Survival analysis of Indonesian banking companies

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ABSTRACT

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Objective – Financial distress is an undesirable condition for any company. To avoid financial distress, and improve the overall financial status of a company, an understanding of the factors affecting financial distress is necessary. This research aims to identify the determinants of banking financial distress.

Methodology/Technique – In this study, 41 banks comprised the sample, selected using purposive sampling. The survival cox proportional hazard analysis method to identify the determinant factors of survival of Indonesian Banks.

Findings –The results show that that macro indicators (inflation and economic growth) have a significant effect on the banks' financial distress. This implies that the government as a regulator must maintain the level of growth and inflation that stabilizes the economy so that banks can avoid financial distress. As for the banks' management, they have an obligation to support government policies in maintaining growth and inflation.

Novelty – The study uses the cox proportional hazard model.

Type of Paper: Empirical.

JEL Classification: G2O, G33.

Keywords: Bank; Cox Model; Financial Distress; Survival Analysis.

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1. Introduction

Banks act as an intermediate institution that contributes to economic growth and stability and must therefore be sustained as best as possible (Brown, 2003; Safiullah, 2010). Budiman, Herwany and Kristanti (2017) declared that banks play a significant role in a nation's economy and therefore they must perform optimally. Many factors affect a bank's sustainability. In addition to the company's internal problems, external factors can also have a part to play. Internal factors relate to the ability of the bank to achieve optimal resources to maintain peak performance (financial and non-financial ratios). On the other hand, external factors relate to macroeconomic conditions that cannot be controlled by the company.

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Economic conditions have a major impact on the performance of banks. If economic conditions deteriorate, banks will find it difficult to perform well. In this situation, banks may begin experiencing financial distress. There are many signs that a bank is experiencing financial difficulties. One such indicator is a low interest cost ratio of less than or a high Non-Performing Loans (NPL). A bank is a financial institution and an intermediary that receives deposits and distributes these deposits to loan activities. Because of its critical role in a country's financial and economic system, banking is a highly regulated industry. Since it is regulated, a bank is not intended to experience bankruptcy. If a bank goes bankrupt, it is feared that this will disrupt the banking system as a whole. The flow on effect of this impact includes significant bail out costs for the fallen bank and the emergence of negative sentiment and loss of confidence from investors and depositors. As a result, the country's economy can also be affected. Therefore, it is necessary to know when a company is experiencing financial difficulties, which is an initial condition of bankruptcy. By identifying the signs of financial distress early, a bank can anticipate the situation and act accordingly to avoid bankruptcy.

There are many studies on financial distress. Outside Indonesia, Cox, Kimmel and Wang (2017), Wang and Shiu (2014), Ptak-Chmielewska (2013) and Gepp and Kumar (2008) used survival analysis techniques to examine this issue. In Indonesia, only a few researchers have used survival analysis for financial distress and there is no research related to survival analysis in the banking industry, particulary in Indonesia.

Kristanti, Rahayu and Isynuwardhana (2019) used survival analysis for Small & Medium Businesses in Indonesia and the results show that working capital, inflation, and economic growth affect financial distress. While Kristanti and Isynuwardhana (2018) used survival analysis for industrial sectors in Indonesia. Kristanti and Effendi (2017) and Kristanti, Effendi, Herwany and Febrian (2014) used survival analysis for financial distress in the manufacturing industry.

From these viewpoints, it is necessary to investigate the survival analysis in the Indonesian banking industry. This research aims to identify what factors affect financial distress of banks in Indonesia. This research is expected to contribute to the development of knowledge, particularly in the field of finance and especially on the topic of financial distress. The research results are also expected to be used as an early warning system in estimating bank failures, both by investors, bank management and regulators.

This paper is organized in several parts. The introduction contains the background to the study. The literature review discusses the background theories related to survival analysis. The methodology outlines the research technique, the sampling, and the model used. The results conveys the results of the statistical data processing. The discussion elaborates on the statistical data and the paper ends with a conclusion.

2. Literature Review

Agency theory is an important consideration in a firm's performance (in this case a bank), especially in the relationship between managers and stakeholders. Agency theory explains how the motivation of the CEO affects firm performance. As stated by Donaldson and Davis (1991), managers must make a decision that fulfills the interest of the stakeholders. According to Mannasoo and Myes (2009), a bank is considered to experience financial difficulties when at least one of the following criteria occurs:

1. bankruptcy;
2. dissolution;
3. in liquidation; and
4. negative net worth.

However, Wong et. al. (2010) and Klomp (2010) state that a bank experiences financial difficulties if it shows at least one of the following criteria:

1. Non-performing loan ratio of more than 10%;
2. Saving the banking sector costs greater than 2% of GDP;

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3. The occurrence of large-scale bank nationalization; and
4. The occurrence of a running systemic bank.

In addition to these criteria, Claesens and Djankov (1999) and Kuncoro and Agustins (2017) add that a bank is considered to experience financial difficulties if they have an Interest Coverage Ratio of 1. The danger of corporate bankruptcy can be predicted by looking at financial indicators and the company's capital structure without ignoring the influence of its macroeconomic environment. A company may experience a downturn during an economic recession compared to when the economy is in prosperity. Common indicators of such economic conditions include inflation and economic growth.

Inflation is defined as a tendency of prices of goods and services to increase at certain times and in certain regions. Inflation can cause people's purchasing power to decline. If purchasing power decreases, their ability to buy goods and services will also decrease. The next result is that the company's performance will also be affected because sales may also decline. If the company's sales decline, the company can experience financial distress. Liu and Wilson (2000) argue that rising inflation will increase the cost of loan interest on corporate debt which creates difficulties and ultimately leads to bankruptcy. Thus, there is a positive influence between inflation and company distress. Kristanti et. al.'s research (2019) found that inflation has a significant positive effect on financial distress in SMEs in Indonesia.

Gross Domestic Product (GDP) reflects the economic growth of a country. GDP will have a good impact on sales and corporate profits so as to avoid distress. Therefore, there is a negative influence between GDP on SMEs distress (Jardin & Pereira, 2013) Declining economic growth is an indication of declining economic activity in the real and finance sectors, such as banks (Wulandari, et. al. 2017; Wong, et. al. 2010; Shehzad, Haan & Scholtens, 2009). Other researchers have found that there is no significant evidence of economic growth under financial pressures (Peltonen et. al., 2015; Klomp, 2010). In contrast, the research of Kristanti et. al. (2019) found evidence that economic growth has a significant positive effect on financial distress of SMEs in Indonesia.

CAR shows the adequacy of capital owned by a bank. Greater CAR will improve the health of the banks, which means the possibility of it experiencing financial difficulties will decrease. CAR has a negative influence on the possibility of banks experiencing financial difficulties (Kuncoro & Agustina, 2017). On the other hand, other research has produced different results. The positive effect of CAR on the likelihood of financial difficulties was identified by Wulandari et. al. (2017), Peltonen et. al., (2015), Messai and Gallali (2015) and Mayes and Stremmel (2014). Meanwhile, Sahut and Mili (2011) and While Musdholifah (2015) found that there is no significant effect between CAR and financial distress.

ROA and ROE reflect bank profitability. ROA is a measure of the bank's ability to generate returns on assets used, while ROE is a measure of the ability of equity to generate profits. The higher the bank's profitability, the less likely the bank will experience financial difficulties. Therefore, there is a negative effect of profitability on the probability of banks experiencing financial difficulties. Kuncoro and Agustina (2016) proved that performance has a negative influence on financial distress.

NIM stands for Net Interest Margin. This is a measure of the difference between net interest income and the value of assets channeled as credit. NIM shows the profitability of banks. A bank that has larger NIM is more efficient in using its assets to generate profits, which is expected to reduce the possibility of financial difficulties. NIM has a positive effect on financial distress of banks in Indonesia.

BOPO is the ratio to measure bank efficiency that shows how efficient operational costs are compared to operating profit. The higher the BOPO, the more inefficient the bank is. Therefore, the lower the bank's profitability, the more likely the bank's financial difficulties are. However, Africa (2016) did not find significant evidence for any of these factors.

LDR is a measure of bank liquidity. The higher the bank's LDR, the lower the bank's ability to manage liquidity. This condition will cause financial difficulties for banks. It can be concluded that there is a negative

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effect of LDR on the probability of banks to experience financial difficulties. Kuncoro and Agustina (2017) and Wulandari et. al. (2017) found no evidence of a significant influence between those 2 factors.

3. Methodology

This research constructs a financial distress prediction model for banks listed on the Indonesian Stock Exchange. Failure time is used as the dependent variable in this model, namely the length of time the bank experiences an event of financial distress. According to Kleinbaum and Klein (2012), events are designed experiences that might occur to individuals. In this research, Time to Event is the number of years starting from when a company is listed on the stock exchange until the year the company experiences an event of financial distress. A bank is included in the financial distress criteria if the NPL value is in the quarter quartile of the sample data distribution for 2 years (Baklouti, Gautier & Affes, 2016) or greater than the third quartile (Messai & Gallali, 2015). If the bank's NPL exceeds 3/4 of the industry's normal distribution, it will be difficult for banks not to experience financial difficulties.

This study uses a 10 year period, from 2009 to 2018, for banks registered on the IDX. Purposive Random Sampling was used and resulted in a sample of 41 banks. The selected sample are listed banks that have produced complete data during the research period (2009-2018). The covariates in this study are macroeconomic variables (inflation and gross domestic product) and financial ratios (third party funds-TPF, capital adequacy ratio-CAR, profit-ROA, net interest margin-NIM, cost efficiency-BOPO, Loans deposit ratio-LDR). Meanwhile non-financial ratios are also used (company age-AGE, number of branch offices-BRANCH, and company size-SIZE are used as control variables).

The CPMH is a semi-parametric model for survival analysis, which is widely used. The CPHM is a robust model and the results will closely approximate the accuracy of the parametric model (Kleinbaum & Klein, 2012). The proportional hazard model is presented as follows:

$$h_i(t) = h_0(t)\exp^{(X_1 \cdot \beta)}$$

Hazard models that contain exponential elements in the formula can be changed in log form. The Regression Model is written as follows:

$$\log h_i(t) = \alpha(t) + \beta_1 X_i + \beta_2 X_i + \beta_3 X_i + \ldots\ldots\ldots\ldots\ldots + \beta_t X_i$$

Finally, the QCHM model that was used to assess the relationship between expansive variables with survival time and to evaluate the probability of a company's survival within a given time frame is as follows:

$$\log h_i(t) = \alpha(t) + \beta_1 GDP_i + \beta_2 INF_i + \beta_3 DPKTA_i + \beta_4 CAR_i + \beta_3 ROA_i + \beta_6 NIM_i + \beta_7 BOPO_i + \beta_8 LDR_i + \beta_9 AGE_i + \beta_{10} BRANCH_i + \beta_{11} SIZE_i$$

in which $h_i(t)$ = hazard if company i entered in financial distress at time t
$\alpha(t) = \log h_0(t)$,

in which $h_0(t)$ = hazard function for individuals who have a value of 0 for all variables

4. Results and Discussion

The descriptive statistical results in Table 1 show that only CAR, ROA, and BRANCH have a standard deviation above the mean. This shows the data spread is varied. However, other variables show the opposite. Based on Table 1, in the research period, many banks were in financial distress. This is evidenced by the mean value of financial distress being 0.93. Economic growth also shows a good number with an average of

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6.08%. Likewise, inflation has a relatively controlled figure during the period, which has a mean of 6.26%. In general, banks in Indonesia have a performance below the industry average. This can be seen from the mean ROA of 1.45 with a minimum value of -2.83 and a maximum value of 5.73. The performance is typically below average, which is also reinforced by a mean NIM of 4.89 with a minimum value of 1.96 and a maximum value of 10.72.

As measured by BOPO, the Indonesian banking industry had a relatively low efficiency, with a mean of 85.63, a minimum value of 16.6 and a maximum value of 182.31. The data also shows that most banks also had a relatively large size. This is evident from the mean size of 7.06 with a minimum value of 5.12 and a maximum value of 8.65. Generally, the banks also had many offices.

Table 1.

	Minimum	Maximum	Mean	Std. Deviation
TIME	2	10	3.1462	2.2692
FD	0	1	0.9269	0.2602
GDP	5.0100	6.4900	6.0834	0.3866
INFL	3.1300	8.3800	6.2648	1.5277
DPKTA	0.1100	0.8800	0.7621	0.1319
CAR	10.0400	489.5800	32.7185	73.0873
ROA	-2.8300	5.7300	1.4539	1.6217
NIM	1.9600	10.7200	4.8954	1.8746
BOPO	16.6000	182.3100	85.6290	25.0403
LDR	50.6000	107.6600	79.8544	14.8050
AGE	11	14	4.4146	2.1630
BRANCH	4	7.004	472.2439	1134.6928
SIZE	5.12	8.65	7.0558	0.9208
N	41			

Testing the fit model with the omnibus test shows a value of -2 Log Likehood = 223,901 with a Chi-square value of 15,491 and a probability of 0.003. The test results illustrate that the model is fit. This means that there is at least one regression coefficient whose value is not equal to zero in the model.

Table 2. Omnibus Tests of Model Coefficients

-2 Log Likelihood	Overall (score)			Change From Previous Step			Change From Previous Block		
	Chi-square	df	Sig.	Chi-square	df	Sig.	Chi-square	df	Sig.
223.901	15.491	11	.161	27.809	11	.003	27.809	11	.003

The statistical test results show that only macro indicator variables have a significant effect (at alpha 5%) on the survival time of the banks experiencing financial distress. The covariate GDP ($\square\square$ of 4.515) is significant at alpha 5% and exp(B) = 91.41. These results indicate that every 1% increase in economic growth will increase the banks experiencing financial distress by 91.41. Likewise, the inflation covariate was significant at alpha 5%. The statistical results show that every 1% increase in inflation will increase the Bank's financial distress in Indonesia by 1.82.

From Table 3, the model can be arranged as follows:

$$\log h_i(t) = \alpha(t) + 4.515\ GDP_i + 0.599\ INF_i + 0.576\ DPKTA_i + 0.001\ CAR_i + 0.156\ ROA_i + 0.006\ NIM_i + 0.009\ BOPO_i - 0.007\ LDR_i - 0.371\ AGE_i + 0.328\ BRANCH_i - 0.297\ SIZE_i$$

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Table 3. Statistical Results

	B	SE	Wald	Sig.	Exp(B)
GDP	4.515	2.008	5.056	0.025	91.405
INF	0.599	0.302	3.930	0.047	1.820
DPKTA	0.576	2.488	0.054	0.817	1.778
CAR	0.001	0.004	0.113	0.737	1.001
ROA	0.156	0.276	0.316	0.574	1.168
NIM	0.006	0.153	0.002	0.968	1.006
BOPO	0.009	0.015	0.412	0.521	1.010
LDR	-0.007	0.017	0.165	0.685	0.993
AGE	-0.371	0.981	0.143	0.705	0.690
BRANCH	0.328	1.052	0.097	0.755	1.388
Size	-0.297	0.865	0.118	0.731	0.743

From the survival analysis, the banks' survival time can be seen. Figure 1 shows the hazard functions, i.e. the probability of the bank experiencing distress. From the figure it appears that the probability of not experiencing distress after 8 years is high. Hence, if Indonesian Banks are able to survive for 8 years, it is less likely for those firms to encounter financial distress. This also means those Indonesian Banks are highly likely to sustain.
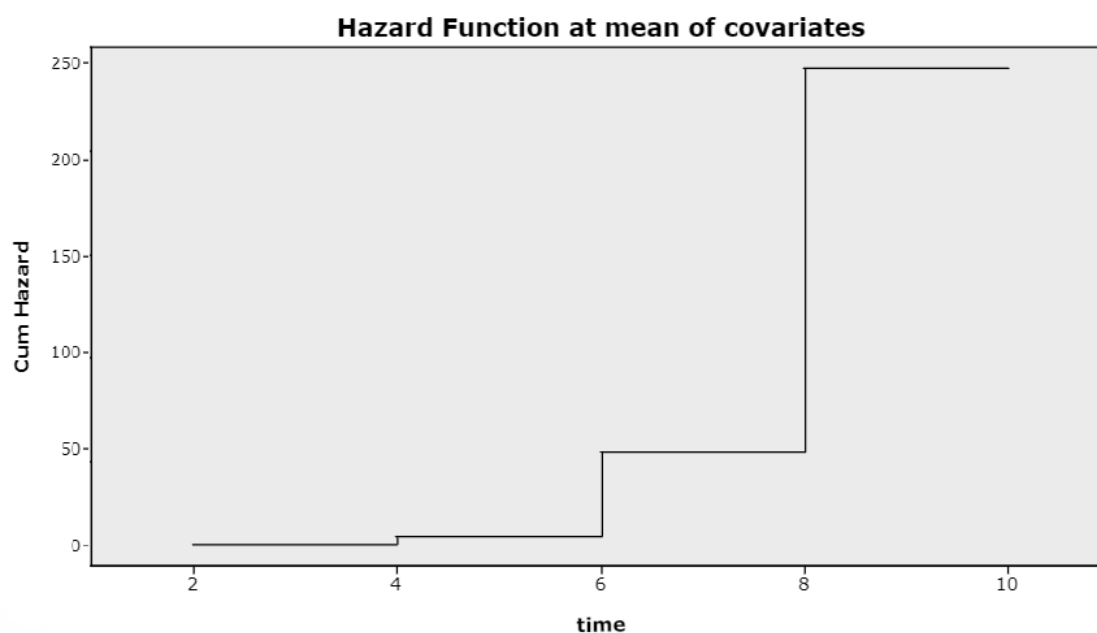

Figure 1. Hazard Functions of Distress

These results are in line with Kristanti et. al. (2019), whose research was conducted on SMEs in Indonesia and showed that economic growth and inflation have a positive effect on distress. The higher the economic growth of a country, the higher the financial distress that might occur in the banking industry. Likewise, if the country experiences high inflation, the possibility of banks experiencing financial distress will also be higher. However, the results of this research contradict research by Jardin and Pereira (2013) who found evidence that economic growth had a negative effect on financial distress. Likewise, other research did not find significant results, such as Peltonen et. al. (2015) and Klomp (2010).

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Economic growth and inflation are like a double-edged knife. High economic growth is expected by every country. However, too much growth has a negative impact that will make people more consumptive because they enjoy prosperity economically. If the people become consumptive, the demand for company products will increase. If product demand is not matched by product availability, it will eventually push prices up. If prices rise continuously over a certain period of time, inflation will emerge. If the government fails to control the inflation, it could endanger economic conditions.

Prolonged inflation will cause difficulties for all economic actors, including banks. Since demand rises and supply is limited, producers will try to find raw materials in order to meet consumer demand and this will cause the price of raw materials to rise. As a result, producers have to increase the selling price to adjust the price increase of raw materials. Furthermore, this will cause consumer demand to decline and eventually the company will experience financial difficulties. Moreover, because most companies finance their activities with loans, they will eventually begin to experience financial difficulties with the inability to pay their obligations. When many companies experience financial difficulties and even bankruptcy, banks will be affected by a lot of bad credits. In addition, banks are also becoming more careful in extending their credit so that their interest income is declining.

Of the many financial and non-financial variables, none of them have a significant effect on the bank's survival time in Indonesia. Variables such as Third Party Funds, Capital Adequacy Ratio, Return on Investment, Net Interest Margin, BOPO, Loan Deposit Ratio, Bank Age, number of branch offices, and company size have an insignificant influence on the Bank's financial distress in Indonesia. This could be related to the characteristics of the banking industry, because they are managed prudently and are highly regulated. Banks are obliged to maintain their performance on the figures that have been set and fulfill other obligations imposed by the government. This is integral to the maintenance of economic stability; if something bad happens to one bank, this will cause systemic problems in the national economy.

The results of this research indicate how important macroeconomic conditions are for bank sustainability because macro factors such as inflation and high economic growth can cause banks to experience financial distress. The economic condition cannot be directly controlled by the bank even though the banks can contribute to creating good economic conditions. The government has a duty to maintain the condition of the economy so that it moves at the targeted level. Therefore, the government must prepare conducive economic conditions so that every economic agent, including banks, can carry out their business activities properly and avoid financial distress. The government can control economic conditions by using monetary and fiscal policies. The policies may include the use of interest rate instruments; the money supply to control inflation. This is the authority of the central bank, namely Bank of Indonesia. Whereas fiscal policy is directed at budget management which to achieve the goals of community welfare and economic growth.

As for the banks, it is important that they are aware of changes in macroeconomic conditions, especially economic growth and inflation. Banks must pay particular attention to the impact of economic growth on financial distress, because an increase of economic growth by 1% will increase the probability of financial distress by 95. As banks can also play a role in inflation and economic growth, they also have an obligation to support government policies in controlling inflation and achieving expected economic growth.

5. Conclusion

Financial distress of banks in Indonesia is influenced by macro factors, namely economic growth and inflation. The rise in the two factors will partially increase the probability of banks experiencing financial distress. It is the government's duty as a regulator to always maintain economic growth and inflation at optimum figures. For banks, they must adjust their policies to reflect the policies set by the government regarding controlling the national economy. The results also show that the probability of banks experiencing financial distress after 5 years is very small. Therefore, the Bank must maintain their sustainability.

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Further research may wish to add governance variables and to use the entire population of the banking industry in Indonesia. Additionally, a comparative analysis between ASEAN countries or other developing countries would be useful.

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