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DOES THE COVID-19 PANDEMIC AFFECT FINANCIAL DISTRESS OF SHARIA COMMERCIAL BANKS IN INDONESIA? (ANALYSIS USING ARTIFICIAL NEURAL NETWORK)

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ABSTRACT
This study aims to determine whether there is a role for the current ratio value, return of equity, operating costs of operating income, company size, and the COVID-19 pandemic in the prediction model of financial distress for Islamic Commercial Banks (BUS) in Indonesia. This study uses a quantitative approach with non-parametric statistical methods artificial neural network backpropagation algorithm. The sample used is the financial report data of Islamic Commercial Banks (BUS) quarterly in 2015-2020 with the proportion of training data and testing data of 90%:10%, 80%:20%, and 70%:30%. The results of this study indicate the best model for predicting financial distress with the highest accuracy of 92.7% and AUC of 92.5%, which is included in the excellent classification. Of the five determinants of financial distress used, return of equity and company size contributed the most then BOPO, Current ratio and pandemic COVID-19 for the last. The COVID-19 pandemic only contributed 5. %. It confirms that Islamic banks in Indonesia can survive during the COVID-19 pandemic. Furthermore, Islamic banks need to maintain a stable return on equity and company size to minimize the chances of Islamic banks experiencing financial distress.

Keywords: Artificial Neural Network; COVID-19; Company Size; Current Ratio; Financial Distress; Operating Costs of Operating Income; Return of Equity

INTRODUCTION

As a world health organization, WHO revealed that Covid-19 was declared a pandemic COVID-19(WHO, 2020). The pandemic COVID-19 spread to various countries, Including Indonesia (Wahyudi, 2020). In the news by CNBC, Minister of Finance Sri Mulyani stated that the Indonesian economy contracted by -5.32% in the second quarter of 2020. This sharp decline impacted the trade, agriculture, manufacturing, and financial services sectors (Julita, 2020). No exception, Islamic banking is an economic sector affected by the Covid-19 pandemic (Albanjari & Kurniawan, 2020).

The profitability is measured by return on assets (ROA). The ROA of Islamic commercial banks in 2020 have decreased continuously from April to November. The decline in profit was due to the economic slowdown during the Covid-19 pandemic (OJK, 2020). If the decline in profitability is not immediately corrected, the company can experience financial distress, which means experiencing financial difficulties (Azis & Rahardjo, 2020). Financial distress is when a business experiences a financial decline before the business faces bankruptcy or liquidation(Platt & Platt, 2002).

Financial distress prediction information can be useful as an early warning system for companies and stakeholders to act proactively in facing the worst possibility that threatens the company's existence to find bankruptcy or liquidation (Dwiyanti, 2017). The reason for this research is to analyze the influence of financial factors in the form of financial ratios on financial distress conditions in Islamic commercial banks.

One of them is the liquidity ratio seen from the current ratio. Generally, the liquidity ratio shows the company's capability to meet its short-term obligations, which shows how well current assets can cover short-term liabilities. If the bank can meet its short-term obligations properly and on time, it can minimize the risk of financial problems. It means that the higher the bank's liquidity, the bank will be more protected from indications of financial distress (Zhafirah & Majidah, 2019).

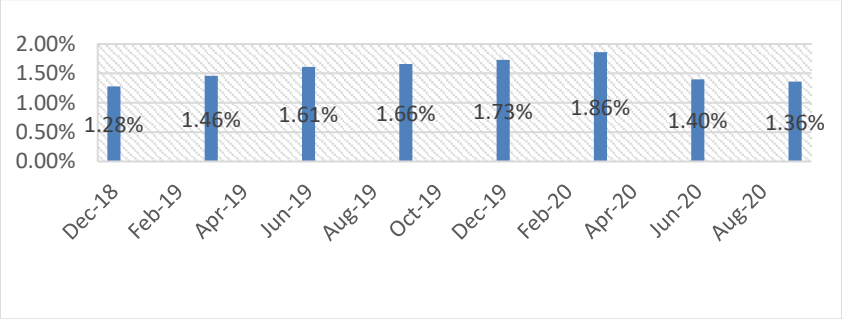


Figure 1. Graph of ROA of Islamic Commercial Banks December 2018-September 2020
Source: Financial Services Authority (OJK), (2020)

Return of equity (ROE) is a profitability ratio that is useful in seeing the capability of Islamic banks to generate profits in terms of shareholder investment. The higher the ROE ratio value, the higher the bank's profit, so the possibility of experiencing financial difficulties is also less (Nabila, 2020). Then there is the BOPO ratio, the ratio that is usually used to control the proportion of operating costs used to the bank's operating income. This high ratio represents the high operational costs that banks use to obtain operating income, so this high ratio causes the soundness of Islamic banks to decline (Wulandari, 2020).

Company size is a scale in determining the size of a company as measured by calculating the natural logarithm of total assets (Wulandari, 2020). (Wulandari, 2020). Suppose the Islamic bank has assets or high asset value. In that case, the Islamic bank can fulfill its future obligations and continue its business continuity. Therefore, a large company size minimizes the risk of Islamic banks experiencing financial difficulties (Pranita & Kristanti, 2020), (Sholikah & Miranti, 2020).

Lin (2009) and Paramitha (2016) have compared analytical techniques between MDA, logit, and ANN to predict financial distress. The results of his research show that the artificial neural network (ANN) analysis technique has the highest level of accuracy compared to the other two models. The ANN model is known as a non-parametric statistical model, where this model can solve unstructured problems and does not require normally distributed data. Therefore, this study aims to obtain the best model and determine what plays a role in predicting financial distress models using artificial neural networks at Islamic Commercial Banks in Indonesia.

LITERATURE REVIEW

Financial distress is a condition in which a company experiences financial degradation that occurred before the bankruptcy or liquidation of the company (Platt & Platt, 2002). An indication of a company in a financial distress situation is when it experiences one situation involving bankruptcy, default, large cash withdrawals, and major events that make it impossible to pay debts when they fall due and enter the bankruptcy process (Lin, 2009). Financial distress is also a condition in which negative net assets cannot be covered by the company's operating cash flows (Geng et al., 2015). A company in financial distress experiences negative EPS, net income, operating income, and business mergers (Brahmana, 2007). In addition, financial problems also arise in companies whose profitability is declining. Companies with high ROA have a great chance of avoiding possible financial problems or financial distress (Dwijayanti, 2010), (Chou & Buchdadi, 2016), (Pratiwi et al., 2019). Financial ratios compare numbers between one component and another in the financial statements (Kasmir, 2017). In essence, the financial ratio is the value obtained from comparing one item with another that has a relevant and significant relationship in a financial statement (Barutu, 2019). The company's financial statements can be an indicator to determine whether the

company is in financial distress or not. With these financial statements relevant financial ratios can be calculated as an instrument to assess the level of financial problems so that it can be seen how high the level of soundness of the Islamic bank's performance is (Aminah et al., 2019).

The current ratio is one indicator of the liquidity ratio. This ratio is usually used to see the company's capability to meet its short-term obligations, which shows how well current assets can cover short-term liabilities. If the bank can cope with short-term commitments properly and on time, it can minimize the chances of the bank experiencing financial distress. It means that the higher the bank's liquidity, the bank will avoid indications of financial distress (Zhafirah & Majidah, 2019). This ratio is calculated by comparing current assets with current liabilities owned by the company (Widati & Prathama, 2015). Return of equity (ROE) is one of the profitability ratios used in determining the company's after-tax profit to its equity level. Shareholders use ROE to determine how well the company's ability to generate net income to dividend income

The BOPO ratio is an efficiency ratio used to measure bank management's capability to control operating expenses against operating income (R. R. Wijaya et al., 2018). The high value of BOPO represents banks' high operational costs to obtain operating income. It causes a decrease in the soundness of Islamic banks(Wulandari, 2020). Size of the company in this study was measured by calculating the natural log of total assets (Zhafirah & Majidah, 2019). Suppose the Islamic bank has a high asset or asset value. In that case, this proves that the Islamic bank can fulfill its obligations for the next period and maintain the company's existence. Therefore, the company's size can minimize the risk of Islamic banks experiencing financial distress (Pranita & Kristanti, 2020), (Widati & Prathama, 2015).

The artificial neural network is an artificial network based on the neural structure of the brain. The brain works by understanding or learning from experience. The main parts of the brain are cells and parts of the body that have cells. Brain cells can remember, think and apply their experiences(A. H. Wijaya, 2019). In an artificial neural network, information about the input is sent to neurons with a certain weight. The activation function is processed by adding the values of all the weights that enter each neuron. The neuron is activated when the input exceeds a certain threshold, but if it does not exceed the threshold, the neuron will not be activated. Furthermore, the output is sent to all related neurons by neurons that have been active through their output weights (Exsanudin, 2014).

METHODS

The study uses secondary data in the form of quarterly financial report data for Islamic Commercial Banks in 2015-2020, sourced from the Financial Services Authority website at www.ojk.go.id. Table 1 shows the operational definitions of variables from this study. This research uses an artificial neural network (ANN) data analysis technique with a backpropagation algorithm to determine the factors that play a role in the financial distress prediction model. An artificial neural network is a non-linear statistical data model analysis technique that analyzes the relationship between the input variable x (i = 1,...., n) and the output variable (y). The data in the artificial neural network model needs to be classified into training data and test data. The data distribution in this study uses the proportions of 90%:10%, 80%:20%, and 70%:30%. The data analysis sequence includes data preprocessing, testing of backpropagation algorithm artificial neural network, and model evaluation using confusion matrix and Receiver Operating Characteristic (ROC) curve. The analytical tool used for testing this research is IBM SPSS 16.0 software.

Evaluation of models with accuracy alone is not appropriate when applied to the minority class classification model or commonly referred to as unbalanced data (balance data). The minority class will have little impact on the accuracy of the model. If the

classification is included in the imbalanced data, the evaluation can be assessed using the metrics of sensitivity, specificity, precision, and F-Measure (Siringoringo, 2018).

The ROC curve is a graph that represents the calculation of false positives on the x-axis against true positives on the y-axis (Kulkarni et al., 2020). Examining the area under the curve, commonly called the Area Under Curve (AUC), where the AUC value ranges from 0 to 1, can provide evidence of the most optimal model (Aryadoust & Goh, 2016). According to research conducted by Ling et al. (2003) and Saifudin & Wahono (2015) the evaluation of the model with the AUC value is more comprehensive in the event of data imbalance. There are five classifications for interpreting the area under the ROC curve: 1) 0.90 to 1 means excellent (very good); 2) 0.80 to 0.90 means good; 3) 0.70 to 0.80 means fair (enough); 4) 0.60 to 0.70 means poor (bad); 5) 0.50 to 0.60 means fail.

RESULTS

The percentage of Islamic commercial banks in Indonesia in 2015-2020 indicated that they were experiencing financial distress was 77%. It is based on the rate of return on assets or ROA in Islamic commercial banks. Meanwhile, Islamic commercial banks with no indication of financial distress were 23% of the 216 samples taken in this study. Larger amounts of data are required for training samples than for testing samples. Researchers conducted tests with the proportion of data 90%:10%, 80%:20%, and 70%:30%.

Testing the backpropagation algorithm artificial neural network model. Figure 2 shows the results of the ANN architecture testing. The three test models show that the output variable contributes almost the same to the Bank's financial distress. Table 2 in neural network testing shows the percentage of prediction errors resulting from training and testing the neural network. Based on the value of percent correct prediction, the test with the largest prediction correctness level is test 1 with a proportion of 90%: 10% with a model truth level of 95%.

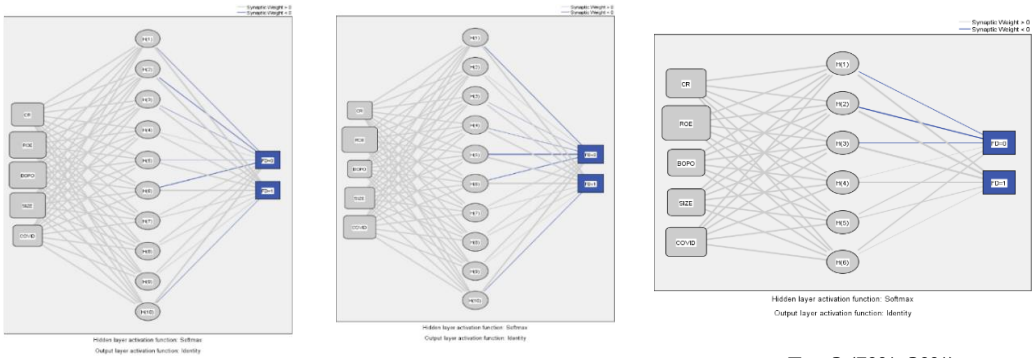
Table 1. Variable Operational Definition

Variabel	Indikator
	Output Variable
Financial distress	Indicators to measure financial distress variables use ROA (Platt & Platt, 2002) with categories: Nilai 1: *Financial distress,* ROA ≤ 1,5% Nilai 0: Non *Financial distress,* ROA > 1,5%
	Input Variable
Current Ratio(Zhafirah & Majidah, 2019)	*Current Ratio* = $\frac{Current\ Assets}{Current\ Liabilities}$
ROE (Nabila, 2020)	ROE = $\frac{Net\ Income}{Stockholders\ Equity}$
BOPO (Wulandari, 2020)	BOPO = $\frac{Operational\ Expenses}{Operational\ income}$
Size (Zhafirah & Majidah, 2019)	.Size = Ln (Total Activa)
Pandemic COVID-19	It is categorical data, 1 for Pandemic COVID-19 era 0 for before Pandemic COVID-19 era

Source: Author Analysis (2021)

The effect of weights on each layer that affects the output layer and the effect of the combination of weights is difficult to consider. It is because the output and input do not have a one-to-one correspondence, which is different from the linear model in which the weights and parameters of each input can be known (Candes & Fine, 2000). Then there is the bias that helps the network to learn the patterns that underlie the data more efficiently and estimate the output accurately (Aryadoust & Goh, 2016). The independent variable importance (Table 3) serves to perform a sensitivity analysis where this can explain how important or influential it is in determining the neural network (SPSS, n.d.). Notolegowo (2016) this analysis represents how much the input variable (independent) affects the output variable (dependent). ROE contributes to determining the indication of financial distress by 48.2% of the overall variables making up the financial distress prediction model. Then the variable size of the company contributes 33.3% of the overall variables that make up the model. The BOPO variable contributes 11.6% of the overall variables that make up the model. Finally, the variable with the smallest effect on financial distress is the current ratio variable which contributes 6.9% of the overall variables that make up the model.

The following in Table 4 results from the three tests' confusion matrix on the artificial neural network model. Previously, it was explained that the actual data in this study was included in the imbalance category with the proportion of positive instances being greater than negative instances. Therefore, the model's evaluation results by calculating the metrics of accuracy, sensitivity, specificity, precision, and F-Measure on the testing data of the three tests are shown in Table 5 below. Moreover, Table 6 measures the best model using AUC. After all stages of testing the backpropagation algorithm artificial neural network, it is necessary to select the best model. So the best model for testing the ANN backpropagation algorithm is the second test with the proportion of data 90%:10%. It has a high value of sensitivity, precision, F-Measure, and AUC compared to the first and third tests.



Test 1 (90%: 10%) Test 2 (80%: 20%) Test 3 (70%: 30%)

Figure 2. ANN Architecture
Source: Author Analysis (2021)

Table 2. Percentage Incorrect Prediction

Testing	Test I	Test II	Test III
Percent Prediction	95,0%	78,6%	83,3%

Source: Author Analysis (2021)

Table 3. Independent Variable Importance

Variable	*Current ratio*	ROE	BOPO	Size	Pandemic COVID-19
Importance	0,105	0,319	0,224	0,267	0,085

Source: Author Analysis (2021)

Table 4. Confusion Matrix Semua Pengujian

Testing	*True Negative*	*True Positive*	*False Negative*	*False Positive*
Test I	1	19	0	2
Test II	4	34	0	3
Test III	9	50	0	5

Source: Author Analysis (2021)

Table 5. Hasil Nilai Metrik *Confusion Matrix*

Metrik	*Accuracy*	*Precision*	*F-Measure*
Test I	93,7%	92,4%	96,9%
Test II	90,1%	90,8%	94,3%
Test III	92,2%	91,9%	95,2%

Source: Author Analysis (2021)

Table 6. Area Under The Curve

AUC	Test I	Test II	Test III
Non-Financial Distress	0,925	0,925	0,940
Financial Distress	0,925	0,925	0,940

Source: Author Analysis (2021)

DISCUSSION

Table 3 shows that ROE as a determinant of financial distress has the highest contribution of 48.2%. These results indicate that profitability is the most important aspect of assessing Islamic banks' financial performance. The greater the profitability value, the Islamic bank is considered healthier, and the continuity of its operational activities is guaranteed (Porwati et al., 2021).

Figure 3 shows that the ROE of Islamic commercial banks in Indonesia during 2015-2020 fluctuated with a relatively increasing trend. Moreover, it decreased again in 2020 due to a decline in profits due to the Covid-19 pandemic. The cause of these fluctuations is that the value of net income has fluctuated. In contrast, the equity of Islamic commercial banks, as seen from shareholders' paid-up capital, has increased yearly. Sufficient equity can be used as a strategy to gain public trust. In addition, the benefits of equity can control the risk of loss on investments, especially those from third-party funds (Nursyamsu, 2016).

The results of this study support research conducted by Saraswati (2014) that ROE has implications for indications of financial distress with a contribution of 51.8% in determining the condition of financial distress from all the model variables used. From their research results, Nabila (Nabila, 2020), Nugraha & Nursito (2021) state that ROE has significant positive implications for financial distress. ROE shows the amount of equity contribution in generating net income. So, it can be concluded that the higher the value of the ROE ratio, the higher the profitability obtained by the bank, so the possibility of a bank has the potential to experience financial distress is also lower.

Company size as a determinant of financial distress model has a high contribution of 33.3% of all other predictor variables. It shows that the size of the company has implications for financial distress. The results of this study align with research conducted

by Setyowati & Sari (2019) that company size has implications in determining the occurrence of financial distress. Total assets are indicators that indicate the contribution of Islamic banks to national banking. In addition, total assets are also an indicator of how big the Islamic bank is (Riauwanto & Sulastiningsih, 2019).

Based on Figure 4, the total assets development of all Islamic commercial banks in Indonesia and the size of Islamic commercial bank companies in this study show an increasing trend during 2015-2020. It represents the total assets of Islamic commercial banks experiencing growth every year. Even so, the growth of Islamic commercial bank assets experienced a slowdown in 2018-2019. Then in 2020, when the Covid-19 pandemic was taking place, the total assets of Islamic commercial banks continued to grow by 13.2%. It means that in terms of assets, Islamic commercial banks are more resistant to the crisis caused by Covid-19. Likewise, the size of the company also shows that during the Covid-19 pandemic, Islamic commercial banks could still maintain their company's existence.

The reason for the strong performance of Islamic banks not affected by the Covid-19 crisis was because they implemented a profit-sharing system that did not apply interest rates in their operational activities, such as conventional banks (Rois & Sugianto, 2021). If bank operations decline due to small assets, it can affect public trust (Riauwanto & Sulastiningsih, 2019). It will cause a decrease in third-party funds (TPF), and the worst consequence can cause a rush which indicates one of the situations when the bank is in financial distress (Riauwanto & Sulastiningsih, 2019), (Lin, 2009).

Based on Table 3, BOPO has a contribution of 11.6% of all other predictor variables. It shows that the BOPO contributes to making a financial distress prediction model. Although the contribution of the importance value given in predicting financial distress is quite small, the importance value of 6.1% is still considered important in making a predictive model with artificial neural networks (Zachari, 2016).

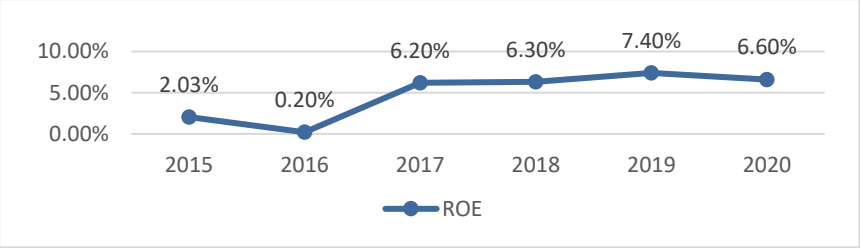


Figure 3. Graph of ROE for 2015-2020 Period
Source: Financial Services Authority (OJK), (2020)

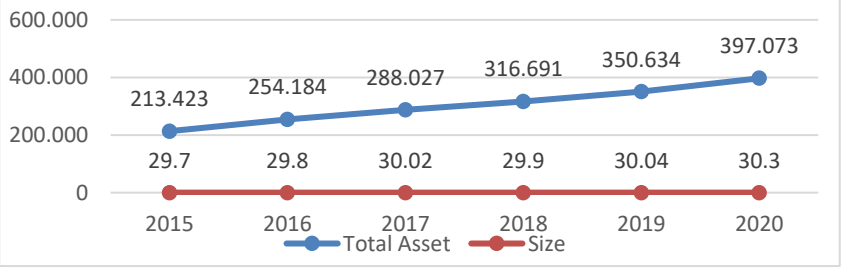


Figure 4. Graph of Total Assets and Size for 2015-2020 Period
Source: Sharia Banking Statistics (2021)

The graph of BOPO for Islamic Commercial Banks for the 2015-2020 period shows a relatively declining trend (Figure 5). Although BOPO in 2020 again increased by 6% to 94%. When viewed with an assessment of the health of Islamic banks, this represents the efficiency of Islamic commercial banks in operational activities, which is still not good where the BOPO value is > 89%. The lack of efficiency of Islamic commercial banks in minimizing their operational costs makes Islamic commercial banks have to be even more careful in managing their operating costs. The BOPO variable has significant positive implications in predicting financial distress (Theodorus & Artini, 2018; Masruri, 2020).

The current ratio as a determinant of the financial distress model contributes 6.9% of all other predictor variables and can still be considered important. This relatively small contribution is due to the high current liabilities of Islamic banks. Then if the Islamic banks are unable to pay off their current liabilities beyond their term, the current liabilities will become non-current liabilities. In addition, researchers also see that from the calculated current ratio data. There are several high current ratio values but are included in the Islamic bank category, indicating financial distress because Islamic commercial banks have a ROA value of 1.5% and vice versa. So that the high and low value of the current ratio of Islamic banks does not mean that Islamic banks can avoid financial distress. Because of this cause, the contribution of the important current ratio in making prediction models of financial distress is quite small.

In Figure 6, the current ratio of Islamic commercial banks shows a relatively increasing trend. Although in 2016, the current ratio decreased sharply. The current ratio decreased due to the large increase in current liabilities compared to current assets. Kasmir (2017) stated that the current ratio based on the company's average standard has a value of 200%. The current ratio value of Islamic commercial banks during 2016-2020 shows that it is still below the current ratio standard.

The results of this study are in line with research conducted by Saraswati (Saraswati, 2014) that the current ratio contributes to the financial distress prediction model with a contribution of 65.1% in determining the condition of financial distress from all the model variables used. In addition, Zhafirah & Majidah (Zhafirah & Majidah, 2019), Kartika & Hasanudin (2019) also show that the current ratio has significant negative implications in determining financial distress or not experiencing financial distress. If the bank can cope with short-term obligations properly and on time, it can minimize the chances of the bank experiencing financial distress. So that the higher the bank's liquidity, the bank will avoid indications of financial distress.

The COVID-19 pandemic has the smallest contribution to the financial distress of Islamic Commercial Banks. It shows that Islamic Commercial Banks still exist during the COVID-19 pandemic. During the pandemic, the main challenge faced by Islamic banks is maintaining the sustainability of their Bank operations (Azhari & Wahyudi, 2020; Effendi & Hariani, 2020; Ihsan & Hosen, 2021; Miranti et al., 2022). Despite the current economic conditions experiencing sluggishness due to the Covid-19 pandemic, Capital in Islamic Commercial Banks is still quite high (Azhari & Wahyudi, 2020). Wahyudi, (2020) stated that the performance of Islamic banks continued to show quality and aggressive performance growth

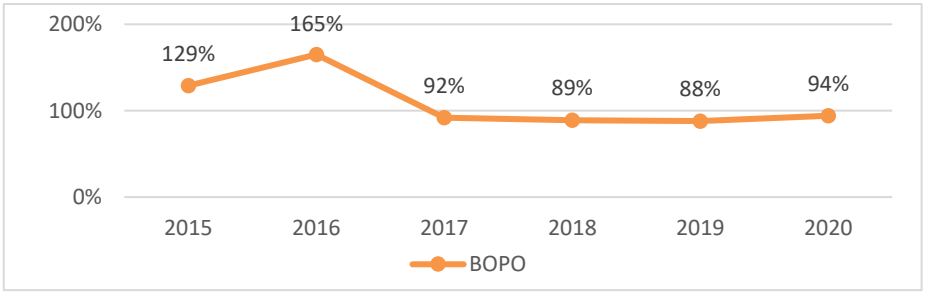


Figure 5. Graph of BOPO for 2015-2020 Period
Source: Financial Statements of Islamic Commercial Banks (2020)

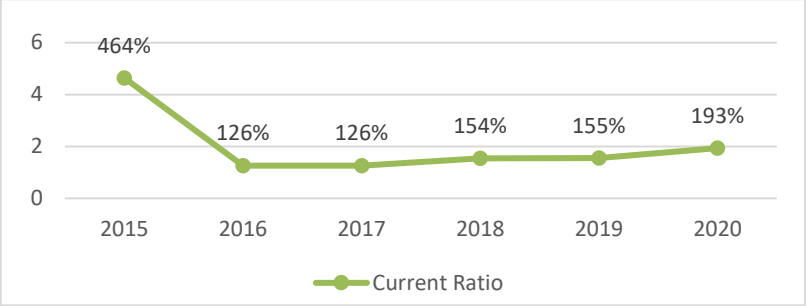


Figure 6. Graph of Current for 2015-2020 Period
Source: Financial Statements of Islamic Commercial Banks (2020)

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CONCLUSION

Based on the study's results, it can be concluded that the best financial distress prediction model was obtained in the second test with the proportion of data of 90%:10%, having the highest accuracy rate of 95%, and the AUC value of 92.5% which is included in the excellent classification. In addition, from the prediction model, the ROE value and company size have the largest contribution, then the importance of the BOPO variable, the current ratio, and the COVID-19 pandemic on financial distress at Islamic Commercial Banks in Indonesia. The artificial neural network method has the disadvantage of not being able to provide results that show a positive or negative direction relationship if you want to know the effect of the input variable on the output variable. This weakness can be anticipated by other modeling and other analytical methods. Furthermore, the company and the company's management are expected to always pay attention to their performance by measuring, evaluating, and improving their performance for the good of all parties related to the company.

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