significant decline. Bank Mualamah Syariah is the bank with the highest efficiency value according to DEA, while Bank BRI Syariah and Bank Tabungan Pensiunan Nasional Syariah have the lowest value.

**Keywords:** Efficiency, Islamic Banking, Data Envelopment Analysis (DEA), Covid-19

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**INTRODUCTION**

The role of banking is very important in the economy of a country because banking is a large industry engaged in the economy. In Indonesia, banks are divided into two, namely Islamic banks and conventional banks. Currently, there are more and more Islamic banks in Indonesia, which shows that more and more people want a financial management bank following Islamic Sharia (Riani & Hendrawan., 2020). Islamic banking plays an important role in the financial system in Indonesia. In recent years, Islamic banking has experienced rapid growth and become one of the most developed sectors in the financial industry.

The Islamic banking industry increasingly demands a measurement of the level of efficiency, whether all Islamic banks in Indonesia have met the level of efficiency, or some Islamic banks in Indonesia still do not meet the level of efficiency (Rusydiana & Marlina., 2019). By knowing the level of efficiency of a bank, we can find out how capable the bank is in optimizing all the resources it has and providing greater benefits to the community as its customers both as depositor customers and financing customers.

The outbreak of the COVID-19 pandemic in Indonesia has caused failures in almost all sectors of life, both in terms of economy, politics, and social culture. Likewise, one of the economic sectors experienced by a country, namely the banking industry (Adebah & Andoh., 2020). Currently, the banking industry is facing major challenges due to the
outbreak of Covid-19. This situation has a very significant influence on the banking industry (Ningsih & Mahfudz., 2020). So that various policies were initiated by the banking industry to survive during this crucial period of the Covid-19 pandemic. One of the policies carried out to reduce the adverse impact of the Covid-19 outbreak is POJK (Financial Services Authority Regulation) National Financial Shock Regulation No.11/POJK.03/2020 issued by the government through the Financial Services Authority (OJK) which aims to manage financial and banking system stability (www.ojk.go.id) (Albanjari & Kurniawan., 2020). With this encouragement, the Indonesian economy is believed to be recovering so that it can increase productivity or efficiency of financial performance in the banking industry during the Covid-19 pandemic (Azhari & Wahyudi., 2020).

Measuring banking efficiency is very important for now, especially during the Covid-19 pandemic. The efficiency of the banking industry's performance is one of the performance benchmarks that underlies the overall performance of a company which refers to maximizing output in such a way as to utilize existing input resources (Ikra et al., 2021). A firm is said to have a higher level of efficiency if with a certain amount of input can produce more amount of output or at a certain amount of output can use fewer inputs (Abidin., 2009).

Efficiency is also often defined as how an industry can produce at the lowest possible cost, but efficiency also involves managing inputs and outputs, namely how to allocate available factors optimally to be able to produce maximum output. Efficiency is a crucial issue for banks because it can measure the performance of the banking industry (Sarifuddin et al., 2015). Banks will strive to manage their performance to achieve efficiency levels to be more competitive. Competitive banking will help developing countries and will accelerate economic recovery in times of economic uncertainty. So the higher the level of banking efficiency of a country, the more sustainable economic growth will be.

In the last 10 years, there has been a rapid increase in Islamic banking which has become an important sector for the economies of several countries (Johnes et al., 2014). Then, Islamic banking experienced rapid development internationally in the Middle East, South Asia, and Southeast Asia (Yahya et al., 2012). Next, Southeast Asia is becoming an important part of the Islamic world's finance given its rapid and sustainable growth (Pantas, 2021). Furthermore, Indonesia and Malaysia are two countries that encourage the growth of the Islamic banking and
finance industry in Southeast Asia (Ghozali et al., 2019). Then, there are similarities in the political economy of Indonesia and Malaysia, where both countries are trying to develop banking structures under a dual banking system, where the sharia and conventional sectors operate simultaneously (Prasetyo et al., 2020).

Several studies examining efficiency comparisons between Islamic banks and conventional banks show that Islamic banking is still less effective in various countries than conventional banks (Al-Khasawneh et al., 2012; Rozani & Rahman, 2013; Abbas et al., 2016). Conversely, Sakti & Mohamad (2018) stated that from 2008 to 2012, Islamic banks in Indonesia were more efficient than conventional banks. Similar findings by a comparison named Ahmad and Luo (2010), analyze the efficiency of Islamic banks and conventional banks in Europe. His findings show that Islamic banks are considered more efficient than conventional banks.

This research then discusses the level of banking efficiency from before the COVID-19 period to the period during COVID-19. Previous studies have examined the level of efficiency of the banking industry, but only at certain periods, and some previous research results show that there are significant differences. The novelty of this study is that we focused on empirical analysis of Indonesia, which is the country with the largest Muslim population and also adopts a dual banking system. We also assume the level of competition between Islamic banking sectors in Indonesia and calculate (using a non-parametric approach) and directly compare the efficiency of 13 Islamic banks in Indonesia during the period 2017-2022.

This research will be structured as follows. The background and objectives of the research are discussed in Chapter 1, chapter 2 examines the theoretical foundations that support banking efficiency research and summarizes previous studies, and Chapter 3 describes the data and research methodology used in this study. Analysis and discussion of the findings will be described in chapter 4. Conclusions and some recommendations based on the findings are contained in the last chapter.

LITERATURE REVIEW

Efficiency is one of the important indicators in the banking sector towards the stability of a country’s financial system (Devi & Firmansyah., 2020). According to Mirzaei & Moore (2014) said that industries that rely on financing from banks will grow much faster and strongly encourage the emergence of new businesses in countries with effective banking systems. King & Levine (1993) was the first to suggest that studying bank efficiency
leads to financial system stability. Another empirical study by Wahab and Haron (2017) confirms that efficiency is a benchmark in determining the optimal input to realize the intended output magnitude. Efficiency in the banking industry will show the ability of banks to maximize production by using existing resources (Hendrawan & Nasution., 2018).

Theoretically, several approaches are found to measure efficiency in the banking industry, namely the profit approach, the intermediation approach, and the production approach (Mulyadi., 2021). The profit approach explains the position of the banking industry as a profit-making institution. The intermediation approach describes the function of banks as intermediary bureaus between surplus parties and deficit parties. The production approach describes the role of banking as a business unit that produces output in the form of financial services (Wahab & Harun., 2017; Dara., 2017).

The banking industry certainly has different instruments from other industries. Banking as an industry engaged in finance has output and input variables that are different from industries operating in the real sector (Ikra et al., 2021; Yilmaz & Gunes., 2015). Therefore, the measurement of banking efficiency needs to be preceded by the introduction of output and input variables in its instrument activities (Puteh et al., 2018). The output and input variables used in this study include input variables in the form of fixed assets, Labor Costs, and third-party funds. While output variables include Operating Revenue and Total Financing.

In addition to using the method of banking performance index parameters and financial ratios, there are several other techniques, including parametric and non-parametric approaches (Ngo & Le., 2019). The parametric approaches include the Distribution Free Approach (DFA), Thick Frontier Approach (TFA), and Stochastic Frontier Approach (SFA), while non-parametric approaches include Data Envelopment Analysis (DEA) approaches (Awaluddin et al., 2019).

Titko et al., (2014) concluded that Data Envelopment Analysis (DEA) is a popular research method to be applied to measuring company efficiency. DEA is also a linear application method to evaluate the efficiency or performance of a unit with the overall unit under study (Syairozi & Handayani., 2017). With other assumptions, DEA is a technique that helps to identify the performance of a company at a specified time to produce the desired production limit (Wahab & Aaron., 2017). The DEA method has been used to measure firm efficiency since 1978, first introduced by Charnes et al., (1978) and later expanded by
Banker et al., (1984) to measure the efficiency of the Decision-Unit-Model (DMU). In research on efficiency, the DEA method is commonly used to measure technical efficiency, including the efficiency of the banking industry (Sharma et al., 2013).

DEA has two models, namely Constant Return to Scale (CRS) and Variable Return to Scale (VRS) (Banker et al., 1984). CRS assumes that if the input increases X times, the output will increase X times. The VRS assumption states that the existence of additional input, namely X times, will not cause an increase in additional output, namely X times, so it can be smaller or larger than X times (Henriques et al., 2018). The assessment of efficiency assessment ratio is between 0 to 1. The banking industry is said to be efficient if it has a ratio that leads to a value of 1 or 100%, as well as vice versa if it leads to a value of 0, the level of efficiency of the banking industry is getting lower. So that by measuring using the DEA method, each bank will be able to determine the weight of its respective value and bear the predetermined value to create the best efficiency (Himmawan & Firdausi., 2021).

Meanwhile, the concept of Efficiency in Islam is explained by Al-Ayubi et al., (2018). They explain the concept of optimising input and output following the Qur’an and Hadith. One of the inputs is based on aqidah (amantu billahi thummastaqim), the principle of having utility (khairunnasi anfauhum linnasi), and being grateful for the achievement (man lam yashkurinnasa lam yashukurillaha), and not extravagance (israf) and squander (tabdhir) with the output.

Previous Studies

Previous studies on the efficacy of Islamic banks in Indonesia were carried out by Firdaus & Hosen, 2013). They employed the DEA and discovered that the efficiency level of Indonesia’s Islamic commercial banks from the second quarter of 2010 to the fourth quarter of 2012 had not yet attained its maximum level. In another study, Zuhroh et al., (2015) demonstrated that the cost efficiency of Islamic banks is inferior to that of conventional banks on a nationwide scale.

Data Envelopment Analysis was used by Farandy et al., (2017) to investigate the efficiency of Islamic banks in Indonesia. With an average score of 91.82, the study’s findings indicate that although Islamic commercial banks in Indonesia are generally less efficient than other commercial banks, they can still effectively use their resources to produce outputs in their role as intermediary institutions. Asset (ASSET), non-
performing financing (NPF), capital adequacy ratio (CAR), number of bank branches (BRANCH), and return on asset (ROA) are used as the explanatory variables in the application of the Tobit model. The findings demonstrated that while CAR and NPF empirically do not have a substantial impact on Islamic commercial banks' efficiency, the variables assets, bank branch count, and ROA have a significant impact.

**METHODOLOGY**

This study used a quantitative non-parametric Data Envelopment Analysis (DEA) approach. This method was originally developed by Charnes et al. (1978) and later expanded by Banker et al. (1984) to measure the efficiency of Decision-Making Units (PUDs). In the efficiency literature, DEA is commonly used to measure technical efficiency, including the efficiency of financial institutions (Sharma et al., 2013). Meanwhile, according to Wu et al. (2006), DEA is one of the methods commonly used by researchers. This method can produce an efficiency score that reflects input and output variables (Yildirim, 2015).

The DEA method can also provide information about DMUs (in this study Islamic Banks in Indonesia) that do not use efficient inputs and cause inefficiencies, both in input and output variables. Finally, this method can produce information on how many inputs and outputs should be adjusted to obtain the maximum relative efficiency value.

There are two frequently used DEA models, the Charnes, Cooper, and Rhodes (CCR) model and the Banker, Charnes, and Cooper (BCC) model, which were introduced in 1984 (Coelli et al., 2005). The main difference between the CCR model and the BCC model is the treatment of scale back. The CCR model assumes that the production technology satisfies the properties of Constant Return to Scale (CRS). Constant return to Scale (CRS) assumes that any increase in input by a certain percentage will be followed proportionally by an increase in output by the same percentage. In other words, adding input x times will add additional output x times. Charnes et al., (1978) assumed that ŷ is convex and proposed a convex estimator.

Briefly, the DEA method can be described in Figure 1.

This study focuses on the efficiency analysis of 13 Islamic banks in Indonesia in the 2017-2022 period. In selecting the research period, we took 2017 data based on the availability of datasets from annual reports from Islamic banks in Indonesia. While in 2022 we took to find out the extent of the impact of Covid-19 on banking efficiency. The detailed case study consists of 13 Indonesian Islamic banks. The input variables used in this study are fixed assets, labor costs, and third-party funds, while the output variables are total financing and operating income. All data related to input and output variables used in this study were obtained from annual reports or financial statements of each bank. The following is the definition of variables in this study.

Table 1. Definition of Input and Output Variables

<table>
<thead>
<tr>
<th>Variable Income</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed assets</td>
<td>Total assets minus accumulated depreciation for Islamic Banks in Indonesia</td>
</tr>
<tr>
<td>Labor costs</td>
<td>Total labor costs incurred</td>
</tr>
<tr>
<td>Third-party funds</td>
<td>Total deposits from customers</td>
</tr>
</tbody>
</table>

Since one of the objectives of this study is to analyze the efficiency of Islamic banking performance, the intermediation approach is considered usable. According to Ascarya et al. (2010), compared to production and modern approaches, the intermediation approach is more appropriate to be applied to Islamic banking because this approach views banks as intermediation institutions. This approach describes banking activities as intermediaries in converting money from third parties into money lent to borrowers (Ascarya et al., 2010). The selection of input-output variables is in line with Suffian (2009), Ascarya and Yumanita (2009), and Rusydiana and Marlina (2019).

RESULTS AND DISCUSSION

Results

The table below shows the efficiency level of 13 Islamic Banks in Indonesia during the 2017-2022 period using Data Envelopment Analysis (DEA) assuming Variable Return to Scale (VRS). The results will be displayed through an efficiency score with a range of 0-1. A score of 1 describes the bank's ability to optimally manage its input and output variables. Meanwhile, if the efficiency score is further than 1, it can be indicated that the bank is inefficient or not optimal in managing its input and output variables. The efficiency score after data processing using MAXDea.8 can be seen in Table 1.

<table>
<thead>
<tr>
<th>NO</th>
<th>DMU</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bank Aceh Syariah</td>
<td>0.58</td>
<td>0.55</td>
<td>0.47</td>
<td>0.41</td>
<td>0.48</td>
<td>0.66</td>
</tr>
<tr>
<td>2</td>
<td>Bank BPD Nusa Tenggara Barat Syariah</td>
<td>0.58</td>
<td>0.68</td>
<td>0.73</td>
<td>0.44</td>
<td>0.94</td>
<td>1.00</td>
</tr>
<tr>
<td>3</td>
<td>Bank Muamalat Syariah</td>
<td>0.97</td>
<td>0.68</td>
<td>1.00</td>
<td>0.90</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>4</td>
<td>Bank Victoria Syariah</td>
<td>0.61</td>
<td>0.73</td>
<td>1.00</td>
<td>0.90</td>
<td>0.94</td>
<td>1.00</td>
</tr>
<tr>
<td>5</td>
<td>Bank BRI Syariah</td>
<td>0.09</td>
<td>0.15</td>
<td>0.20</td>
<td>0.22</td>
<td>0.25</td>
<td>0.46</td>
</tr>
<tr>
<td>6</td>
<td>Bank BNI Syariah</td>
<td>0.20</td>
<td>0.20</td>
<td>0.24</td>
<td>0.36</td>
<td>1.00</td>
<td>0.74</td>
</tr>
<tr>
<td>7</td>
<td>Bank Syariah Mandiri</td>
<td>1.00</td>
<td>0.86</td>
<td>0.72</td>
<td>0.78</td>
<td>0.49</td>
<td>0.62</td>
</tr>
<tr>
<td>8</td>
<td>Bank Jabar Banten Syariah</td>
<td>0.62</td>
<td>0.80</td>
<td>1.00</td>
<td>1.00</td>
<td>0.96</td>
<td>1.00</td>
</tr>
<tr>
<td>9</td>
<td>Bank Mega Syariah</td>
<td>0.31</td>
<td>0.33</td>
<td>0.44</td>
<td>0.43</td>
<td>0.41</td>
<td>0.54</td>
</tr>
<tr>
<td>10</td>
<td>Bank Panin Dubai Syariah</td>
<td>0.82</td>
<td>0.93</td>
<td>1.00</td>
<td>0.89</td>
<td>0.94</td>
<td>1.00</td>
</tr>
<tr>
<td>11</td>
<td>Bank Syariah Bukopin</td>
<td>0.66</td>
<td>0.84</td>
<td>1.00</td>
<td>0.57</td>
<td>0.88</td>
<td>1.00</td>
</tr>
<tr>
<td>12</td>
<td>BCA Syariah</td>
<td>0.67</td>
<td>0.86</td>
<td>1.00</td>
<td>0.57</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>13</td>
<td>Bank Tabungan Pensiunan Nasional Syariah</td>
<td>0.42</td>
<td>0.42</td>
<td>0.39</td>
<td>0.42</td>
<td>0.49</td>
<td>0.66</td>
</tr>
<tr>
<td></td>
<td>RATA-RATA</td>
<td>0.50</td>
<td>0.48</td>
<td>0.43</td>
<td>0.42</td>
<td>0.49</td>
<td>0.66</td>
</tr>
</tbody>
</table>

Table 1. Indonesia’s Sharia Banking Efficiency Score
Based on the table above, it can be seen that there are only two DMUs that get almost maximum efficiency, namely Bank Muamalat Syariah and Bank Jabar Banten Syariah. Bank Muamalat Syariah achieved a constant value of 1 during 6 years of observation and almost reached a constant value of 1. The second largest value is Bank Jabar Banten Syariah with a constant value of 1 for 6 years of observation and with an average efficiency of 0.90. Then followed by Bank BCA Syariah and Bank Victoria Syariah with an efficiency value of 0.89 each. Meanwhile, Bank BRI Syariah and Bank Tabungan Pensiunan Nasional Syariah received the lowest average score of 0.23, followed by Bank Mega Syariah with an average value of 0.41.

It can also be seen that the efficiency value of Islamic Banks in Indonesia fluctuates every year. The average overall efficiency score of Islamic banks in Indonesia in the study period was 0.58. However, if measured every year, the average shows interesting numbers. The value of the Islamic banking industry in Indonesia showed a decline from 2017 to 2018. Then the decline was very significant in 2019 and decreased again in 2020, when the COVID-19 pandemic spread to Indonesia. The impact of COVID-19 will most likely be felt first by the bank's income statement in the short term (Sakouvugui & Guilavogui., 2022).

If current economic conditions persist and the borrower is unable to repay its debts, the bank may be forced to recognize the loan loss in full and record the value of the capital in the long run. In addition, if payments are late, banks can be in trouble due to the risk of bad debts, in the worst-case scenario, bank runs. Cecchetti and Schoenholtz (2020) stated that the COVID-19 turmoil raised great concerns regarding the resilience of the banking sector to maintain efficiency in the role of intermediation. He found evidence that the institutional characteristics and types of banking business models used by Islamic banks mitigated the impact of COVID-19 on banking stability. He also found that Islamic banks have a greater risk profile.
Various innovations need to be carried out by Islamic banks in Indonesia to improve their performance, especially in terms of efficiency. Several innovations such as financial technology, digitalization, mobile services, and others are needed to facilitate customers in this COVID-19 pandemic era. In the long run, increased customer engagement allows banks to be more efficient and cost-effective.

In addition to generating efficiency scores, the DEA method can also identify potential improvements or the level of improvement needed to achieve optimal efficiency. This helps determine which variables need to be optimized. The analysis of potential improvements is conducted using observations from the latest year and is performed separately from previous years to depict the actual values that need to be attained. This analysis compares projected values with real values or the most recent available data. The difference between projected values and real values indicates the level of inefficiency in variables that need to be corrected by Islamic banks in Indonesia. The results of potential improvement measurements can be seen in Figure 2.
Based on the analysis of potential improvement, it is evident that the main cause of inefficiency in Islamic banks in Indonesia lies in the suboptimal achievement of output variables, particularly total financing. This variable contributes to more than half of the sources of inefficiency. This means that inefficient banks need to increase their financing by 50% of the existing amount to achieve efficient performance. Additionally, to enhance efficiency, banks also need to optimize the use of fixed assets by 18%, labor costs by 18%, third-party funds by 12%, and increase business income by 2%.

**CONCLUSION AND RECOMMENDATION**

The results of this research indicate that the average efficiency level of Islamic banks in Indonesia fluctuated during the study period from 2017 to 2022. Interestingly, the study found that the overall efficiency of Islamic banking in Indonesia shows an increasing trend in certain years, particularly in 2022, with an average efficiency value of 0.66. However, it decreased from 2019 to 2020. Mualamat Sharia Bank is the bank with the highest efficiency according to DEA, while BRI Sharia Bank and National Pension Savings Sharia Bank have the lowest values. However, during the year 2020, Islamic banks in Indonesia were more affected by the Covid-19 impact.
Recommendation

With the disease as a whole and related preventive measures, the spread of COVID-19 is a significant global shock. The financial sector, especially banking, is expected to play a crucial role in mitigating the impact in the short term by providing essential loans to businesses and households. On the input side, practitioners recommend the need to improve the quality of human resources in banking and innovate banking products to offer a broader range of options to customers for optimal financing distribution. To facilitate this on the output side, banks must take various policy measures to enhance liquidity and increase credit flow. The potential impact of these countercyclical loan policies on the long-term stability of the banking system and the extent to which they can absorb this shock without losing resilience due to their improved capital position since the global financial crisis is a crucial policy consideration.

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