International Journal of Research on Finance & Business (IJRFB) ISSN: 3046-4609 (Online)
Vol. 7, No 1, November 2025, pp. 20-39 ISSN: 3032-7806 (Print)

COMPARISON OF MODEL ACCURACY LEVELS BETWEEN ALTMAN Z SCORE AND ZMIJEWSKI IN PREDICTING FINANCIAL DISTRESS IN COMPANIES WITH SPECIAL NOTATION IN INDONESIA

Farras Muhammad Lendra [1], Yeney Widya Prihatiningtias [2]

[1.2] *Accounting Department, Faculty of Economics and Business, Brawijaya University, Indonesia*

Abstract. The phenomenon of financial distress in public companies is an important concern for investors and stakeholders. The Indonesia Stock Exchange (IDX) applies a special notation as an indicator for companies experiencing financial problems. To predict financial distress, there are several commonly used models, including Altman Z-Score and Zmijewski X-Score. This study aims to determine if there is a significant difference in the value of the prediction results of the Altman and Zmijewski models and to determine which Altman or Zmijewski model is more accurate in predicting financial distress in companies with special notations in Indonesia. This research uses a quantitative approach with a comparative method. The research sample consists of 48 companies with a total of 144 observations. Data analysis was carried out by descriptive statistical test, Mann-Whitney difference test, and prediction model accuracy test. The results showed that there was a significant difference between the predicted values of the two models. The research results show that the Altman model has a higher accuracy rate of 73.61% than the Zmijewski model which only has an accuracy of 68.75%. This finding supports the signaling theory that financial performance can continue to get worse and worse and can indicate that the company gets a special notation, thus influencing investor decisions and can lead to bankruptcy. Thus, the Altman model is more recommended for investors in evaluating the risk of corporate financial distress.

Keywords: Altman Z-Score, Financial Distress, Model Accuracy, Notation, Zmijewski X-Score.

I. INTRODUCTION

Economic and business aspects have experienced significant developments in recent years. Companies now have various methods for obtaining funding or capital, one of which is through the capital market. The capital market is where transactions for transferring ownership of debt securities (bonds) and company shares occur for the medium to long term (Alawi, 2019). Essentially, there are two main parties in the capital market: the company, which requires capital, often known as the issuer, and the party that makes the capital deposit, known as the investor. Companies generally raise funds in the capital market for operational purposes such as purchasing assets, paying suppliers, or for other purposes such as acquiring other companies and expanding into new business lines (Sasikirono et al., 2023). Investors generally invest to expect returns, which can be in the form of dividends and/or capital gains. Based on

their investment decisions, investors are divided into two categories: rational and irrational. Rational investors are those who make decisions based on knowledge of circulating information, returns, and investment risks. Meanwhile, irrational investors are investors whose investment decisions are influenced by psychological and demographic factors (Mahmood et al., 2024).

When making investments, investors can consider information related to fundamental and technical factors in determining their investment plans, both long-term and short-term. The fundamental difference between these two approaches lies in the data sources used and how they are interpreted. Technical analysis relies more on direct market data, while fundamental analysis utilizes data from financial reports and external factors. External factors that can influence a company's condition include Gross Domestic Product (GDP) and consumer behavior. It has been found that a country's economic growth is directly proportional to increased purchasing power, and positive consumer attitudes also impact the company's progress (Ejiro U. Osiobe, 2020). In many cases, investors and traders use a combination of these two approaches to gain a more comprehensive understanding of market conditions and investment prospects. Investors should be able to rationally assess a company's financial capabilities, specifically whether the company is experiencing financial distress, to estimate its viability and maximize potential investment returns. Conversely, companies are required to have good corporate governance to ensure continued operation (going concern) regardless of the challenges and obstacles they face.

A report released by the Indonesian Central Securities Depository (KSEI) shows that the number of capital market investors continues to experience significant growth. In 2021, there were 7.48 million investors registered on the Indonesia Stock Exchange, a 92% increase from 3.9 million the previous year (Pahlevi, 2022). Meanwhile, in terms of companies or issuers, in 2021, 54 companies conducted IPOs on the Indonesia Stock Exchange, with a total issuance value of IDR 62.61 trillion. This is a more than tenfold increase compared to the previous year's issuance value of only IDR 5.58 trillion, and it is even claimed that in terms of the number of companies conducting IPOs, it is among the highest in ASEAN (Nur Qolbi, 2024). This high growth rate, both in investor growth and in company IPOs, reflects investor confidence in obtaining competitive returns and corporate confidence in raising funding through the capital market.

There are several company classifications in the capital market, including financial services, property, agriculture, mining, industry, and construction. As a form of protection offered by the Indonesia Stock Exchange (IDX) to potential investors, the I-Suite program provides a special designation or notation to troubled listed companies, as outlined in Circular Letter SE-00001/BEI/12-2018.

These programs and circulars can provide comfort and information to investors in the capital market before making transactions. Furthermore, companies receiving these notations indicate they are experiencing problematic conditions, and these notations can be revoked once the company has improved its performance and addressed its issues. Specific notations such as B (filing for bankruptcy), M (filing for debt repayment suspension), E (negative equity), Y (not holding a GMS), and S (not reporting profits) can increase the risk of bankruptcy (Hudaya et al., 2024). According to the official website of the Indonesia Stock Exchange, 96 companies had received these notations as of the end of November 2024.

Financial distress is an early indication of bankruptcy. In other words, financial distress is a condition where a company fails to manage its finances optimally, which, if prolonged, can lead to the risk of insolvency (Gupita et al., 2020; Hutauruk et al., 2021; Listyarini, 2020). Predicting bankruptcy is crucial because it allows company management to take corrective action on company policies, including improving financial planning, profitability, liquidity, and solvency (Zori č ák et al., 2020). Company owners and other stakeholders naturally expect the company to be sustainable, or to continue operating in the long term. Essentially, there are two main aspects that need to be considered to maintain a company's going concern aspect: profitability and cash flow (Susanto & Handoyo, 2023).

Profitability is vital for a company because it increases its value and enables it to continue growing. Beyond profit, cash flow, particularly maintaining a positive cash flow, plays a crucial role because it is closely linked to daily operational activities, such as supplier payments, employee salaries, tax obligations, and so on. A company's failure to manage its profits and cash flow can have fatal consequences for its long-term viability. The importance of profit and cash flow management, coupled with the existence of other external factors, such as legal and licensing issues, increases in tax rates, duties, and excise duties on certain raw materials, shifts in community values and lifestyles, supply chain and security disruptions, and even the occurrence of a pandemic, requires effective mitigation. Failure to address these issues could lead a company into financial distress.

By understanding financial distress as discussed previously, it can be said that it falls under the fundamental analysis method. As part of fundamental analysis, understanding a company's financial condition and the accuracy of its financial distress can help investors make better investment decisions. Using financial statement analysis can be an option to identify whether or not a company is experiencing financial difficulties. Several alternative calculation models exist to estimate a company's financial distress. In estimating financial distress, several types of calculation models are often used, including the Altman Z-score and Zmijewski models. These calculation models utilize information contained in the financial statements to produce values that can describe the company's financial condition. The Altman model uses several variables: working capital to total assets, retained earnings to total assets, earnings before interest and taxes to total assets, book value of equity to book value of total debt, and sales to total assets. Meanwhile, the Zmijewski model uses variables: net income to total assets, liabilities to total assets, and current assets to current liabilities.

The Altman and Zmijewski models are calculation models frequently used by researchers to predict financial distress. The Altman model can predict good financial condition and avoid bankruptcy. Existing research shows that the Altman model is able to provide the most accurate indication of financial condition in companies listed in Indonesia (Anugrah, 2019). Another comparison between the empirical model and the Altman model in predicting financial distress in companies listed on the Indonesia Stock Exchange (IDX) in 2016-2020. The results of this study showed that the Altman model had a higher accuracy rate than the empirical model with an accuracy rate of 96.2% (Fadhli & Arifin, 2022). Furthermore, another study compared the Altman, Springate, and Zmijewski models in predicting financial distress in 28 manufacturing companies listed on the Indonesia Stock Exchange in 2011-2014. The results of this study showed that the Zmijewski model was the most accurate model in predicting financial distress with an accuracy rate of 100% (Listyarini, 2020). In line with this, a

comparison of bankruptcy prediction models showed that the highest level of accuracy was achieved by the Zmijewski model with an accuracy level of 84% (Farha, 2021).

Previous studies have yielded differing results regarding the most accurate model for estimating financial distress. Therefore, researchers will combine the Altman and Zmijewski models to estimate financial distress in companies listed on the Indonesia Stock Exchange, which have specific notations related to financial performance. They aim to determine whether the use of different variables in these two models significantly differentiates the accuracy of predicting financial distress. Both models, the Altman Z-Score and the Zmijewski, were chosen to analyze the accuracy of corporate financial distress in this study because they are commonly used in the financial world to assess financial conditions. Both models are effective in predicting corporate financial distress using historical financial data. Furthermore, the data required to calculate the Z-scores for these two models is widely available, enabling broad application across various sectors. By considering various important aspects of a company's financial health, both the Altman Z-Score and the Zmijewski can provide strong indications of the likelihood of financial distress a company may face. Therefore, the use of the Altman Z-Score and Zmijewski to analyze the accuracy of financial distress in companies is expected to provide insights for Indonesian investors to pay more attention to specific notations for troubled issuers. This will help them manage and make smarter investment decisions for the success of their portfolios.

II. LITERATURE REVIEW

A. Signal Theory

In this study, the theoretical basis used is signaling theory. Signaling theory is a relevant theoretical basis for this study because it explains how to reduce information asymmetry between company management and external parties, such as investors and creditors, through signals sent by the company. Based on the signaling theory perspective proposed by Spence (1973), it explains that the sender (the owner of the information) provides a signal in the form of information that reflects the condition of a company to the recipient (investor). Signaling theory explains all actions taken by a company's management, which are expressed as indications for investors regarding how management views the company's prospects. The positive aspect of this theory is that companies that provide information that produces positive results will certainly outperform companies that provide less favorable information. If a financial report reflects a positive signal (good news), investors will be interested in taking further action. Conversely, if a financial report reflects a negative signal (bad news), investors will turn to other companies that reflect a positive signal (good news). In this case, if a company experiences financial distress, it will be reflected in the company's financial report, so investors will immediately respond to the financial distress.

Signaling theory is a suitable theoretical foundation for this research because it explains how asymmetric information between company management and external parties, such as investors and creditors, can be reduced through signals sent by the company. In the context of this research, the financial ratios used in the Altman Z-Score and Zmijewski models serve as signals reflecting the company's financial condition. By analyzing these signals, external parties can more accurately identify signs of financial distress. Therefore, signaling theory provides a relevant framework for evaluating the effectiveness of financial distress prediction models in conveying information important for financial decision-making.

B. Financial Distress

Financial distress is a situation where a company experiences financial difficulties, characterized by insufficient cash flow to meet both long-term and short-term obligations, requiring the company to make adjustments to its activities (Yodi Pratama et al., 2022). When financial difficulties occur, a company's inability to meet its obligations indicates a lack of working capital. This lack of working capital can be caused by several factors, such as current liabilities and excessively high operating costs. If a company experiences financial distress and no further corrective action is taken, it can go bankrupt (Hutauruk et al., 2021).

There are many factors that can be used as a benchmark for determining whether a company is experiencing financial distress. The following are factors that can influence financial distress (Fadhli & Arifin, 2022):

1. Liquidity
   The liquidity ratio reflects a company's ability to pay short-term liabilities using current assets. If a company is able to meet its short-term obligations on time, it is considered liquid, meaning it can avoid financial distress.
2. Leverage
   The leverage ratio measures the ability of a company's assets to be financed by debt. High leverage indicates that the company has more debt than assets, thus increasing the risk of future default.
3. Profitability
   Profitability ratios are used to measure a company's ability to generate profits. High profitability indicates a company's ability to avoid financial distress.
4. Activity
   Activity ratios are used to measure a company's effectiveness in utilizing its resources. If a company is optimally utilizing its assets, it can be concluded that the company is far from financial distress.
5. Sales Growth
   The growth ratio is a measure of a company's growth rate over time. If a company's sales growth continues to increase, it can be concluded that the company is far from financial distress.
6. Cash flow
   Cash flow is the change in cash over time within a given period. The cash flow statement provides information on cash receipts and disbursements during a specific period. If a company's cash flow reflects good condition and is able to carry out its operational activities, then the company is far from financial distress.
7. Company Size
   Company size is an internal factor that reflects the total assets a company holds. If a company has significant profit potential, the likelihood of experiencing financial distress is lower. Three models exist for predicting bankruptcy: the Altman Z-Score model, the Zmijewski model, and the Springate model. In this study, the author will compare the Altman Z-Score model with the Zmijewski model.

C. Altman Z-Score

The Altman Z-Score model is a bankruptcy prediction model invented by Edward I. Altman in 1968. The Z-Score model is a model that pioneered the multi-discriminant analysis model and has been widely used throughout the world. The Altman prediction model is the best

bankruptcy prediction model among the three bankruptcy prediction models, namely the Zmijewski model and the Springate model (Anugrah, 2019). The Z-Score model aims to find the Z value, the Z value is a value that can indicate the financial condition of a company whether it is in a state of non-bankruptcy or bankruptcy. In the process, Altman made various modifications to the formula, which are explained as follows.

Edward I. Altman in 1967 (the first model) measured a business's vulnerability to failure using multivariate statistics. Altman used a weighting system of five financial ratios and released it in 1968 as the Altman Z-Score model with the following formula:

$$Z = 0.012XI + 0.014X2 + 0.033X3 + 0.006X4 + 0.999X5$$

Altman Z-Score categorizes Z values as follows:

a. If the Z value < 1.8, then it is a bankrupt company.
b. If the value is 1.8 < Z < 2.99 then it is in the grey area (it cannot be determined whether the company is bankrupt or not).
c. If the Z value > 2.99 then the company is not bankrupt.

Revised Altman Z-Score Model (1983), Altman further developed a more advanced model of the Z-Score using samples of private companies and non-manufacturing companies so that this second model is more relevant to all companies. For private companies, because stock price information is not available, Altman replaced the market value of equity (Market Value of Equity) in variable X4 with the book value of shareholder equity (Book Value of Equity). The Altman Z-Score model for private companies is:

$$Z = 0.717X1 + 0.847X2 + 3.108X3 + 0.42X4 + 0.988X5$$

In this 1983 revised model, Altman categorized the Z-Score values for private companies as follows:

a. If the Z' value is < 1.23 then it is a bankrupt company.
b. If the value is 1.23 < Z' < 2.9 then it is in the grey area (it cannot be determined whether the company is bankrupt or not).
c. If the Z' value > 2.9 then the company is not bankrupt.

Modified Altman Model (1984): Over time, many researchers have modified the Altman Z-Score to make it more relevant to specific industry sectors. In this latest model, the sales-to-total-assets ratio was removed in the hope of incorporating industry effects. Furthermore, the sample size was changed to include both public and non-public companies. The following is the modified Altman Z-Score formula:

$$Z = 6.56X1 + 3.26X2 + 6.72X3 + 1.05X4$$

The assessment indicators used in categorizing companies are as follows:

a. If the Z value is < 1.1 then it is a bankrupt company.
b. If the value is 1.1 < Z" < 2.6 then it is included in the grey area (it cannot be determined whether the company is not bankrupt or is experiencing bankruptcy).
c. If the Z value is > 2.6, the company has no problems with its financial condition.

Altman uses financial ratios to predict a company's financial distress, namely working capital divided by total assets, retained earnings divided by total assets, earnings before interest and tax divided by total assets, stock market value divided by book value of total debt, and sales divided by total assets (Masdiantini & Warasniasih, 2020).

D. Zmijewski X-Score

This model was developed by Zmijewski in 1984 using financial ratio analysis to measure a company's debt performance, leverage, and liquidity (Zmijewski, 1984). In this model, Zmijewski used group ratios such as rate of return, liquidity, leverage, turnover, fixed payment coverage, trends, firm size, and stock return volatility. His research showed significant differences between companies that did not go bankrupt and those that went bankrupt. The following is the formula and explanation of Zmijewski's model:

$$X = -4.3 - 4.5X1 + 5.7X2 - 0.004X3$$

Information:
X = financial distress index
X1 = Return on Assets (ROA)
X2 = Debt Ratio (DR)
X3 = Current Ratio (CR)

This Zmijewski model has a cut off value of 0, with the following criteria:

a. If the prediction score is <0, the company is in the non-financial distress zone.
b. If the predicted score is > 0, the company is in the financial distress zone.

E. Previous Research

Several previous studies serve as references for researchers to provide an initial overview of the field under study. The use of these reference journals serves to identify research gaps in previous research and avoid overlapping with previous research. Much literature compares various models for predicting corporate financial distress. However, the results show inconsistencies between studies.

Existing research has shown that the Altman model has greater accuracy than the Zmijewski model (Fadhli & Arifin, 2022; Mahastanti & Utami, 2022; Salim & Ismudjoko, 2021; Supitriyani et al., 2022). For example, a study by Salim and Ismudjoko (2021) using a purposive sampling technique using 22 samples of coal mining companies listed on the Indonesia Stock Exchange (IDX) showed that the Altman model was the most accurate predictive model, with the highest accuracy rate of 90.91%, followed by the Zmijewski model with an accuracy rate of 86.36%. Consistent with this research, Fadhli and Arifin (2022) found a more accurate result, at 96.2%, than the Altman model.

Contrary to previous results, the Zmijewski model also has better accuracy than the Altman model (Farha, 2021; Listyarini, 2020; Saha & Ahmed, 2024; Sudrajat & Wijayanti, 2019). For example, research conducted by Farha (2021) analyzed 93 manufacturing companies listed on the Indonesia Stock Exchange between 2012 and 2015. The results showed that the Zmijewski model had the highest accuracy rate, at 84%, compared with a slight difference of 83% for Altman. Another supporting study is Listriyani (2020), who found the Zmijewski model to be the most accurate model in predicting financial distress, with a 100% accuracy rate for manufacturing companies in Indonesia during 2011 and 2014.

Another study also showed that the two models have equal accuracy (Amin et al., 2024). This study showed similar results in predicting corporate financial distress, conducted on PT. Waskita Karya for six years. The differences in results so far have created a research gap, indicating that the accuracy of the two models can vary across research periods and sectors studied. Furthermore, the characteristics of the two models differ in the ratios used, resulting in differing results. For example, the results by Salim and Ismudjoko (2021) tended to be

accurate using the Altman model for coal companies in the 2015-2019 period. This contrasts with the results by Farha (2021) who showed that the manufacturing sector in 2012-2015 was more accurate using the Zmijewski model. However, in the manufacturing sector and overlapping periods, Listriyani (2020) also found the Zmijewski model to be more accurate. This gap is one of the phenomena that researchers have raised.

This study shares similarities with previous research that tested two models, including Altman and Zmijewski. The difference lies in the recency of the company objects, which are designated B (bankruptcy filing), M (debt payment suspension filing), E (negative equity), Y (no GMS), and S (no profit reporting), which could pose a higher risk of bankruptcy during the post-pandemic recovery period of 2021-2023, as this period can later determine the effectiveness of a company's financial recovery. Therefore, the company...
Companies that are ineffective in their financial recovery can show less than optimal performance and end up being subject to special notations or even bankruptcy.

F. Research Framework

In this study, the initial step that serves as the basis for conducting the research is related to indications of financial distress in companies with special notation in Indonesia. Financial distress can be detected through various financial indicators such as declining profits, increasing debt, decreasing liquidity, and other issues that threaten the sustainability of the company's operations. After indications of financial distress are identified, the next step is to predict the likelihood of financial distress in these companies. Two models used for this prediction are the Altman Z-Score and the Zmijewski X-Score. These two models have different methodologies and variables in measuring a company's financial health.

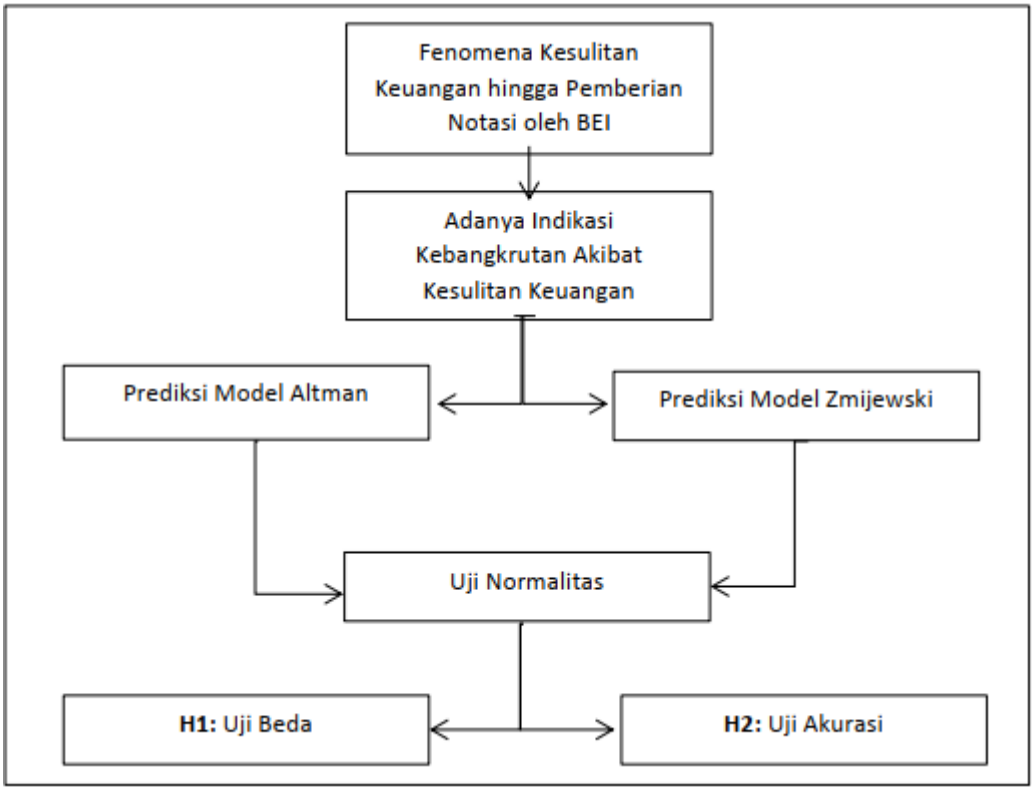

Figure 2.1 Research Framework

The next step is to conduct a normality test analysis to determine the distribution of data between the Altman Z-Score and the Zmijewski X-Score. Then, the researcher will conduct a difference test using the Paired Sample t-test analysis tool if the data is normally distributed. However, if the data is not normally distributed, the Wilcoxon or Mann-Whitney test analysis tool will be used. Next, the researcher conducted a comparative analysis between the Altman Z-Score and the Zmijewski X-Score. This analysis aims to compare the performance of the two models in predicting financial distress in manufacturing companies in Indonesia. The final stage is to test the accuracy of each model to determine which model is most effective in predicting financial distress. The test is conducted using historical data from manufacturing companies and evaluating the predictive capabilities of both models. The results of this test will indicate which model is more accurate and reliable in financial risk management practices. Ultimately, this study focuses on comparing two financial distress prediction models, namely the Altman Z-Score and the Zmijewski X-Score, with samples from companies with special notations in Indonesia. Through comparative analysis and accuracy testing, this study seeks to determine the best model that can help companies and stakeholders effectively identify and anticipate financial distress. Therefore, several hypotheses are formulated as tentative assumptions regarding the research problem statement.

Research Hypothesis:

1. *Differences in the Results of the Altman and Zmijewski Model Values*

Signaling theory explains all actions taken by a company's management, which are expressed as indicators for investors regarding how management views the company's prospects through financial statement assessments in determining financial performance. A study by Salim and Ismudjoko (2021) with 22 samples of mining companies showed that the Altman and Zmijewski models had different model value results. Meanwhile, research conducted by Farha (2021), which analyzed 93 manufacturing companies from 2012-2015, showed that the Zmijewski and Altman models also had different model value results. This is confirmed by other previous studies that stated significant differences in the value results of the two models in predicting a company's financial distress (Farha, 2021; Listyarini, 2020; Saha & Ahmed, 2024; Sudrajat & Wijayanti, 2019). Therefore, the first hypothesis is as follows.

H1: There is a significant difference in the predicted values of the financial distress models between Altman and Zmijewski in companies with special notation in Indonesia.

2. *Differences in Accuracy of Altman and Zmijewski Models*

Signaling theory also discusses how differences in results can signal differences in model accuracy, leading to different interpretations in investment decision-making. Existing research has shown that the Altman model has better or greater accuracy than the Zmijewski model (Fadhli & Arifin, 2022; Mahastanti & Utami, 2022; Salim & Ismudjoko, 2021; Supitriyani et al., 2022). Contrary to previous findings, the Zmijewski model also has better accuracy than the Altman model (Farha, 2021; Listyarini, 2020; Saha & Ahmed, 2024; Sudrajat & Wijayanti, 2019). Therefore, the following hypotheses can be formulated.

H2: There is a difference in the accuracy of the financial distress model prediction results between Altman and Zmijewski in companies with special notation in Indonesia.

III. RESEARCH METHODOLOGY

This research is a comparative study with a quantitative approach. Comparative studies are used to compare variable values in two or more populations, samples, or time periods to determine whether there are differences between the research objects (Sugiyono, 2022). The quantitative approach was chosen because it is based on positivism and meets the empirical, objective, measurable, rational, and systematic principles for testing hypotheses (Sugiyono, 2022). The purpose of this study is to compare the Altman Z-Score and Zmijewski X-Score models in predicting financial distress in companies with specific notation as of November 2023.

The sample was determined using purposive sampling, a selection method based on specific categories (Bougie and Sekaran, 2020). The criteria used were companies that received a special notation as of November 2024, as this category reflects a higher risk of bankruptcy (Hudaya et al., 2024), with the following details:

1. Notation B (bankruptcy filing),
2. Notation M (application for postponement of debt payment),
3. Notation E (negative equity),
4. Notation Y (not holding a GMS),
5. Notation S (not reporting profit).

The study population included companies listed on the IDX during the 2021–2023 period, a transitional period during the post-pandemic recovery period that demonstrates the effectiveness of corporate financial recovery. Companies that fail to recover optimally during this period are at risk of receiving special notation and even bankruptcy.

Table 3.1 Sample Calculation Results

Kriteria	Jumlah
Populasi perusahaan yang mendapat notasi khusus oleh BEI per November 2024	228
Perusahaan yang tidak mendapat notasi B, M, E, Y, dan S per November 2024	(132)
Perusahaan yang tidak lengkap atas laporan keuangan selama periode observasi	(48)
Total Perusahaan Sampel	**48**
Total Sampel Observasi 2021-2023	**144**

Source: Data processed by researchers (2024)

The type of data used is secondary data, that is, data obtained from existing sources (Sugiyono, 2022). The data consists of financial reports from companies that meet the sample criteria and are accessed through www.idx.co.id.
or the company's official website for the period 2021–2023. The research utilized cross-sectional and time series data to illustrate the company's development (Sugiyono, 2022).

Data collection was conducted through documentation techniques by reviewing relevant financial reports (Sugiyono, 2022). Literature review was also used to obtain additional information from various scientific works and articles related to the research topic.

Data analysis includes descriptive statistics to see the distribution of data, calculations of Altman Z-Score and Zmijewski X-Score to predict financial distress, as well as a comparison of the results of the two models to determine the most appropriate accuracy for companies with special notation in Indonesia.

IV. RESULTS AND DISCUSSION

A. Descriptive Statistics

Descriptive statistical analysis is conducted to provide an overview of the data so that readers can more easily understand it. The statistical data typically used are the mean, maximum, minimum, and standard deviation. The results of the descriptive statistical analysis can be seen in the following table:

Table 4.1 Statistical Results of the Altman and Zmijewski Model

Model	Sampel Observasi	*Mean*	*Std. Dev.*	*Min*	*Max*
Altman	144	-45.03	150.80	-1201.43	11.84
Zmijewski	144	28.73	97.29	-3.14	707.49

Source: data processed by researchers (2025)

The descriptive statistical analysis results table above shows that the two models have different statistical values and can be an indication of a significant difference between the two. In the Altman model, the average value is -45.03 with a standard deviation of 150.80. Meanwhile, the Zmijewski model shows the average and standard deviation of 28.73 and 97.29. Both models have standard deviations greater than the average value, which means that both models also have large variations. And in the Altman model, the minimum and maximum values are -1201.43 and 11.84, respectively, while the Zmijewski model shows the minimum and maximum values of -3.14 and 707.49.

B. Normality Test

This study will use the One Sample Kolmogorov-Smirnov test with a significance level of 0.05. Data are considered normally distributed if the significance level is greater than 0.05. The results of the normality test can be seen in the table below:

Table 4.2 Normality Test Results

	MODEL
N	288
Normal Parameters	
Mean	-8.149
Std. Deviasi	131.955
Most Extreme Differences	
Absolute	0.362
Positive	0.362
Negative	-0.361
Test Statistic	0.362
Asymp. Sig. (2-tailed)	0,000

Source: data processed by researchers (2025)

The results of the One-Sample Kolmogorov-Smirnov test showed a significance level of less than 0.05, indicating that the data were not normally distributed. If the data were not normally

distributed, the Wilcoxon or Mann-Whitney test would be used for comparative analysis in subsequent treatments.

C. Difference Test

This test is a type of mean difference test, which tests whether there is a difference in the average between two sample groups. Decision-making in this test is based on a comparison of probability values (Sig. 2-tailed). The results of the difference test can be seen in the following table:

Table 4.3 Results of the Altman and Zmijewski Model Difference Test

	MODEL
Mann-Whitney U	2698.500
Wilcoxon W	13138.500
Z	-10.853
Asymp. Sig. (2-tailed)	0,000

Source: data processed by researchers (2025)

In this difference test, the Mann-Whitney Test is used based on the normality test by testing the difference in the average values of the two types of models. The Altman model in this study is the first model and the second model is Zmijewski. The results show that from testing the difference in Altman and Zmijewski values, there is a difference with a negative value of -10.853 and a significance of 0.00. Thus, there is a difference between the results of the two models because the significance value is less than 0.05. The results of this test state that the first hypothesis is accepted, namely that there is a significant difference between the results of the Altman and Zmijewski model values.

D. Accuracy Test

Accuracy test calculations can be used to identify the predictive model with the highest level of accuracy and to show the percentage of error types by comparing one model with another. Before conducting the accuracy test, below is a table showing the difference in the number of categories between the two models over three consecutive years, with the categories being bankrupt (B), gray area (GA), and non-bankrupt (TB).

Table 4.4 Comparison of the Number of Categories of Prediction Results of the Altman and Zmijewski Models

MODEL ALTMAN				
Kategori	Tahun			Total
	2021	2022	2023	
TB	6	7	5	18
GA	5	4	1	10
B	37	37	42	116
Total	48	48	48	144
MODEL ZMIJEWSKI				
Kategori	Tahun			Total
	2021	2022	2023	
TB	11	9	7	27
B	37	39	41	117
Total	48	48	48	144

Source: data processed by researchers (2025)

The table above shows that the Altman and Zmijewski models have varying numbers of categories each year. The Altman model has three categories: bankruptcy (B), gray area (GA), and non-bankruptcy (TB). The Zmijewski model, on the other hand, has two categories: bankruptcy and non-bankruptcy. These differing perceptions of financial distress categories result in varying numbers of each category in each model. However, the number of bankruptcy categories in both models is nearly identical, at 116 and 117, respectively, out of the 144 companies observed over three years.

Accuracy is calculated by comparing the correct sample size with the total sample size for each model. The error rate for each model is determined by comparing the remaining incorrect samples with the total sample size. The calculation of the values for each model and the results of each prediction model will naturally result in a difference between the predicted results and the actual situation. In this case, the actual condition of a company experiencing financial distress is identified by a negative net profit indicator for two consecutive years. There are at least 96 observation samples from 36 companies experiencing negative net profit for at least two consecutive years, which fall into the actual financial distress category. The following summarizes the differences between the predicted and actual conditions of financial distress.

Table 4.5 Summary of Comparison and Accuracy Level of Prediction Model Results with Actual Conditions

MODEL ALTMAN				
KATEGORI		PREDIKSI		TOTAL
		B	S	
REAL	B	87	9	96
	S	29	19	48
TOTAL		116	28	144
Tingkat Akurasi				73.6111
Tingkat Error				26.3889
MODEL ZMIJEWSKI				
KATEGORI		PREDIKSI		TOTAL
		B	S	
REAL	B	84	12	96
	S	33	15	48
TOTAL		117	27	144
Tingkat Akurasi				68.7500
Tingkat Error				31.2500

Source: data processed by researchers (2025)

The table above shows a difference in accuracy between the two prediction models. The Altman model correctly predicted 87 companies in bankruptcy or financial distress and 19 companies in non-bankrupt or non-financial distress, with an accuracy rate of 73.61%. Meanwhile, the Zmijewski model correctly predicted 84 companies in financial distress and 15 companies in non-financial distress, with an accuracy rate of 68.75%. Therefore, the Altman model is more capable and more accurate in predicting actual conditions, with a higher accuracy rate than the Zmijewski model.

E. Discussion

1. There are differences in the results of the Altman and Zmijewski models.

The Altman Z-Score and Zmijewski X-Score models show statistically significant differences in predicting financial distress for companies listed on the Indonesia Stock Exchange (IDX), as evidenced by various studies analyzing the methodology and results of both models. These differences stem from different approaches to weighting financial ratios, variable selection, and sensitivity to leverage and profitability indicators (Masdiantini & Warasniasih, 2020; Sugiarti & Nikmah, 2023). The constant values of the two models differ, with the Altman model using a positive constant and the Zmijewski model using a negative constant. The differences in the constants also lead to different interpretations of non-bankruptcy and bankruptcy. Therefore, the difference in average values also indicates a significant difference. Further explaining the main difference between the two designs, the Altman Z-Score model uses a multivariate approach that focuses on liquidity, profitability, and solvency ratios. For non-manufacturing companies, the modified Z-Score formula includes: working capital to total assets (liquidity); retained earnings to total assets (cumulative profitability); EBIT to total assets (operational efficiency); and equity to total liabilities (solvency). In contrast, the Zmijewski X-Score prioritizes

leverage and liquidity risk through variables such as total debt to total assets and net income to total assets. This model places a heavier weight on debt-related metrics, reflecting its emphasis on bankruptcy risk over operational performance (Kembi et al., 2024; Santoso et al., 2024; Tanjung, 2020).

This research aligns with Farha (2021), who analyzed 93 manufacturing companies from 2012 to 2015, showing that the Zmijewski and Altman models also have different model value results. This is confirmed by other previous studies that stated significant differences in the results of the two models in predicting a company's financial distress (Farha, 2021; Listyarini, 2020; Saha & Ahmed, 2024; Sudrajat & Wijayanti, 2019). Companies that receive special notation on the Indonesia Stock Exchange have significantly different statistical values. Despite these differences, the two models also have several similarities and similarities in the categories and values of the prediction models because the companies studied are in the same financial condition, namely attempting financial recovery after the pandemic. From a signaling theory perspective, each model characteristic provides a signal in assessing a company's financial condition.

2. There is a Difference in the Accuracy of the Altman and Zmijewski Models

The data analysis results show that the Altman model produces a higher level of accuracy than the Zmijewski model. This difference is also due to the differences in the characteristics of each model, resulting in differences in prediction and categorization. This study shows that the second hypothesis is accepted. This study also accepts the existing research hypothesis, namely that the Altman model has better or greater accuracy than the Zmijewski model (Fadhli & Arifin, 2022; Mahastanti & Utami, 2022; Salim & Ismudjoko, 2021; Supitriyani et al., 2022), and rejects the results of other studies, which state that the Zmijewski model also has better accuracy than the Altman model (Farha, 2021; Listyarini, 2020; Saha and Ahmed, 2024; Sudrajat and Wijayanti, 2019).

The Altman model produces more accurate results due to its sector-specific adaptation. The modified Altman model is tailored for the non-manufacturing sector, making it more suitable for retail and logistics companies in Indonesia, which frequently face liquidity difficulties. Furthermore, the Altman model has the advantage of a lower error rate (20.83%), reducing the risk of mislabeling distressed companies as non-bankrupt. Furthermore, the Altman model has comprehensive variable characteristics. By integrating market value and sales efficiency, the Altman model takes into account external investor sentiment and operational scalability, which are crucial in emerging markets like Indonesia (Marsenne et al., 2024; Santoso et al., 2024; Ulfah & Moin, 2022). The Altman model is considered more conservative or skeptical in assessing company finances, as clearly seen in its classification into bankruptcy, gray area, and non-bankrupt categories. This is key to increasing the model's caution in assessing actual conditions.

Signaling theory states that the high level of accuracy is due to differences in the reading and interpretation of financial conditions obtained through financial ratios (Jariah et al., 2024). This is because each model has a different financial ratio equation model for assessing financial condition. These differences can then impact investment decisions. Investors can avoid companies experiencing financial distress in their investments to obtain sustainable future benefits. To assess this, investors can use accurate models, such as the results of this study using the Altman model, as a basis for investment decisions.

V. CONCLUSION

A. Conclusion

Based on the results of the data analysis and discussion that have been done previously in testing the existence of significant differences in the results of the model prediction values and the level of accuracy of the Altman and Zmijewski models, it can be concluded that there is a significant difference in the value of the financial distress model prediction results between Altman and Zmijewski in companies with special notation in Indonesia, thus the problem formulation is answered. From the perspective of signal theory, it includes each model characteristic that provides a signal in assessing the financial condition of a company and each model has different characteristics, so that these differences can result in different interpretations. In addition, there is also a difference in the accuracy of the financial distress model prediction results between Altman and Zmijewski in companies with special notation in Indonesia, thus the second problem formulation has also been fulfilled. Signal theory states that the level of accuracy can indicate the use of the model in bankruptcy prediction, so that the most accurate model is able to provide a more accurate and useful signal in investment decisions. In this study, the Altman model is more accurate than the Zmijewski model.

B. Implications

Based on the conclusions, limitations, and suggestions of the research in testing for significant differences in the results of the model prediction values and the accuracy level of the Altman and Zmijewski models, the following research implications can be drawn:

a) Theoretical Implications

Theoretically, further researchers can develop studies on differences in results and accuracy in companies that receive notations or with more in-depth analysis from perspectives other than signal theory, such as business continuity .

b) Practical Implications

In practice, companies included in the notation can improve their financial performance to escape the notation, thereby attracting investors. For investors, using the Altman financial distress ratio model can be a special consideration, especially when a company receives a special notation.

c) Policy Implications

In addition, it has implications for capital market regulators to provide historical data for certain periods from special notation companies that can be accessed at any time, so that it can strengthen investment decisions and evaluations for investors.

C. Limitations

Based on the results of data analysis, discussion, and conclusions, in testing for significant differences in the predicted values and accuracy of the Altman and Zmijewski models, there are limitations in the sample of companies with special notation obtained not based on historical data, but rather data that was only available at the time of collection, so it cannot show the specifications of companies that received special notation in several consecutive periods. In this study, company data was only collected as of November 2024, or not in the year-end period, which is a limitation of the study. The reason is that the research or observation was conducted in November-December 2024 before the latest announcement regarding companies with

special notation for the closing period or year-end. Furthermore, this study also ignores the classification of industry types, which adds to the research limitations, because companies that receive special notation on the Indonesia Stock Exchange consist of several industry categories with different characteristics.

D. Suggestion

The explanation of these limitations resulted in a suggestion to expand the scope of the research from the time period to the observation of special notation data from time to time periodically to find companies that continue to receive notation within a certain period or per fiscal year (year-end). In addition, the classification of industry types in the Altman and Zmijewski prediction model is also one of the suggestions for further research development in this object, considering the characteristics of the ratio and composition of companies in various sectors so that it can see how this model is more accurately used in any industry. To strengthen this suggestion, it can also be refined by expanding the scope of this research regarding the symptoms of financial difficulties leading to bankruptcy or insolvency of companies that receive special notation in the stock market by involving going concern audit opinions as an indication of the company experiencing disruptions and obstacles in its business continuity.

ACKNOWLEDGEMENT

The author would like to express gratitude to all the people who have helped in the completion of this study.

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