

PREDICTING CORPORATE BANKRUPTCY IN INDONESIA'S TRANSPORTATION INDUSTRY

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Abstract: This study predicts the potential bankruptcy of transportation firms listed on the Indonesia Stock Exchange in 2014-2019. Three prediction models are modified Altman Z-score, Springate Score, and Zmijewski Score. This study also aims to determine the determinants of bankruptcy according to the three models. Archival techniques are used to collect data. Based on the modified Altman Z-score, 65 companies are in the potentially bankrupt category, while 39 companies are healthy. According to the model, the determinants of bankruptcy are profitability and market value. Based on the Springate model, there are 115 firms in the potentially bankrupt category and 17 companies in the healthy category. The determinants of bankruptcy are working capital, profitability, and activity. Zmijewski's model suggests that 111 firms are healthy and 21 are in the bankrupt category. It shows that profitability and solvency are significant predictors of bankruptcy. This paper is a compilation of the concerns surrounding corporate bankruptcy risk, issues that each company manager should be aware of to secure business continuity. Investors also need to consider this company's bankruptcy prediction analysis to determine investment choices. The government also needs to evaluate the policy for the transportation industry.



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The transportation sector is one of the most important contributors to economic and competitive advantage and is inseparable from almost all aspects of daily life. It supports the mobility of people, goods, services, and the development of other sectors. The sector is critical for na-

tional development. Adequate transportation facilities and infrastructure and an efficient and highly competitive transportation sector will determine Indonesia's economic growth rate in challenging global competition.

The transportation sector has faced numerous challenges in recent years. Air transportation companies are under pressure from new fare regulations on low-cost carriers (LCC) or low-cost airline ticket prices, which are expected to reduce airline

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revenue. Conventional transportation companies have shifted online, while sea transportation companies face oversupply, lower demand, operational costs, and static fares. Because of these issues, many transportation companies are at risk of bankruptcy.

In Corporate governance, bankruptcy prediction is a critical concern for management. A large number of prediction models have been developed. Artificial intelligence-based technologies are becoming increasingly crucial in predictive modeling (Jencova et al., 2021). Financial statement analysis evaluates the firm's prospects and risks and its future financial condition, including bankruptcy. It is a vital tool for obtaining information related to its financial performance (Adnan, 2000).

Bankruptcy generally begins with financial problems, especially chronic illiquidity. Illiquidity can hinder the firm from carrying out its daily operational activities. This situation is also known as financial distress. The final stage of financial distress is bankruptcy. Bankruptcy occurs because management fails to overcome the firm's financial difficulties. It is a condition where a firm can no longer run its operations (Effendi, 2018). Adnan (2000) defines bankruptcy as a firm's failure to pay its obligations. Because the firm has insufficient funds to run its operations, it cannot generate profits, hence its inability to pay its obligations. Corporate bankruptcy is when a business entity is declared bankrupt by a court decision because of its inability to pay off its obligations to two or more creditors (Garner, 2009).

Failure refers to economic or financial failure. Economic failure occurs when a firm loses revenue so that it cannot cover the costs incurred. In other words, the generated profit is smaller than the cost of capital. Economic failure can also be interpreted as when the present value of the firm's cash flow is less than its liabilities. It can be interpreted as insolvency, which occurs when a firm's cash flow is not sufficient to cover interest or principal payments at a specific time (Achim and Borlea, 2008). The definition of insolvency in bankruptcy is a negative net worth on the balance sheet, or the present value of cash flows is less than liabilities. The determinants of bankruptcy risk include rising commodity prices,

uneven negotiating power, competitiveness issues, and the macroeconomic environment (Aleksanyan and Huiban, 2016).

The bankruptcy of a firm may result from many factors, including mismanagement, economic condition, and business life cycle. Management errors are decision-making errors by the firm's management, for example, excessive business expansion, poor financial management policies, and high operating expenses. The economic condition of a country can also result in bankruptcy. For instance, a national crisis or economic downturn may drive down the prices of the firm's products. Because the firm is generating lower income, it cannot cover its high operating expenses. The business life cycle may also result in bankruptcy. A firm goes through four stages in its life cycle: birth, growth, maturity, and decline. Firms at the maturity stage or entering a downward cycle should renew their life cycle through research and development or mergers. Without such initiatives, the firm will enter a downward cycle that can lead to bankruptcy. Aleksanyan and Huiban (2016) focus on the economic and financial determinants of firm bankruptcy in the French food industry and compare them with those in other manufacturing industries.

Bankruptcy can be mitigated by analyzing accounting data in financial statements to find an early warning. The earlier signs of bankruptcy are identified, the easier it is for management to mitigate the firm's bankruptcy (Adnan, 2000). Likewise, creditors and investors can prepare their strategies before the firm becomes insolvent. The firm can use bankruptcy prediction models to predict its bankruptcy. Bankruptcy may happen when firms lack sufficient capital to cover their business obligations. It is the state in which a firm cannot pay its debts to creditors, suppliers, shareholders, state, or other parties. Bankruptcy risk is part of internal business risks caused by failure to meet timely payments (Achim and Borlea, 2008).

Bankruptcy is determined by many factors, among them firm productivity. Typically, productivity begins worsening three years before a failure. Bankruptcy, stock price volatility, and investment decisions of listed firms on the Tehran Stock Ex-

change demonstrate the urgency for techniques to assess the financial potential of a firm (Salehi and Mousavi Shiri, 2016). Analyzing financial ratios and generating patterns to anticipate bankruptcy before investing in a firm is necessary. Credit cost has a positive and significant impact on the probability of bankruptcy in controlling for firm productivity (Aleksanyan and Huiban, 2016). Some bankruptcy prediction models have been developed, one of which is the discriminant analysis model. The discriminant analysis model is a statistical technique used to predict bankruptcy and explain the relationship of variables that strongly influence bankruptcy (Gamayuni, 2009). The dependent variable is definite (nominal or nonmetric), and the independent variable is metric. There are several models of multiple discriminant analysis (MDA), such as the Altman Z-score (Edward Altman, 1968), Springate Score (Gordon L.V Springate, 1978), and Zmijewski Score (Zmijewski, 1984), and (Chan, 2016).

Altman Z-Score is the most popular bankruptcy prediction model. Early in his research, Edward Altman used financial ratios, grouped into liquidity, profitability, leverage, solvency, and activity ratios, to predict bankruptcy (Anjum and Siddiqui, 2012). In the following years, he continued to develop the Altman Z-score into the modified Altman Z-score. Based on the modified Altman Z-score, the variables used to predict bankruptcy is working capital, retained earnings, profitability, and market value. Gordon Springate developed the **Springate Model** in 1978. It is based on the Modified Altman Z-Score and uses five financial ratios to predict corporate failure (Odibi et al., 2015). The Springate Score uses the same method as Altman Z-score, MDA. The variables used by the Springate Model to predict bankruptcy are working capital/total assets, earnings before interest and tax (EBIT)/total assets, net profit before taxes/current liability, and sales/total assets (Stefko et al., 2019). **The Zmijewski Score (1984)** uses financial ratios to analyze and measure the company's leverage and liquidity performance. This model has the three best financial ratios for predicting corporate bankruptcy: profitability, leverage (debt ratio), and liquidity (Pertapan et al., 2018).

The predicting bankruptcy model that is most used is Altman Z-score, Springate Score, and Zmijewski Score. Pertapan et al. (2018) predicted the bankruptcy of PT Blue Bird Tbk in 2011-2016 using Altman Z-score, Springate Score, and Zmijewski Score. Altman Z-score shows that the firm is in the grey zone. A modified Altman Z-score to predict financial distress within the nursing home industry. This research is clustered into three categories: distressed, risk-of-financial distress, and healthy (Lord et al., 2020). The Springate Score and Zmijewski Score show that the firm is in good condition.

Balte' and Pavel (2019) predict the bankruptcy of firms in the hospitality and restaurant industry listed on the Romanian Bucharest Stock Exchange from 2007 to 2017. They use Altman Z-score, Springate Score, Taffler's model, the French Commercial Model, and B-Gheorghe Băile'teanu's model. From a sample of 26 companies, the authors find that 14 firms have a relatively high bankruptcy risk, and 12 have a relatively low bankruptcy risk. Artificial intelligence-based technologies are becoming increasingly important in the field of predictive modeling. A multi-layer neural network (MLP – Multi-Layer Perception) predicts the bankruptcy of enterprises in the Slovak Republic's electrical industries (Jencova et al., 2021).

Other studies on bankruptcy prediction also had been done. Agarwal and Patni (2019) focused on the Indian business world, specifically the Bombay stock exchange's PSUs index. The application of Altman's Z-score bankruptcy model to analyze the financial soundness of manufacturing and non-manufacturing enterprises was studied in this study. The findings show that Altman's Z-score model accurately predicts financial distress using financial ratios. Fatmawati (2012) stated that the Zmijewski models could be used to predict the company delisted during the observation period. The Altman and Springate models could not be used as predictive models for delisting. It's because the Zmijewski model prioritized debt. The more the debt, the more accurate the prediction of the company's delisting would be. Meanwhile, the Altman and Springate models placed a greater emphasis on profitability.

There have been numerous empirical studies on bankruptcy prediction that used other approaches. Stefko et al. (2019) examine electrical engineering industrial companies in the Slovak Republic using three bankruptcy prediction models: Taffler, Springate, and Creditworthy. They apply the Taffler model to predict bankruptcy in the sample firms using MDA. The results show that the firms are in good health. The Springate model shows that 27.53% of companies have experienced problems in the last two years. Salehi and Mousavi Shiri's (2016) research aims to improve current patterns for predicting bankruptcy concerning Iran's environmental situation and offer a new pattern for determining the bankruptcy of publicly traded enterprises. Smes et al. (2019) explore the impact of the non-financial company-specific and macro-economic variables. The findings revealed that non-financial variables considerably increase discriminatory performance, although macroeconomic variables do not.

The qualitative study uses the linear snowball approach for data collecting (Fauzia, 2017). The interview progressed like a snowball, with each entrepreneur being interviewed convincingly to learn more about their reasons for bankruptcy. The majority of bankruptcies were caused by capital structures that did not meet qualifications, followed by a lack of proper accounting reporting, poor management systems, a lack of professionalism, and fraudulence from internal and external factors.

Ioannou et al. (2020) focused on the performance of acquired companies in Cyprus and investigated the degrees of bankruptcy risk following acquisitions. For a five-year post-acquisition period, Altman's Z score is used to assess the levels of bankruptcy risk. The data imply that the acquired companies' bankruptcy risk had increased over time. This growth was primarily due to changes in the current (85 percent) ratio and debt ratio (69 percent) rather than profitability.

The previous research stressed predicting the enterprises' bankruptcy but did not identify the bankruptcy prediction determinant. This research analyzed the bankruptcy prediction of the transportation industry in Indonesia. Therefore, this study ana-

lyzes the potential bankruptcy of the transportation industry in Indonesia by comparing three models: modified Altman Z-score, Springate Score, and Zmijewski Score. This study also aims to verify the determinants of bankruptcy based on the three models to identify the dominant factors that impact non-bankruptcy companies. This study is beneficial to managers, investors, and the government.

This study is critical since it focuses on management, investors of the firms, and the government. This study can be put to use. This research is a compilation of corporate bankruptcy risk problems that every company manager should know to secure business continuation. Investors should also consider the company's bankruptcy prediction analysis while making investment decisions. To improve the performance of transportation businesses, the government needs to assess the policies imposed on them.

METHOD

The samples are the firms in the transportation industry listed on the Indonesia Stock Exchange (IDX) from 2014 to 2019. The firms are purposively sampled based on the two criteria: (1) the firm must have been listed on the IDX since 2014 or earlier, and (2) the firm must have published financial statements in 2014-2019. Secondary data are collected using the archival method. The data sources are archived documents in the form of annual financial reports obtained from the IDX. The prediction models used in this study are Altman Z-score, Springate Score, and Zmijewski Score. This study also aims to verify the determinants of bankruptcy based on the three models. Discriminant and logit models are used to analyze the data.

Operational Definitions and Variable Measurements. In this section, the operational definitions of variables and the measurements of each variable will be presented. This section explained how to measure variables. The variable consists of dependent and independent variables based on the modified Altman Z-score, Springate Score, and Zmijewski Score.

a. Dependent Variable

The dependent variable of this study is firm bankruptcy, measured as a dummy variable, where 0 is for firms categorized as bankrupt and 1 otherwise. The dummy variable is a qualitative variable transformed into a quantitative one on a nominal scale (Ghozali, 2018). A firm is said to be bankrupt if its score passes a cut-off point based on the modified Altman Z-score, Springate Score, and Zmijewski Score.

The **Modified Altman Z-Score** model (Siddiqui, 2012) is expressed as:

$$Z\text{-score} = 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4$$

where:

X1 = Working capital/total assets

X2 = Retained earnings/total assets

X3 = EBIT/total assets

X4 = Market value of equity/book value of debt

The cut-off value in the modified Altman Z-score model is as follows:

$Z < 1.10$ means that the firm is likely heading towards bankruptcy; $1.10 < Z < 2.60$ means that the company is in a grey area or its condition is uncertain; and $Z > 2.60$ means that the company is doing well (Altman, 1968)..

The **Springate Model** (Effendi, 2018) uses the following formula:

$$S\text{-score} = 1.03X_1 + 3.07X_2 + 0.66X_3 + 0.4X_4$$

where:

X1 = Working capital/total assets

X2 = EBIT/total assets

X3 = Net profit before taxes/current liability

X4 = Sales/total assets

A firm is likely facing bankruptcy if the S-score is less than 0.862; otherwise, it is said to be healthy.

The **Zmijewski Model** (Zmijewski, 1984) uses the following formula:

$$X\text{-score} = -4.3 - 4.5X_1 + 5.7X_2 + 0.004X_3$$

where:

X1 = Return on Asset

X2 = Debt ratio

X3 = Current ratio

A firm will likely face bankruptcy if $X > 0$. If $X < 0$, the firm is in good condition.

b. Independent Variable

The independent variables are measured using the modified Altman Z-score, Springate Score, and Zmijewski Score.

Modified Altman Z-Score (Odibi et al., 2015):

1) Working capital (X1)

The working capital ratio measures the company's ability to meet its short-term obligations. It is calculated as the ratio of net working capital to total assets (Brigham, 2019).

2) Retained earnings (X2)

This ratio measures the firm's ability to generate retained earnings from its total assets. *Retained earnings* are profits derived from the company's operating results that are not distributed to shareholders in dividends (Brigham, 2019). They are measured as retained earnings/total assets.

3) Profitability (X3)

According to Brigham (2019), this ratio measures the company's ability to generate EBIT from all its assets. It is expressed as EBIT divided by total assets.

4) Market value (X4)

This ratio measures the firm's ability to meet its long-term obligations from the market value of equity (Brigham, 2019). It is measured as the ratio of the market value of equity to total liabilities.

Based on the **Springate Model**, the variables used to predict bankruptcy are:

1) Working capital to total assets (X1)

Brigham (2019) stated that this ratio measures the company's ability to meet its short-term

obligations. It is measured as the ratio of working capital to total assets.

- 2) Profitability (X2)
Brigham (2019) stated that this ratio measures the company's ability to generate EBIT from all its assets. The formula is EBIT divided by total assets.
- 3) Solvency (X3)
Ben et al. (2015) stated that this ratio measures a firm's ability to meet its short-term debt using profit before tax. The formula is the ratio of net profit before tax to current liability.
- 4) Activity (X4)
This ratio measures the company's level of success in using all its assets to create optimal sales and measures the level of efficiency of the firm in using all its assets (Brigham, 2019). The formula used is sales to total assets.

Based on the **Zmijewski Model**, the variables that determine bankruptcy are:

- 1) Profitability (X1)
This ratio measures the company's ability to generate profits (Brigham, 2019). The formula is the return on assets.
- 2) Solvency (X2)
The ratio describes the company's capital structure, measured by debt ratio, namely total debt over total assets (Brigham, 2019).
- 3) Liquidity (X3)
This ratio measures company liquidity and how much current debt is guaranteed by its current assets. If the resulting value is < 1, its current assets cannot guarantee current debt (Brigham, 2019). It is measured as current assets over current liabilities.

Data Analysis Technique

This study aims to determine the variables that predict bankruptcy using three models. The models used in this study are Altman Z-score, Springate Score, and Zmijewski Score. The first stage of this study identifies transportation firms at risk of bankruptcy. This bankruptcy prediction analysis uses three methods: modified Altman Z-score, Springate

Score, and Zmijewski Score. In the second stage, this study examines the factors determining bankruptcy based on Altman Z-Score, Springate Score, and Zmijewski Score.

The data analysis technique used in this study is logistic regression analysis, which describes the relationship between independent variables and a categorical or non-parametric dependent variable (Ghozali, 2018). The dependent variable is computed using the modified Altman Z-score, Springate Score, and Zmijewski Score. Data analysis is carried out using the IBM SPSS version 25 software. The logistic regression equations are expressed as follows:

1. Modified Altman Z-Score Model

Description:

Logit (Y) = log {(Y/(1-Y))}: Probability of company

$$Logit(Y) = \log\left\{\left(\frac{Y}{1-Y}\right)\right\}$$

$$= \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4$$

going bankrupt α : constant $\beta_1, \beta_2, \beta_3$: Regression coefficient

- X1: Working capital
- X2: Retained earnings
- X3: Profitability
- X4: Market Value

2. Springate Model

Description:

Logit (Y) = log {(Y/(1-Y))}: Probability of company

$$Logit(Y) = \log\left\{\left(\frac{Y}{1-Y}\right)\right\}$$

$$= \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4$$

going bankrupt

- α : constant
- $\beta_1, \beta_2, \beta_3$: Regression Coefficient
- X1: Working capital
- X2: Profitability
- X3: Liquidity
- X4: Activities

3. Zmijewski Model

$$\begin{aligned}
 \text{Logit}(Y) &= \log\left\{\left(\frac{Y}{1-Y}\right)\right\} \\
 &= \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3
 \end{aligned}$$

Description:

Logit (Y)=log {(Y/(1-Y))}: Probability of company going bankrupt

α: constant

β1, β2, β3: Regression Coefficient

X1: Profitability

X2: Solvency

X3: Liquidity

RESULTS

The transportation sector supports the economic activities of a country. Inadequate transportation would result in the poor distribution of goods and services. Consequently, economic growth becomes slow. Transportation firms are broadly divided into land, sea, and air. The sector generally provides two types of services: the transportation of passengers and goods.

The results of the bankruptcy prediction analysis of transportation firms in Indonesia using the modified Altman Z-score, Springate, and Zmijewski models are as follows:

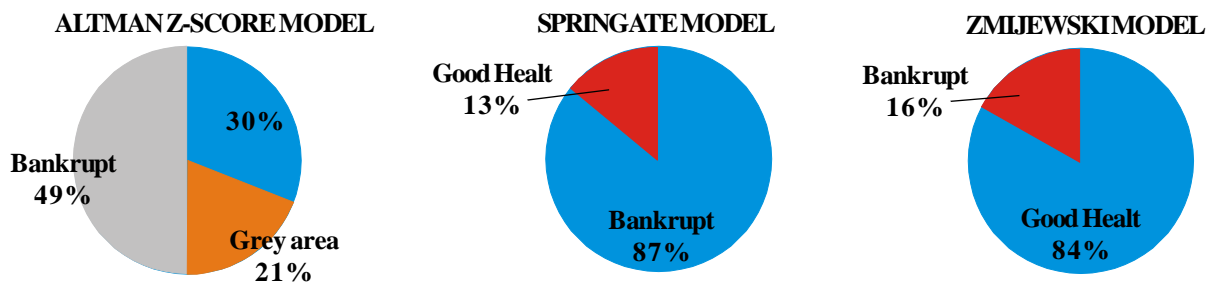


Figure 1. Identification of Potential Bankruptcy Transportation Firms in Indonesia

Table 1. Descriptive Statistics of Modified Altman Z-Score, Springate Score, and Zmijewski Score

Independent Variable	Minimum	Maximum	Mean	Std.Deviations
Altman Z-score Model				
Working capital	-5.70	.32	-.1988	.83973
Retained earnings	-80.06	.84	-3.3041	12.9760
Profitability	-.55	1.12	.0303	.1715
Market value	.06	8.58	1.6782	1.80403
Springate model				
Working capital	-5.70	.32	-.1556	.75058
Profitability	-.55	1.12	.0379	.15831
Liquidity	-1.91	7.61	.0548	.90379
Activity	0.001	4.78	.4867	.58153
Zmijewski model				
Profitability	-.66	2.19	.0127	.27643
Solvency	.07	8.31	.6733	1.03097
Liquidity	.002	6.04	1.2328	1.23440

Figure 1 shows that 49% of firms in the Indonesian transportation industry in 2014-2019 are at risk of bankruptcy based on a modified Altman Z-score. Around 21% of firms are in the grey or uncertain area, and 30% are in a healthy state. The Springate model shows that 87% are at risk of bankruptcy, and 13% are in a healthy state. Based on the Zmijewski model, 16% of the companies are predicted to face bankruptcy, while 84% are in good health.

Descriptive Statistics

Table 1 shows the descriptive statistics of the three models. Some companies have a negative net working capital, which means their current debt exceeds their current assets. Retained earnings are also negative, indicating that the debt exceeds the retained earnings, but the common share is still higher

than the debt. The average total debt is also < 1 , showing that the total debt is still lower than the total asset. Some firms experience losses, as can be seen from the negative profitability. The average activity is also still low. Total asset turnover is less than one.

Analysis of Determinants of Bankruptcy

According to the modified Altman Z-score, table 2 shows that retained earnings and market value are the most important determinants of firm health. However, working capital and profitability are not significant predictors. The Springate model shows that working capital, liquidity, and activity determine firm health. The Zmijewski model shows that profitability and solvency are substantial determinants of firm health. Liquidity is not significantly related to firm health.

Table 2. Variables in The Modified Altman Z-Score, Springate, and Zmijewski Models

Modified Altman Z-Score			Springate Model			Zmijewski Model		
Variable	β	Sig.	Variable	β	Sig.	Variable	β	Sig.
Working Capital	1.452	.730	Working capital	16.177	.038	Profitability	34.672	.011
Retained earnings	7.116	.003	Profitability	0.129	0.085	Solvency	-33.000	.004
Profitability	-2.654	.759	Liquidity	7.272	.001	Liquidity	-.661	.514
Market value	3.445	.014	Activity	11.450	.008			

DISCUSSION

Table 2 shows the dissimilar results of each bankruptcy prediction model. There is a clear difference between the Zmijewski model and the other models. On the other hand, the differences between the modified Altman Z-score and Springate Score are minor. Based on the modified Altman Z-score results, almost half of the transportation companies (49%) in 2014-2019 face bankruptcy, while 30% are in the healthy category. Meanwhile, according to the Springate model, 87% of companies face bankruptcy, and 17% are in the healthy category. The difference between the modified Altman Z-score and Springate Score is because the former divides firms into a healthy, a grey area, and bankrupt.

In contrast, the latter only has two categories, healthy and bankrupt. In addition, the variables and cut-off values of the two models are also different. Zmijewski's model focuses on corporate leverage, as seen from the two variables of liquidity and solvency. The first concerns short-term debt, and the second is long-term debt. The higher the short-term and long-term debts, the higher the company's bankruptcy risk. The modified Altman Z-score model and Springate model predict that most transportation firms in Indonesia are facing bankruptcy. In contrast, the Zmijewski model shows that most firms are in good health. The significance of each variable in the bankruptcy prediction model is discussed in a more detailed discussion.

Determinants of Bankruptcy Based on The Modified Altman Z-score Model

The results indicate that working capital does not predict bankruptcy. The inability of a firm to pay its current debt is unrelated to its bankruptcy. According to Altman in Batchelor (2018), the ratio of networking capital to total assets measures efficiency and short-term financial health. The company can still increase its current assets by selling fixed assets, obtaining debt, or increasing its equity. This finding confirms Widiyawati et al. (2015) and contradicts Odibi et al. (2015), who find that networking capital to total assets significantly affects non-bankrupt and bankrupt firms. In this study, the sample firms are from the transportation sector; generally, they have relatively low current assets. Supposing the net working capital to total assets is small or negative means that the firm has difficulty guaranteeing its current liabilities with its existing assets. In the long term, it faces the risk of bankruptcy.

Retained earnings are inversely related to bankruptcy. Retained earnings are the proportion of sources of equity funds originating from the company's internal sources. The results suggest that firms with a higher internal funding source do not face the risk of bankruptcy. Firms with good financial conditions tend to have stable or increasing retained earnings. The amount of retained earnings is determined by the company's net income. A lower ratio indicates that the company is in the early stages of financial distress. If this condition continues, the company can be bankrupt. Odibi et al. (2015) showed that a low ratio of retained earnings to total assets has a strong positive relationship to bankruptcy. A higher ratio of retained earnings to total assets means that the firm has a lower likelihood of bankruptcy.

Profitability does not significantly predict bankruptcy. Profits are not significantly correlated to firm bankruptcy. Based on the accrual basis, income and expenses on credit may determine operating profit. Income on credit allows accounting for uncollectible receivables, so it is not a significant predictor of firm bankruptcy. The results contradict the findings of Odibi et al. (2015), who found a positive correla-

tion between the ratio of EBIT to total assets and non-bankrupt companies.

Market value is inversely related to bankruptcy. The market value of a firm tends to fluctuate every year, while the book value of debt tends to be constant. The fluctuating market value of equity can be caused by the fluctuating stock market prices of the firms. Investors will buy the shares of firms with a good financial condition, causing their prices to increase. If a firm is in poor condition, investors release their shares, causing their market value to fall. These results are similar to Odibi et al. (2015). They find that the ratio of the market value of equity to book value has a strong positive relationship with non-bankrupt companies.

Determinants of Bankruptcy Based on The Springate Model

Working capital reflects a firm's liquidity, and it inversely relates to non-bankruptcy. Companies with a high level of liquidity tend not to go bankrupt and vice versa. Higher liquidity requires the companies to pay their current liabilities when they are due (Poongavanam and Babu, 2012). In addition, the company also uses working capital for its daily operating activities. A low or negative net working capital indicates that the company cannot fully run its operating activities. On average, transportation firms have a negative net working capital, which means their current assets cannot cover their liabilities. Therefore, it is not surprising that 87% of transportation firms in Indonesia are facing bankruptcy, according to the Springate model. The results are similar to Ben (2015), who shows that the ratio of working capital to total assets is a significant predictor of bankruptcy.

Profitability has an inverse relationship with bankruptcy. The ratio of EBIT to total assets indicates the company's ability to generate an operating profit. The higher the operating profit, the lower the likelihood of a firm going bankrupt. Companies with high operating profits can pay interest and taxes. They have additional capital that can be used to invest in other ventures. A firm with a low ratio of EBIT to total assets shows that it can only generate a small operating profit from its assets, so it is likely

to experience financial distress (Widiyawati et al., 2015). Therefore, a smaller profitability ratio means a higher risk of bankruptcy. The results are consistent with Odibi et al. (2015), who find that the ratio of EBIT to total assets has a strong positive effect on non-bankrupt and bankrupt firms.

Liquidity is related to bankruptcy because the ratio of net profit before tax to current liabilities is consistent with the results of the Springate model. The average net profit ratio before tax to current liabilities is 0.0548, which means profit before taxes can only cover 5.48% of the current debt. The average transportation firm cannot cover its current debt with pre-tax profit. The results are similar to Ben (2015), who shows that the ratio is positively related to bankruptcy. The net profit ratio before tax to current liabilities measures how the company can cover all its liabilities using profit before tax. A higher ratio indicates that the company can cover its existing debt using profit before taxes. On the other hand, if this ratio is low or negative, it cannot cover its current debt with profit before taxes. If this happens for an extended period, it can bring the company into financial distress and bankruptcy.

As measured by sales to total assets, activities are inversely related to bankruptcy. The sale to total assets ratio is an indicator of the company's success in running its operations. If the company generates small or even negative sales, the company is not successful in running its operations. Firms in this industry tend to record high sales. The results are similar to Ben (2015), who shows that the ratio is related to bankruptcy.

Sales to total assets are also used to measure the company's activities. This ratio provides information on the company's ability to generate sales based on its assets. A higher ratio indicates that the company effectively uses all its assets and has a lower likelihood of bankruptcy.

Determinants of Bankruptcy Based on the Zmijewski Model

Profitability is inversely related to bankruptcy. Return on assets shows the company's ability to generate profits from its assets. This ratio measures

the company's ability to efficiently manage and use assets to earn a net profit (Avenhuis, 2013). Considering that the sample is transportation firms with substantial fixed assets and investment costs, the net profit to total asset ratio is expected to be small. The maximum value of return on assets in this industry is 2.19. The minimum value is 0.66, and the average is 0.0127. The higher the company's profitability, the lower its likelihood of bankruptcy.

Solvency is a significant predictor of bankruptcy. Firms with low debt tend not to go bankrupt, and vice versa. The results are similar to Bernardin and Tifani (2019), who indicates that leverage (debt ratio) significantly predicts financial distress. There is a trade-off between debt and risk. A high debt to asset ratio will increase the company's profitability. At the same time, if the firm cannot pay the interest and principal of the debt, the firm is at risk of insolvency.

The current ratio does not predict bankruptcy. The current ratio looks at the ability of the company's current assets to meet its current liabilities or short-term obligations. If this ratio is low in the long term, it will affect the company's solvency. The analysis shows that the current ratio is not a determinant of bankruptcy. Firms that cannot meet their short-term obligations can still do so by selling their fixed assets. Thus, it is uncertain that firms with liquidity issues can go bankrupt. Larasati and Wahyudin (2020) also shown that liquidity has no effect on financial distress risk.

CONCLUSIONS

This study looked at the likelihood of the transportation business in Indonesia going bankrupt. This study compares three models to assess the bankruptcy prediction of the transportation industry in Indonesia. The models are modified Altman Z-score, Springate Score, and Zmijewski Score. This research also intends to validate the determinants of non-bankruptcy business based on the three models. The modified Altman Z-score model categorizes 65 companies into the bankruptcy category and 39 companies into the healthy category. Based on the modified Altman Z-score, the variables related

to bankruptcy business are retained earnings and market value. Meanwhile, working capital and profitability are not related to bankruptcy business. The Springate model predicts 115 companies to face bankruptcy and 17 companies to be healthy. Net working capital, liquidity, and activity are significant determinants of bankruptcy. Zmijewski's model suggests that 111 companies are in the healthy category, and 21 firms are in the bankrupt category. Profitability and solvency significantly predict bankruptcy. However, the current ratio does not predict bankruptcy.

IMPLICATIONS

This research is very important to pay attention to managers, investors, and the government. This research can compile issues related to corporate bankruptcy risk that every company manager should be aware of to ensure business continuity. Investors also need to consider this company's bankruptcy prediction analysis to determine investment choices. The government needs to evaluate the policies imposed on transportation companies to improve transportation companies performance.

LIMITATIONS

This study examines the history of financial analysis and the most extensively used models. This study analyzes predictions of bankruptcy of transportation companies in Indonesia by comparing three bankruptcy assessment models: the Modified Altman Z-Score Model, Springate, and Zmijewski. This study didn't compare another prediction of the bankruptcy model. This research analyzed the potential bankruptcy of firms in the transportation industry listed on the Indonesia Stock Exchange from 2014 to 2019. This study did not examine other predictions of bankruptcy models like Trustworthiness Index IN99, Trustworthiness Index IN05, Quicktest, Taffler Model, Credibility Index, Index of Bonity, or Balance Analysis I.

RECOMMENDATIONS

Based on the results, transportation companies are experiencing financial difficulties. Companies

need to increase sales and cost efficiency, considering the average level of company profits is low. The government also needs to review the policy that protects the transportation industry. The regulations on the low-cost carrier (LCC) or low-cost airline ticket prices make the companies can not increase their profit and retain earnings. The company needs to review the company's funding policy. Transportation companies have a relatively high level of debt, both short-term debt and long-term debt. Even some companies tend to have negative equity. This study emphasizes analyzing bankruptcy predictions based on three bankruptcy prediction methods and has not compared with all bankruptcy prediction methods. Therefore, the following research can compare bankruptcy and other prediction methods.

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