

Comparing the Financial Distress Prediction by Using Altman Z-Score, Springate S-Score and Zmijewski X-Score Models in Tobacco Companies listed in Indonesia Stock Exchange 2017-2021

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Hasna Kurnia Ulfah

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Abstract

This research takes the topic of the Comparison of Financial Distress Predictions Using Altman Z-Score, Springate S-Score and Zmijewski X-Score Models in Tobacco Companies Listed in Indonesia Stock Exchange. In this case, a test was conducted to compare the accuracy of the Altman Z-Score, Springate S-Score and Zmijewski X-Score models in predicting the financial distress of tobacco companies. The sample used saturated sample consisting of 5 companies with 25 observations in each model. To get the right level of accuracy, the comparison of the categories of distress or non-stress scores of each financial distress model with the comparison of ROE and BI rate in the respective year of each company was carried out using a dummy variable. Through this research, it is known that the Springate S-Score models were the models with the most accurate results in predicting financial distress in Tobacco companies listed in the Indonesia Stock Exchange (IDX) by 80%.

Keywords : Altman Z-Score, Springate S-Score, Zmijewski X-Score, Tobacco Companies, Financial Distress Prediction

Abstrak

Penelitian ini mengambil topik Perbandingan Prediksi Kebangkrutan/Kesulitan Keuangan Dengan Menggunakan Model Altman Z-Score, Springate S-Score dan Zmijewski X-Score Pada Perusahaan Tembakau yang Terdaftar di Bursa Efek Indonesia. Dalam hal ini dilakukan pengujian untuk membandingkan akurasi model Altman Z-Score, Springate S-Score dan Zmijewski X-Score dalam memprediksi kebangkrutan perusahaan rokok. Sampel menggunakan sampel jenuh yang terdiri dari 5 perusahaan dengan 25 observasi pada masing-masing model. Untuk mendapatkan tingkat akurasi yang tepat, perbandingan kategori skor distress atau non-stress masing-masing model kebangkrutan dengan perbandingan ROE dengan BI rate pada tahun yang bersangkutan masing-masing perusahaan dilakukan melalui variabel dummy. Melalui penelitian ini diketahui bahwa model Springate S-Score merupakan model dengan hasil yang paling akurat dalam memprediksi kebangkrutan pada perusahaan rokok yang terdaftar di Bursa Efek Indonesia (BEI) sebesar 80%.

Kata kunci : Altman Z-Score, Springate S-Score, Zmijewski X-Score, Perusahaan Tembakau, Prediksi Kebangkrutan

CHAPTER I

INTRODUCTION

1.1. Background of the Study

A company is an entity founded by an individual or institution with the main objective of maximizing shareholder wealth. To some extent, shareholder wealth maximization is a creature of company law (Edwards, 2021, p.705). However, most of the company's main goal is to get the maximum profit. Thus, the company is able to survive, operate, not to liquidate and also grow in the long term. In order to achieve this goal, companies are required to have good management skills so that companies can develop in the long term and can compete continuously.

Good companies are usually able to attract investors, where investors can invest or buy shares on the IDX (Indonesian Stock Exchange). To assess a company, investors need to analyze the company's financial statements. Thus, investors can make a decision whether the company deserves funds through accurate data. It can be seen that the company is in the state of financial difficulty which leads to financial distress (Hartaroe et al., 2016).

Various analytical models have been developed to measure the potential for financial distress of a company. This condition occurs when financial conditions decline. Thus, they are no longer able to operate and pay off their obligations. More simply, financial distress indicates the state of the company before financial distress or liquidation. Financial distress analysis is increasingly needed as an early warning. Therefore, the management can immediately take action to save the company and investors can immediately take anticipatory steps to prevent loss (Andriani&Sihombing, 2021, p.170). The company's inability to anticipate global developments can weaken the company's management fundamentals. This will result in a decrease in business volume which in turn will result in the financial distress of the company. Financial distress

is a condition where a company is considered to have failed to maintain its business.

The tobacco industry still makes a significant contribution to the Indonesian economy. Apart from being a driving force for the Indonesian economy, the tobacco industry also absorbs a large number of workers, source of high tobacco excise, and it is an important commodity for tobacco farmers. The Ministry of Industry (Kemenperin) noted that state revenues from the tobacco industry from excise and tax rates have increased every year. On September 13, 2019, after holding a limited meeting at the Presidential Palace in Jakarta, Sri Mulyani Indrawati as the Minister of Finance stated that the increase in tobacco excise rates by an average of 21.55% which will take effect from January 1, 2020. With the increase in excise rates, retail tobacco selling prices also increase by 35%. This decision is stated in the Minister of Finance Regulation or PMK Number 152/PMK.010/2019. The average increase in tobacco excise tax from 2009-2021 can be seen in the Figure 1.1.

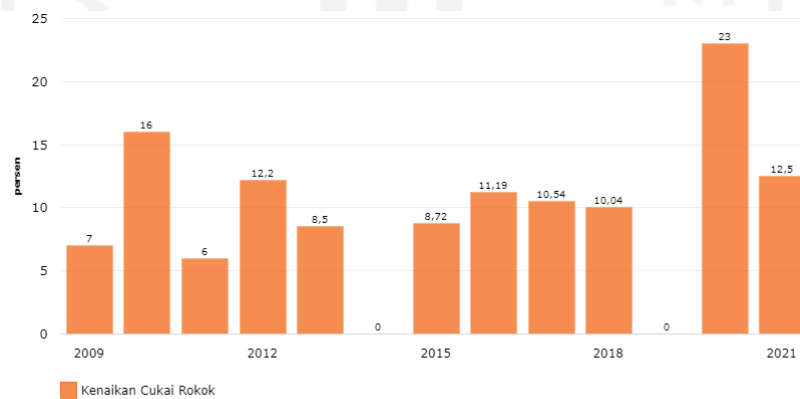


Figure 1.1. Average Increase in Tobacco Excise 2009-2021

Source: Indonesian Ministry of Finance, 2021

Based on Figure 1.1, the increase in excise rates is not stable. Routinely, the government raises tobacco excise rates almost every year. From 2015 to 2021, the average increase in tobacco excise rates was 10%. In 2019, there was no increase in tobacco excise but there was a significant increase in 2020 by 23%.

The increase in tobacco excise rates will certainly have an impact on the performance of tobacco issuers' shares. In the tobacco industry, it is necessary to anticipate financial distress that may occur. It can be seen from government policies and the stock prices of tobacco issuers which have fallen drastically. One of the indicators of financial distress that can be observed by external parties is the stock price in the capital market which continues to fall. The tobacco industry is one of the industries that has had its ups and downs, but still exists in Indonesia. The sluggish economic growth and even minus during the crisis had no impact on the tobacco industry in Indonesia. In fact, the tobacco industry in Indonesia faces many challenges due to the impact of the prolonged crisis. For example, when people's purchasing power decreases, excise rates continue to rise and labor wages are adjusted to the demands of the increasingly high cost of living.

According to Saragih & Dewi (2019, p.16), financial distress is a condition in which a company is no longer healthy and is considered unable to meet the company's needs due to a decrease in profitability. Financial distress can also be regarded as a condition where the company cannot fulfill its obligations. Financial distress can occur because the costs incurred in sales transactions are greater than the expected rate of return in the long term. Thus, it will have an impact on the survival of the company (Manalu et al., 2017, p.680).

A basic understanding of the potential for financial distress is very important in making investment decisions. Investors are expected to take good companies to invest in. This understanding must also be owned by a

company manager to be able to anticipate all possibilities that can occur. If a company manager is wrong in making decisions, the high debt of the company can be the cause that brings the company to financial distress (Paoki et al., 2019, p.5138).

According to Arum and Handayani (2018, p.109), to overcome and minimize the occurrence of financial distress, companies need to conduct an analysis in order to predict the financial distress that will occur. Thus, companies can take steps to make improvements and appropriate counter measures. The trick is to analyze the financial statements issued by the company. Financial statement analysis is an analytical technique to determine the financial position and results achieved by the company. The goal is to predict the condition of the company's performance in the future. This will make it easier for investors to make decisions to invest (Soedarsa et al, 2019, p.31)

The method that is more often used by companies is to analyze the company's financial health, where companies can predict the possibility of Financial Distress. Financial distress Prediction Models can be used which consisted of several models, namely Altman Z-Score, Springate S-Score, and Zmijewski X-Score. These models are known for being easy to implement.

According to Siekelova et al. (2019, p.89), it showed that by using the Altman Z-Score method from 105 manufacturing companies in Romania, 37 companies were in good health, 39 companies were in the gray area position and 29 companies had the potential to go financial distress. While according to Tanjung (2020, p.131-132), the Altman Z-Score and Zmijewski X-Score methods predict that all companies do not have the potential to go financial distress. The Springate S-Score method predicts that PT. Indofarma (Persero), Tbk. were potentially financial distress. While the Ohlson method predicts PT. Indofarma (Persero), Tbk., PT. Kimia Farma (Persero), Tbk., and PT. Pyridam Farma Tbk. were

potentially financial distress. According to research conducted by Pulungan and Hartini (2018, p.247), the result showed that by using the Springate S-Score method, 8 property companies, namely PT. Alam Sutera Realty, Tbk., PT. Bakrieland Development, Tbk., PT. Bukit Darma Property, Tbk., PT. Intiland Development, Tbk., PT. Sentul City, Tbk., PT. Cowell Development, Tbk., PT. Bumi Serpong Damai, Tbk., and PT. Megapolitan Development, Tbk. are potentially financial distress.

Ben et al, (2015, p.1) used the Springate X-Score model to predict property and real estate companies listed in the IDX. The result was that from a total of 27 companies studied, there were 8 companies that were predicted to be in a healthy condition. There were 9 companies that went financial distress for 3 years, from 2011 to 2013. Five companies experienced a change in category from companies that were predicted to have the potential to go financial distress to companies that were predicted to be in a healthy condition. And finally, there were 5 companies that experienced changes in conditions from companies that were predicted to be healthy to companies that were predicted to experience symptoms of financial distress.

The results of research conducted by Meita (2015, p.18) concluded that the Altman Z-Score model and the Springate S-Score model are financial distress prediction model that gives the same high value in predicting financial distress of coal mining companies with a financial distress prediction value of 88.89%. However Andriani & Sihombing (2021, p.173) stated that the Zmijewski X-Score model is the most accurate model in predicting financial distress in the property and real estate sectors listed on the Indonesia Stock Exchange (IDX) by 90%.

Based on the description above, the researcher is interested in conducting research with the title *"Comparing the Financial distress/Financial Distress Prediction by Using Altman Z-Score,*

Springate S-Score and Zmijewski X-Score Models in Tobacco Companies listed in Indonesia Stock Exchange 2017-2021”.

1.2. Problem Identification

Based on the description of the background above, the identification of the problems proposed in this research are:

1. The government raises tobacco excise rates almost every year. From 2015 to 2021, the average increase in tobacco excise rates is 10%.
2. The increase in tobacco excise rates will certainly have an impact on the performance of the shares of tobacco issuers.
3. The stock price of tobacco issuers in the capital market continues to fall.
4. There are differences level of accuracy in the results of the Altman, Springate and Zmijewski methods in determining the health condition and financial distress of companies by previous researcher.

1.3. Problem Formulation

Based on the description of the background of the problem above, the formulation of the problem proposed in this research are as follows:

1. Can the Altman Z-Score model predict financial distress in tobacco companies?
2. Can the Springate S-Score model predict financial distress in tobacco companies?
3. Can the Zmijewski X-Score model predict financial distress in tobacco companies?
4. Are there differences in the results of financial distress prediction using the Altman Z-Score, Springate and Zmijewski methods?
5. Which method is the most accurate among the three methods?

1.4. Limitation of Research Area

Based on the formulation of the problem, the researcher limits the scope of the discussion. Thus, the research in this final report will not deviate

from the existing problems. Furthermore, this research focused more on the object being examined in order to produce research that can contribute to the development of science and early warning of financial distress for the company, along with the limitations of the research:

1. The sample used in this research is tobacco companies listed on the Indonesia Stock Exchange for the period 2016-2021.
2. The data used in this report is secondary data obtained from the Indonesia Stock Exchange website, namely www.idx.co.id.
3. The model used in predicting the financial distress of the company is the modified Altman Z-Score Model, Springate and Zmijewski.

1.5. Research Objectives

Based on the formulation of the problem above, this research aims to analyze the company's financial statements and predict the level of financial distress experienced by tobacco companies as follows:

1. To examine whether the Altman Z-Score model can predict financial distress in tobacco companies listed in the Indonesia Stock Exchange (IDX).
2. To examine whether the Springate model can predict financial distress in tobacco companies listed in the Indonesia Stock Exchange (IDX).
3. To examine whether the Zmijewski model can predict financial distress in tobacco companies listed in the Indonesia Stock Exchange (IDX).
4. To examine whether there are any differences in the results of financial distress prediction using the Altman Z-Score, Springate and Zmijewski methods in tobacco companies listed in the Indonesia Stock Exchange (IDX).
5. To examine the most accurate prediction model among the Altman Z-Score, Springate, and Zmijewski models in predicting financial

distress in tobacco companies listed in the Indonesia Stock Exchange (IDX).

1.6. Research Contributions

1. For Researcher

The researcher gains knowledge about financial distress predictions and additional insight by applying the knowledge and theories that have been obtained during college.

2. For Other Parties

Investors, creditors, and the government also need information about the financial condition of a company. Thus, they can take appropriate economic and business decisions to face the possibility of company financial distress in the future.

3. For Companies

This research is expected to be used as an early warning sign to anticipate financial distress and as a means to identify and even improve conditions before they reach critical conditions. Therefore, management can take quick and appropriate action.

4. For Academics

This research is expected to be a reference for academics who will conduct further research regarding the prediction of a company's financial distress using the Z-Score Altman, Springrate, and Zmijewski models.

1.7. Definition of Term

Compare/comparing

Definition: It means side by side to show differences and similarities. It implies the purpose of showing relative value or superiority by eliciting characteristic qualities whether similar or different. In this research, the comparison of the three financial distress prediction models is carried out to find out whether there are differences or similarities in the results and to find out which model is the best.

Financial Distress

Definition: Financial distress is a condition when a company experiences a financial crisis and fails to meet debtor obligations because it does not have the funds to continue their business. This condition is accompanied by a decrease in profits and fixed assets and usually occurs before financial distress.

Prediction

Definition: A prediction is a forecast, but not only about the weather. Pre means “before” and diction has to do with talking. Thus, prediction is a statement about the future. It is a guess, sometimes based on facts or evidence, but not always.

Altman Z-Score

Definition: The Z-score formula for predicting financial distress was found in 1968 by Edward I. Altman, an Assistant Professor of Finance at New York University. The formula can be used to predict the probability that a company will go financial distress within two years.

Springate S-Score

Definition: The springate model is a financial distress prediction model, the development of the Altman prediction model was conducted by Gordon L.V Springate in 1978. Springate (1978) conducted this research hoping to predict financial distress before financial distress.

Zmijewski X-Score

Definition: Zmijewski (1984) is the name of the inventor financial distress prediction model which later became known by his own name. Zmijewski uses ratio analysis that measures several performances to find out the company will experience financial distress or financial distress.

Tobacco Companies

Definition: Companies that develop, prepare for the sale, delivery, advertising, and distribution of tobacco and tobacco-related products.

Indonesia Stock Exchange

Definition: Stock exchange or capital market which is a space for buying and selling securities, shares and other futures investment instruments in Indonesia.

CHAPTER II

REVIEW OF RELATED LITERATURE

2.

2.1. Theoretical Review

1. Financial distress

Financial Distress is a condition in which an institution is declared financial distress by a court decision, if the debtor has two or more creditors and does not pay at least one debt that has matured. The company's failure to run the company's operations to generate profits can also be called financial distress. Financial distress prediction is an important application in finance to help make accurate decisions for business companies (Zhang et al., 2021, p.185). Financial distress as a failure can be defined in several meanings, namely:

Economic distress is a condition in which a company loses money or income from a company that cannot cover its own costs. This event can be interpreted that the level of profit is smaller than the cost of capital or the present value of the company's cash flows is smaller than the liabilities. This failure occurs when the company's actual cash flows have fallen below the expected cash flows.

Financial distress, both in terms of cash and working capital. Some asset liability management plays a very important role in the arrangement to prevent being exposed to financial distress. Financial distress of a company will quickly occur if the company is located in a country that is experiencing economic difficulties, because economic difficulties can trigger rapid corporate financial distress that may occur in companies that are initially or have experienced an unhealthy company.

Financial distress is often defined as a failure where the definition as the following (Brigham, 2008).

- Economic failure

In running the business does not rule out when the cost is issued by the company exceeds the revenue earned by the company. This condition can be interpreted as an economic failure.

- Financial Failure

The company is experiencing financial failure means the company have difficulty funding either in the sense of funds in terms of cash or in understanding of working capital. The consequences of a business is usually an extremely costly and disruptive event. Statistical financial distress prediction models attempt to predict whether a business will experience financial distress in the future. However, by analyzing current finances, there will be a possibility that can be used as a conduit for 'what will be' the company in the future.

- Technical insolvency

Technical insolvency leads more to the company's failure to live technical/regulatory obligations applicable. The business is deemed to fail if the company can not fulfill its obligations at maturity, albeit in total assets exceed the total debt.

- Insolvency in the sense of financial distress

Financial distress can also be interpreted as a condition where the current value of the current the expected cash is lower than the liabilities held.

- Legal Financial distress

The company is declared financial distress, only if it is filed formally with the Act

Financial distress is a term used to describe the condition of a company that is experiencing financial difficulties (Cındık & Armutlulu, 2021, p.238). Several models in predicting financial distress are Altman model, Zmijewski model, Grover model, Ohlson model, Fulmer model and so on. By knowing the right

financial condition prediction models and using the financial information of companies published on the Indonesian stock exchange, it is hoped that investors and other parties with an interest in financial analysis can make the right decisions. (Prasetianingias & Kusumowati, 2019, p.9)

This research used the measurements used by Husein and Pambekti (2014, p.410-411) that determined financial distress using a comparison of ROE with the BI rate in the year concerned. The dependent measure on this variable is the Dummy variable, If the ROE is greater than the BI rate, it will be coded "0" or in other words the company categorized to be healthy. Then if the ROE value less than the BI rate but still greater than 0, it means that the company still can produce the net profit but it s under BI Rate so it is categorized as grey area or the company experienced loss (coded by "2"), then if the company's ROE is less than 0 or in negative, it will be concluded that the company experiencing financial distress or potentially financial distress (it is coded by "1"). ROE or return on equity is one of the important elements to determine the extent to which a business is able to manage the capital of its investors. If the ROE calculation is greater, the company's reputation will also increase in the eyes of capital market/share issuers. This is because the business is proven to be able to make the best management of shareholder equity.

2. Financial distress indicator

Companies that are experiencing liquidity difficulties, which can be seen from the company's inability to meet liquidity (debt). The indicators that we must pay attention to in companies related to the effectiveness and efficiency of their operations are decrease in sales volume due to changes, consumer demand, increase in productive costs, intense level of competition, failure to do compensation,

ineffective in carrying out receivables collection, lack of support for banking facilities (credit), and the high level of dependence on receivables. (Priambodo, 2018)

3. Financial Distress Prediction methods

1. Altman Z-Score

Altman (developed 1968) introduced the Z-Score model in 1968 and this model has been well-received as a financial distress model for nearly decades, although some models of financial distress are beginning to be applied, the Altman Model is still considered superior and widely applied by researchers around the world (Niresih and Pratheepa, 2015, p.270). Altman is also the first to implement multiple discriminant analysis, Altman's rationale uses analysis discriminant analysis stems from the limitations of ratio analysis through the methodology that basically a deviation which means each ratio is tested separately so that the combined effect of several ratio is only based on the considerations of the financial analysts. As it goes time and adjustments to different types of companies, Altman then revise the model so that it can be applied to all companies, such as manufacturing, non-manufacturing, and bond issuing companies in emerging market.

In this research, the type of industry used is the manufacturing industry (Tobacco Companies) so that the Altman formula is used with the Multiple Discriminant Analysis method which has 5 types of financial ratios, namely working capital to total assets, retained earnings to total assets, earning before interest and taxes to total assets, market value of equity to book value of total debts, and sales to total assets.

The model formed by Altman for predicting a company's financial distress is:

$$Z = 0.717A + 0.874B + 3.107C + 0.420D + 0.998E$$

Whereas:

Z = Overall Index or Score

A = Working Capital to Total Assets

B = Retained Earnings to Total Assets

C = Earnings before Interest & Tax to Total Assets

D = Market Capitalization to Total Liabilities

E = Sales to Total Assets

The following is an explanation of the ratio variables contained in the Altman model::

a. *Working Capital to Total Asset (X1)*

This ratio shows the company's ability to generate net working capital from the total assets owned. This ratio is calculated by dividing working capital by total assets.

$$WCTA = \frac{\text{Working Capital}}{\text{Total Assets}}$$

Negative net working capital is likely to be facing problems in covering its short-term obligations due to the unavailability of sufficient current assets to cover the liabilities.

b. *Retained Earning in Total Assets Ratio (X2)*

This account informs the total income or loss from investments made by the company. This account indicates the balance of profits earned. Below is the formula for the RETA ratio:

$$RETA = \frac{\text{Retained Earning}}{\text{Total Asset}}$$

Negative net working capital is likely to be facing problems in covering its short-term obligations due to the unavailability of sufficient current assets to cover liabilities that.

c. *Earning Before Interest and Taxes to Total Assets Ratio (X3)*

This ratio shows the company's ability to generate profits from company assets before interest and tax payments(Kasmir:2014).

$$EBITTA = \frac{EBIT}{\text{Total Asset}}$$

d. *Market Capitalization to Total Liabilities Ratio (X4)*

This ratio is used to assess the company's solvency, namely the company's ability to meet long-term obligations or measure the ability of the company's capital to bear all of its obligations.

$$MCTL = \frac{\text{Market Capitalization}}{\text{Total Liabilities}}$$

e. *Sales to Total Assets Ratio (X5)*

The ratio of sales to total assets measures the ability of a business to generate sales with the smallest possible assets. When the ratio is high enough, it indicates that management is able to squeeze as much use out of the small investment in assets as possible.

$$SaTA = \frac{\text{Sales}}{\text{Total Assets}}$$

Altman (1968) used the Z-score model to predict the financial distress of state-owned companies. This model provides research criteria for the condition of the company. If a company got Z value of greater than 2.99, it can be concluded that a company is in safe zone. When $Z < 1.81$, the Z value of less than 1.81 implies that the company will very likely go financial distress in the near future. Hence, if a company has Z value of less than 1.81, it is considered

to be in the distress zone. When $1.81 \leq Z \leq 2.99$, Z value of anything in between 1.81 and 2.99 indicates that the company is at grey zone.

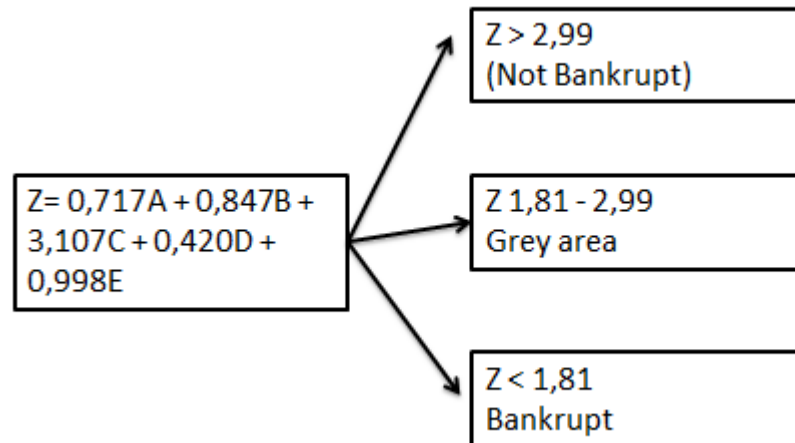


Figure 2.1 Altman Z-score Model

Source: Processed data from various journals

2. Springate S-Score

Gordon L. V Springate (1978) has conducted research related to predictive model of a company's potential financial distress. Springate model is a model which was developed using multidiscriminant analysis. At first Springate uses 19 financial ratios but after doing Springate testing, it takes four ratios. Below is the formula of Springate:

$$S = 1.03A + 3.07B + 0.66C + 0.4D$$

Whereas:

A = Working Capital to Total Assets

B = Net Profit before Interest and Taxes to Total Assets

C = Net Profit before Taxes to Current Liabilities

D = Sales to Total Assets

The following is an explanation of the available ratio variables on Springate models:

a. *Working Capital to Total Asset (A)*

This ratio shows the company's ability to generate net working capital from the total assets owned. This ratio is calculated by dividing working capital by total assets.

$$WCTA = \frac{\text{Working Capital}}{\text{Total Assets}}$$

Negative net working capital is likely to be facing problems in covering its short-term obligations due to the unavailability of sufficient current assets to cover the liabilities.

b. *Net Profit before Interest and Taxes to Total Assets (B)*

This ratio shows the company's ability to generate profits from company assets before interest and tax payments (Kasim: 2014). This ratio is calculated by net income with total assets with the following formula:

$$NPBITTA = \frac{\text{NPBIT}}{\text{Total Assets}}$$

c. *Net Profit Before Taxes to Current Liabilities (C)*

This ratio can be calculated by comparing the net profit before tax with current liability.

$$NPBTTA = \frac{\text{NPBT}}{\text{Current Liabilities}}$$

d. *Sales to Total Assets (D)*

The ratio of sales to total assets measures the ability of a business to generate sales with the smallest possible assets. When the ratio is high enough, it indicates that management is able to squeeze as much the small investment in assets as possible.

$$SaTA = \frac{\text{Sales}}{\text{Total Assets}}$$

Springate (1978) used 4 financial ratios to predict the company's financial distress. This model provides the criteria for assessing the company. If the value of S-Score > 0.862, the company is predicted as a potentially healthy company. While if the value of S-Score < 0.862, the company is predicted as a company that will potentially experience financial distress.

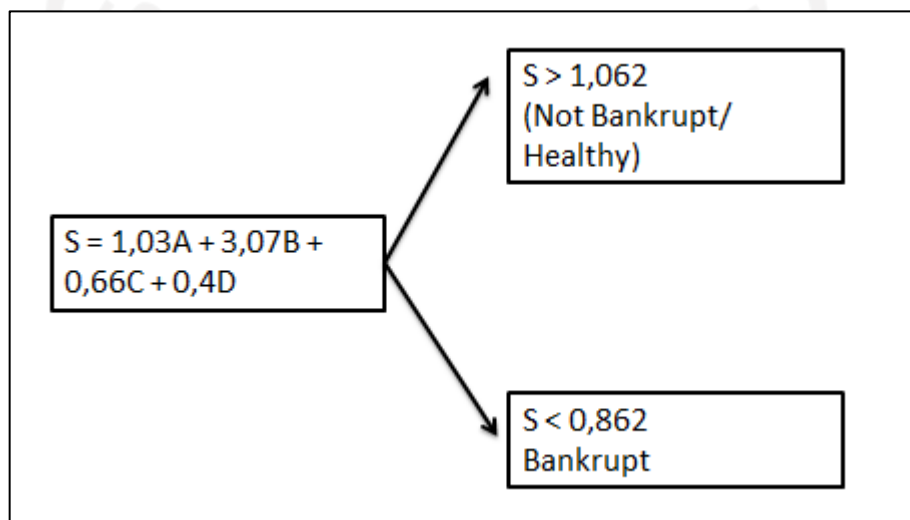


Figure 2.2 Springate Model

Source: Processed data from various journals

3. Zmijewski X-Score

Zmijewski (1983) used liquidity ratio analysis, leverage, and measuring the performance of a company. Zmijewski performed a potency measurement with 75 sample financial distress companies and 73 healthy companies during 1972 to 1978. The F-Test indicator on the ratio of the group rate of return, liquidity, leverage turnover, fixed payment coverage, trend, company size, and stock return volatility showed significant difference between healthy companies and unhealthy. Thus, this model produces the following formula:

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

Whereas:

X_1 = ROA (Return on Asset)

X_2 = Leverage (Debt Ratio)

X_3 = Liquidity (Current Ratio)

X_1 = Net profit/Total Assets

X_2 = Total Debt/Total Assets

X_3 = Current assets/Current Liabilities

The following is an explanation of the ratio variables contained in the Zmijewski model:

a. Return on Asset (X_1)

Return on Assets is a ratio that show the results (return) on the use of company assets in creating net income.

$$ROA = \frac{\text{Net Profit}}{\text{Total Assets}}$$

b. Leverage (or Debt Ratio) (X_2)

The leverage ratio compares the company's total debt burden to its assets or equity. This ratio shows the number of the company's assets owned by shareholders compared to assets owned by creditors.

$$Leverage = \frac{\text{Total Debt}}{\text{Total Assets}}$$

c. Liquidity (Current Ratio) (X_3)

Liquidity reflects the company's ability to meet short-term obligations using the most valuable assets that is easy to liquidate. Assets that can be converted into cash quickly can be

said to be a liquid asset; written on the report finance as current assets.

$$\text{Current Ratio} = \frac{\text{Current Assets}}{\text{Current Liabilities}}$$

Companies that have X-Score values between the upper and lower bounds of the interval range are categorized as companies that are experiencing financial difficulties, or are categorized as vulnerable to financial distress. The smaller the X-Score value of a company, the smaller the possibility of the company experiencing failure or financial distress. $X=0$, it means the company is healthy, but if $X>0$, it can be categorized that the company is in dangerous situation or financial distress.

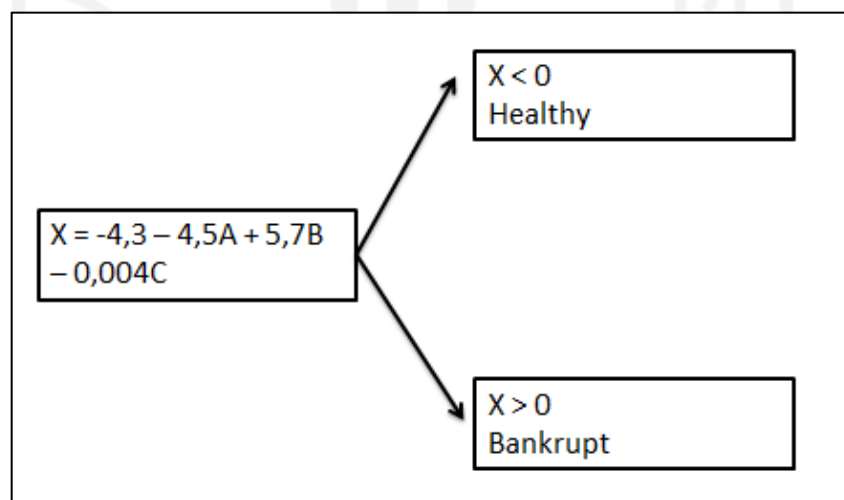


Figure 2.3 Zmijewski Model

Source: Processed data from various journals

2.2. Research Framework

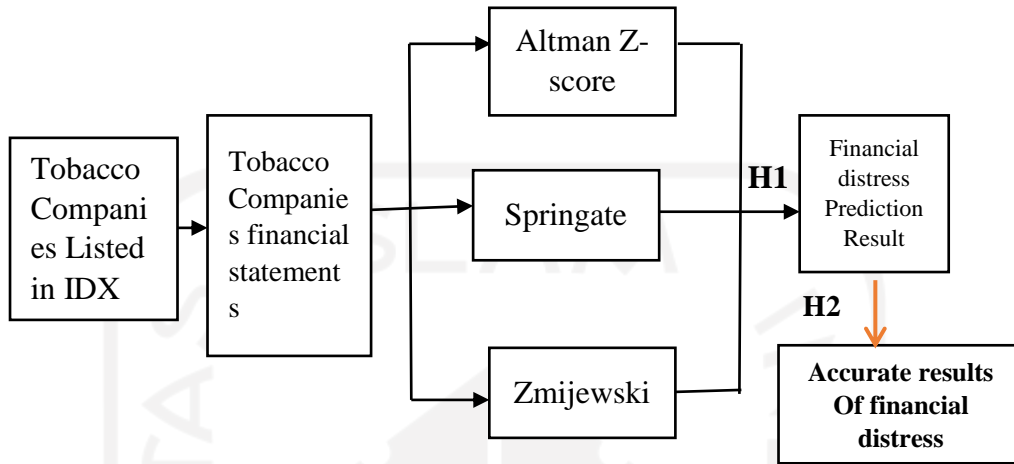


Figure 2.4 Research Framework

2.3. Hypothesis Formulation

In a research conducted by Siekelova et al., (2019, p.89), it was shown that using the Altman Z-Score method from 105 manufacturing companies in Romania, 37 companies were in good health, 39 companies were in the gray area position and 29 companies had the potential to go financial distress. In a research conducted by Tanjung (2020, p.131-132), it is said that the Altman Z-Score and Zmijewski methods predict that all companies do not have the potential to go financial distress.

The Springate S-Score method predicts PT. Indofarma (Persero), Tbk. potentially financial distress. While the Ohlson method predicts PT. Indofarma (Persero), Tbk., PT. Kimia Farma (Persero), Tbk., and PT. Pyridam Farma Tbk. potentially financial distress. According to research conducted by Pulungan and Hartini (2018, p.247), it is said that by using the Springate S-Score method, 8 property companies, namely PT. Alam Sutura Reality, Tbk., PT. Bakrieland Development, Tbk., PT. Bukit Darmo Property, Tbk., PT. Intiland Development, Tbk., PT. Sentul City, Tbk., PT. Cowell Development, Tbk., PT. Bumi Serpong Damai, Tbk., and PT. Megapolitan Development, Tbk. potentially financial distress.

Ditiro (2015) used the Springate model to predict property and real estate companies listed on the IDX. The result is that from the total of 27 companies studied, there were 8 companies that are predicted to be in a healthy condition. There were 9 companies that went financial distress for 3 years, from 2011 to 2013. Five companies experienced a change in category from companies that were predicted to have the potential to go financial distress to companies that were predicted to be in a healthy condition. And finally, there were 5 companies that experienced changes in conditions from companies that were predicted to be healthy to companies that were predicted to experience symptoms of financial distress. Based on the results of those previous studies, the first hypotheses proposed in this research will be ***H1 : There are differences in the results of financial distress prediction using the Altman Z-Score, Springate and Zmijewski methods***

The results of research conducted by Meita (2015, p.18), it provides the conclusion of the Altman Z-Score model and the Springate model are financial distress prediction model that gives the same high value in predicting financial distress of coal mining companies with a financial distress prediction value of 88.89%. Meiliawati & Isharijadi (2016, p.20) the Springate model is the most accurate model in predicting the potential for financial distress of cosmetic sector companies listed on the Indonesia Stock Exchange with an accuracy percentage of 91.66%, where the accuracy of the model is 91.66%. However Andriani & Sihombing (2021, p.173) stated in their research that the Zmijewski X-Score model is the most accurate model in predicting financial distress in the property and real estate sectors listed on the Indonesia Stock Exchange (IDX) by 90% . Based on the results of those previous studies, the second hypotheses proposed in this research ***H2 : There are differences in accuracy level of the Altman Z-Score, Springate and Zmijewski methods in predicting financial distress.***

CHAPTER III RESEARCH METHOD

3.1. Research design

This research was a quantitative descriptive analysis model, which was carried out by collecting, clarifying, analyzing and interpreting the data obtained from the company. Thus, it can provide things by what actually happened. This research used quantitative research with descriptive comparative research approach. Descriptive comparatives compare the same variables for different samples. This descriptive comparative research compared the accuracy of the Altman Z-Score, Springate S-Score and Zmijewski X-Score models in predicting the financial distress of Tobacco companies.

3.2. Population and Sample

3.2.1. Population

The population used in this research were tobacco companies that listed in the Indonesia Stock Exchange for the period of 2017-2021.

Table 3.1. Tobacco Companies

1.	Gudang Garam Tbk	GGRM
2.	H.M. Sampoerna Tbk	HMSP
3.	Bentoel Internasional Investama Tbk	RMBA
4.	Wismilak Inti Makmur Tbk	WIIM
5.	Indonesian Tobacco Tbk	ITIC

Source: Indonesia Stock Exchange, 2021

3.2.2. Sample

In this research, the sample used was the same as the existing population. The sample selection was used by using saturation sampling technique in order to obtain all 5 companies. This research was conducted using the method of financial statement analysis with the discriminant analysis of Altman Z-score,

Springate S-Score and Zmijewski X-Score based on financial report data obtained from the Indonesia Stock Exchange website. The accuracy of the model was used to determine which model was the most appropriate in predicting company financial distress.

3.3. Research Variable

Table 3.2. Research variable of Altman Z-Score, Springate S-Score, Zmijewski X-Score, and financial distress

No	Variable	Variable concept	Indicator	Scale
1	Altman Z-Score model	The cut off values are 2.99 and 1.81. With the Z value of 2.99, the company will not experience financial distress in the future. and the company between 1.81 and 2.99 is in the grey area. If the value is less than 1.81, the company will potentially go financial distress in the future.	$Z = 0.717A + 0.874B + 3.107C + 0.420D + 0.998E$ <p>Z = Overall Index or Score A= Working Capital to Total Assets B = Retained Earnings to Total Assets C = Earnings before Interest & Tax to Total Assets D = Market Capitalization to Total Liabilities E = Sales to Total Assets</p>	Ratio

3	Springate Model	<p>The Springate model that has the company standard score of $S > 0.862$ is said to be a healthy company. If $S < 0.862$, it is said to have the potential for financial distress.</p>	$S = 1.03A + 3.07B + 0.66C + 0.4D$ <p>A = Working Capital to Total Assets B = Net Profit before Interest and Taxes to Total Assets C = Net Profit before Taxes to Current Liabilities D = Sales to Total Assets</p>	Ratio
2	Zmijewski Model	<p>With cut off, when the score is more than 0, the company is predicted to go financial distress. If the company score is less than 0, it is predicted not to go financial distress.</p>	$X = -4.3 - 4.5A + 5.7B - 0.004C$ <p>A= ROA (Return on Asset) B= Leverage Debt Ratio) C= Likuidity Current Ratio)</p>	Ratio

4	Financial distress Prediction	Financial distress prediction is an important application in finance to help make accurate decisions for companies (Zhang et al., 2021, p.185).	Category 0 = healthy, Category1= financial distress Category 2= grey	Ratio
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3.4. Data and Source of Data

To obtain relevant data, it can be used as a basis in the analysis process. The researchers used data collection with the documentation method (using secondary data). The documentation method is a research method sourced from written objects. The documentation method in this research is to obtain secondary data from the financial statements of tobacco companies listed in the Indonesia Stock Exchange (IDX).

3.5. Data Analysis Method

In processing the data, the tool that the researcher used were Microsoft Excel 2010 and SPSS 20 version to check the result and hypothesis testing.

1. In order to answer the first problem formulation, the thing that must be done is to enter the required elements from GGRM, HMSP, RMBA, ITIC, and WIIM financial statements from 2016-2020. Thus, the Altman Z-Score can be formulated as follows:

$$Z\text{-Score} = 0.717A + 0.847B + 3.107C + 0.420D + 0.998E$$

whereas:

A = Working Capital / Total Assets

B = Retained Earnings / Total Assets

C = Profit Before Interest and Tax / Total Assets

D = Market Value of Equity / Book Value of Total Debt

E = Sales / Total Assets

If the calculation can show the results of the prediction of the financial distress/health of tobacco companies, it can be concluded that the Altman Z-Score model can be categorized to assess the financial distress of tobacco companies.

2. In order to answer second problem formulation, the thing that must be done is to enter the required elements from GGRM, HMSP, RMBA, ITIC, and WIIM financial statements from 2016-2020. Thus, the Springate S-Score can be formulated as follows:

$$S\text{-score} = 1.03A + 3.07B + 0.66C + 0.4D$$

whereas:

S= Index Springate

A = Working Capital / Total Assets (Working Capital to Total Assets)

Work = Current Assets – Liabilities

B= Income before Interest and Taxes / Total Assets (Earning Before Interest and Taxes to Total Assets)

C= Income Before Tax / Current Liabilities (Earning Before Interest and Taxes to Current Liabilities)

D= Sales / Total Assets (Sales to Total Assets)

If the calculation can show the results of the prediction of the financial distress/health of tobacco companies, it can be concluded that the Springate S-Score model can be categorized to assess the financial distress of tobacco companies.

3. In order to answer third problem formulation, the thing that must be done is to enter the required elements from GGRM, HMSP, RMBA, ITIC, and WIIM financial statements from 2016-2020. Thus, the Zmijewski X-Score can be formulated as follows:

$$Y = -4.3 - 4.5A + 5.7B - 0.004C$$

whereas:

A = ROA

B = Debt Ratio

C = Current Ratio

If the calculation can show the results of the prediction of the financial distress/health of tobacco companies, it can be concluded that the Zmijewski X-Score model can be categorized to assess the financial distress of tobacco companies.

4. In order to answer question number 4 (hypothesis test for H1), the first thing to do is to compare the results of the three methods (Altman Z-Score, Springate S-Score, and Zmijewski X-Score). Then after getting the comparison results, normality test is done. In this section to know the significant differences result, Kruskal Wallis test is done. It is a ranking-based nonparametric test whose purpose is to determine whether there are statistically significant differences between two or more groups of independent variables on the dependent variable on a numerical data scale (interval or ratio) and ordinal scale. Kruskal Wallis test steps:
 - a. Creating an acceptance area:

Ho: There are no differences in the results of financial distress prediction using the Altman Z-Score, Springate and Zmijewski methods.

Ha: There are differences in the results of financial distress prediction using the Altman Z-Score, Springate and Zmijewski method methods
 - b. Determine the level of significance by using 0.05 level of significance. If the test results show Asymp. Sig. (2-sided) less than 0.05, Ho is rejected and Ha is accepted. If the test results show Asymp. Sig. (2-sided) more than 0.05, Ho is accepted and Ha is rejected.
5. To answer problem formulation number 5 (hypothesis test for H2) by which prediction model is the most accurate in predicting the financial distress of tobacco companies in Indonesia, it is done by

calculating the correct or incorrect estimates to test the level of accuracy in predicting financial distress.

This study uses the measurements used by Husein and Pambekti (2014) and determines financial distress using a comparison of ROE with the BI rate in the year concerned as the real condition of the company. The dependent measure on this variable is the Dummy variable, If the ROE is greater than the BI rate, it will be coded "0" or in other words the company categorized to be healthy. Then if the ROE value less than the BI rate but still greater than 0, it means that the company still can produce the net profit but it is under BI Rate so it is categorized as grey area or the company experienced loss (coded by "2"), then if the company's ROE is less than 0 or in negative, it will be concluded that the company experiencing financial distress (it is coded by "1"). ROE or return on equity is one of the important elements to determine the extent to which a business is able to manage the capital of its investors. Afterwards, compare them with the prediction results of Altman, Springate, and Zmijewski.

To find out whether there is a difference in the accuracy results in knowing which model has the highest accuracy, it can be done using the chi square test. The steps to perform the chi square test are as follow:

- Creating an acceptance area:

Ho: There are no significant differences in accuracy level of the Altman Z-Score, Springate and Zmijewski methods in predicting financial distress.

Ha: There are significant differences in accuracy level of the Altman Z-Score, Springate and Zmijewski methods in predicting financial distress.

- Determine the level of significance by using 0.05 level of significance. If the test results show Asymp. Sig. (2-sided) less than 0.05, Ho is rejected and Ha is accepted, and if the

test results show Asymp. Sig. (2-sided) more than 0.05, Ho is accepted and Ha is rejected.

- The level of accuracy shows the results of the percentage of the prediction model correctly from the entire sample. The level of accuracy is calculated as follows:

- **Accuration level =**
$$\frac{\text{the sample that proven to be true}}{\text{total sample}} \times 100\%$$



CHAPTER IV

RESEARCH FINDINGS, DISCUSSION, AND IMPLICATION

4.1. Research description

1. Data Description

In using Altman Z-Score, Springate S-Score, and Zmijewski X-Score models, the required financial statement are Sales, EBIT, EBT, Current assets, Total assets, Current liabilities, Total Liabilities, Retained Earning, Net Profit, Market capitalization, and Working capital listed on:

- Balance Sheet of GGRM, HMSP, RMBA, ITIC and WIIM as of December 31 2016-2020.

- Income statement of GGRM, HMSP, RMBA, ITIC and WIIM as of December 31, 2016-2020.

Table 4.1. Financial Statement of GGRM (in million rupiah)

GGRM	Year				
	2016	2017	2018	2019	2020
Sales	76.274.147	83.305.925	95.707.663	110.523.819	57.340.043
EBIT	16.616.716	18.221.662	18.644.327	22.783.255	17.388.244
EBT	10.122.038	11.237.253	11.156.804	15.073.090	9.663.133
Current_Asset	41.933.173	43.764.490	45.284.719	52.081.133	7.647.729
Total_Asset	62.951.634	66.759.930	69.097.219	78.647.274	78.191.409
Current_Liabilities	23.387.406	24.572.266	22.003.567	25.258.727	17.009.992
Total_Liabilities	23.387.406	24.572.266	23.963.934	27.716.516	19.668.941

Retained_Earning	36.699.588	40.986.735	43.950.868	43.950.868	57.340.043
Net_Profit	6.672.682	7.755.347	7.793.068	10.880.704	7.647.729
Market_cap	122.949.223	161.238.574	160.901.859	101.976.664	78.887.608
Working_capital	18.545.767	19.192.224	23.281.152	26.822.406	-

Source: Processed secondary data, 2022

Table 4.2. Financial Statement of HMSP (in million rupiah)

HMSP	Year				
	2016	2017	2018	2019	2020
Sales	95.466.657	99.091.484	106.741.891	106.055.176	92.425.210
EBIT	23.854.676	24.215.842	25.490.791	26.122.981	18.771.235
EBT	17.011.447	16.894.806	17.961.269	18.259.423	11.161.466
Current_Asset	33.647.496	34.180.353	37.831.483	41.697.015	41.091.638
Total_Asset	42.508.277	43.141.063	46.602.420	50.902.806	49.674.030
Current_Liabilities	6.428.478	6.482.969	8.793.999	12.727.676	16.743.834
Total_Liabilities	8.333.263	9.028.078	11.244.167	15.223.076	19.432.604
Retained_Earned	12.530.625	12.486.976	13.635.669	13.934.964	8.478.617
Net_Profit	12.762.229	12.670.534	13.538.418	13.721.513	18.771.235

Market_cap	445.498.235	550.484.504	431.540.065	244.267.961	175.058.706
Working_capital	27.219.018	27.697.384	29.037.484	28.969.339	24.347.804

Source: Processed secondary data, 2022

Table 4.3. Financial Statement of RMBA (in million rupiah)

RMBA	Year				
	2016	2017	2018	2019	2020
Sales	19.228.981	20.258.870	21.923.057	20.834.699	13.890.914
EBIT	- 757.999	- 313.675	- 215.217	- 315.938	- 2.422.879
EBT	- 1.391.369	- 400.127	- 324.590	- 29.138	- 2.649.762
Current_Asset	8.708.423	9.005.061	9.584.354	11.598.066	8.283.505
Total_Asset	13.470.943	14.083.598	14.879.589	17.000.330	12.464.005
Current_Liabilities	3.625.665	4.687.842	6.028.559	6.083.396	3.769.077
Total_Liabilities	4.029.576	5.159.928	6.513.618	8.598.687	6.755.055
Retained_Earned	- 5.789.930	- 6.307.627	- 6.865.326	- 6.829.654	- 9.522.347
Net_Profit	- 2.086.000	- 480.063	- 608.463	- 50.612	- 2.666.991
Market_cap	17.618.150	13.832.432	11.357.155	12.012.000	12.376.000
Working_capital	5.082.758	4.317.219	3.555.795	5.514.670	4.514.428

Source: Processed secondary data, 2022

Table 4.4. Financial Statement of ITIC in million rupiah

ITIC	Year				
	2016	2017	2018	2019	2020
Sales	82.017	113.377	134.518	166.565	224.296
EBIT	11.531	24.069	24.492	28.019	37.461
EBT	- 1.094	- 11.733	- 11.430	- 3.306	- 13.885
Current_Asset	30.357	27.787	34.570	89.879	142.831
Total_Asset	166.316	161.111	355.679	447.812	505.077
Current_Liabilities	149.376	135.964	130.150	140.593	158.228
Total_Liabilities	157.649	44.600	149.662	181.661	225.251
Retained_Earned	- 24.666	- 16.821	- 7.435	- 15.027	- 8.278
Net_Profit	- 1.483	- 8.672	- 8.249	- 7.000	- 6.120
Market_cap	-	-	-	2.445.872	611.468
Working_capital	- 119.019	- 108.177	- 95.580	- 50.715	- 15.397

Source: Processed secondary data, 2022

Table 4.5. Financial Statement of WIIM (in million rupiah)

WIIM	Year				
	2016	2017	2018	2019	2020
Sales	1.685.796	1.476.427	1.405.384	1.393.574	1.994.067

EBIT	134.384	44.173	57.094	30.791	208.118
EBT	136.663	54.491	70.731	42.874	215.214
Current_Asset	996.925	861.172	888.980	948.430	1.288.719
Total_Asset	1.353.634	1.225.712	1.255.574	1.299.522	1.614.442
Current_Liabilities	293.712	160.791	150.202	157.444	351.791
Total_Liabilities	362.541	247.621	250.337	266.351	428.590
Retained_Earned	470.639	455.694	482.088	509.241	660.728
Net_Profit	106.290	40.590	51.143	27.328	172.507
Market_cap	923.944	608.963	296.082	352.779	1.133.932
Working_capital	703.213	700.382	738.778	790.986	936.928

Source: Processed secondary data, 2022

4.2. Research Findings

1. Altman Z-Score Method result

The first test was carried out on the Altman model, using the formula $Z\text{-Score} = 0.717A + 0.847B + 3.107C + 0.420D + 0.998E$ here are the calculation results (more complete calculations can be found in appendix 4.6):

Table 4.6.

Altman Z-Score Method result of GGRM, HMSP, RMBA, ITIC and WIIM

No.	Company	Company Code	Year	ALTMAN ZSCORE	Prediction	Code
1	Gudang Garam	GGRM	2017	4,942	Healthy	0
			2018	5,575	Healthy	0
			2019	5,821	Healthy	0

			2020	4,566	Healthy	0
			2021	3,643	Healthy	0
2	Hanjaya Mandala Sampoerna Tbk	HMSP	2017	27,147	Healthy	0
			2018	30,351	Healthy	0
			2019	20,799	Healthy	0
			2020	11,053	Healthy	0
			2021	7,311	Healthy	0
3	Bentoel Internasional Investama Tbk	RMBA	2017	2,993	Healthy	0
			2018	2,333	Grey	1
			2019	1,938	Grey	1
			2020	1,760	Financial distress	1
			2021	0,890	Financial distress	1
4	Indonesian Tobacco	ITIC	2017	0,069	Financial distress	1
			2018	0,597	Financial distress	1
			2019	0,381	Financial distress	1
			2020	6,111	Healthy	0
			2021	1,778	Financial distress	1
5	Wismilak Inti Makmur Tbk	WIIM	2017	3,289	Healthy	0
			2018	3,072	Healthy	0
			2019	2,502	Grey	1
			2020	2,468	Grey	1
			2021	3,507	Healthy	0

Source: Processed secondary data, 2022

Based on table 4.6, it shows that when using the Altman Z-Score prediction, Gudang Garam Tbk company is a company that is financially healthy. This is shown from the results of the Altman z-score in 2017-2021, which are 4,942; 5.575; 5,821; 4,566 and 3.643, which means that all values above the cut off of 2.99 indicate that the Gudang Garam company is not predicted to go financial distress.

For the prediction results of Hanjaya Mandala Sampoerna Tbk, Altman also indicated that in the 2017-2021 period, the company did not experience financial

difficulties because all of Altman's results showed more than the cut off value of 2.99. In 2017 it was 27,147, in 2018 it was 30,351, in 2019 it was 20,799, in 2020 it was 11,053 and for 2021 it was 7,311. So it can be predicted that this company will not go financial distress.

The results of the Altman z-score calculation at Bentoel International Investama Tbk show that from 2017 to 2021 there was a significant decline, namely 2,993; 2,333; 1.938; 1.760 and 0.890. In these results it can be concluded that RMBA experienced a healthy condition in 2017 then turned into a company that experienced in the grey zone or had the potential to go financial distress in 2018 and 2019, and the last one experienced financial distress in 2020-2021.

The results of the Altman z-score calculation at Indonesia Tobacco Tbk show that from 2017 to 2021 there were successive ups and downs, namely 0.069; 0.597; 0.381; 6,111 and 1,778. In these results, it can be concluded that ITIC experienced a predictive picture of companies that had financial distress financial conditions in 2017, 2018, 2019. Then turned into a company that had a healthy financial condition in 2020, then surprisingly in 2021 experienced a significant decline, namely to 1.778 which means the company is in financial distress.

The result of the Altman z-score calculation at Wismilak Inti Makmur Tbk shows that from 2017 to 2021 it experienced ups and downs, which were 3,289; 3,072; 2,502; 2,468 and 3,507. From these results, it can be concluded that WIIM experiences a picture of the condition of companies that have good financial conditions, namely based on their value which is not below 1.81.

2. Springate S-Score Method result

The second test was carried out on the Springate model using the formula $S\text{-score} = 1.03A + 3.07B + 0.66C + 0.4D$, here are the calculation results (more complete calculations can be found in appendix 4.7):

Table 4.7.

Springate S-Score Method result of GGRM, HMSP, RMBA, ITIC and WIIM

No.	Company	Company Code	Year	SPRIN GATE S-SCORE	Prediction	Code
1	Gudang Garam	GGRM	2017	1,884	Healthy	0
			2018	1,935	Healthy	0
			2019	2,064	Healthy	0
			2020	2,197	Healthy	0
			2021	1,228	Healthy	0
2	Hanjaya Mandala Sampoerna Tbk	HMSP	2017	5,027	Healthy	0
			2018	5,023	Healthy	0
			2019	4,585	Healthy	0
			2020	3,942	Healthy	0
			2021	2,849	Healthy	0
3	Bentoel Internasional Investama Tbk	RMBA	2017	0,534	Financial distress	1
			2018	0,766	Financial distress	1
			2019	0,756	Financial distress	1
			2020	0,885	Healthy	0
			2021	-0,242	Financial distress	1
4	Indonesian Tobacco	ITIC	2017	-0,332	Financial distress	1
			2018	0,105	Financial distress	1
			2019	0,144	Financial distress	1
			2020	0,209	Financial	1

					distress	
			2021	0,432	Financial distress	1
5	Wismilak Inti Makmur Tbk	WIIM	2017	1,645	Healthy	0
			2018	1,405	Healthy	0
			2019	1,504	Healthy	0
			2020	1,308	Healthy	0
			2021	1,891	Healthy	0

Source: Processed secondary data, 2022

Based on table 4.7 it shows that when using the Springate S-Score prediction, Gudang Garam Tbk company is a company that is financially healthy. This is shown from the results of the Springate S-Score in 2017 to 2021, which are 1,884;1,935; 2,064; 2,197 and 1,228, which means that all values above the cut off of 0,862 indicate that the Gudang Garam company is not predicted to go financial distress.

For the prediction results of Hanjaya Mandala Sampoerna Tbk, Springate model also indicated that in the 2017-2021 period, the company did not experience financial difficulties because all of Springate's results showed more than the cut off value of 0,862. In 2017 it was 5,027, in 2018 it was 5,023, in 2019 it was 4,585, in 2020 it was 3,942 and for 2021 it was 2,849. So it can be predicted that this company will not go financial distress.

The results of the Springate S-Score calculation at Bentoel International Investama Tbk show that from 2017 to 2021 there are results almost every year experiencing financial difficulties/financial distresses except in 2020. In 2017 RMBA was indicated to be financial distress with a score of 0.534 which means less than the cut-off value is 0.862. Then in 2018 the score increased but still not more than 0.862, which is 0.766, which means that they are still experiencing financial difficulties. Likewise, in 2019 it decreased to 0.756. In 2020 became turning point because it experienced an increase in the score to more than the cut off value of 0.885 which indicated that the financial situation was improving,

which meant that it was not in a state of financial distress. However, in 2021 it experienced a very large score decline to -0.242, which means that the RMBA is in a state of financial distress.

The results of the Springate S-Score calculation at Indonesia Tobacco Tbk show that from 2017 to 2021 experiencing financial distress. All scores are not higher than the cut off value of 0.862. However, even though all scores are below the cut off score, at least they have increased their scores little by little every year. It can be concluded that according to the Springate, ITIC's financial improvements have been made every year, the score increased from 2017-2021 by -0.332; 0.105; 0.144; 0.209 and 0.432.

The result of the Springate calculation at Wismilak Inti Makmur Tbk shows that from 2017 to 2021 are in healthy financial condition. All scores indicate that the results are more than the cut off value of 0.862. In 2017 it was 1,645, in 2018 it was 1,405, then in 2019 it was 1,50, in 2020 it was 1,308 and in 2021 it was the biggest score of 1,891. Even though the results all show healthy in WIIM, the numbers still go up and down every year.

3. Zmijewski X-Score Method result

The third test was carried out on the Zmijewski model using the formula $X\text{-Score} = -4.3 - 4.5A + 5.7B - 0.004C$, here are the calculation results (*more complete calculations can be found in appendix 4.8*):

Table 4.8.
Zmijewski X-Score's method result of GGRM, HMSP, RMBA, ITIC and WIIM

No.	Company	Company Code	Year	ZMIJEWSKI X-SCORE	Prediction	Code
1	Gudang Garam	GGRM	2017	-2,652	Healthy	0
			2018	-2,718	Healthy	0
			2019	-2,822	Healthy	0
			2020	-2,906	Healthy	0

			2021	-3,305	Healthy	0
2	Hanjaya Mandala Sampoerna Tbk	HMSP	2017	-4,513	Healthy	0
			2018	-4,408	Healthy	0
			2019	-4,215	Healthy	0
			2020	-3,795	Healthy	0
			2021	-3,761	Healthy	0
3	Bentoel Internasional Investama Tbk	RMBA	2017	-1,889	Healthy	0
			2018	-2,051	Healthy	0
			2019	-1,614	Healthy	0
			2020	-1,423	Healthy	0
			2021	-0,239	Healthy	0
4	Indonesian Tobacco	ITIC	2017	1,144	Financial distress	1
			2018	-2,963	Healthy	0
			2019	-2,005	Healthy	0
			2020	-1,915	Healthy	0
			2021	-1,809	Healthy	0
5	Wismilak Inti Makmur Tbk	WIIM	2017	-3,113	Healthy	0
			2018	-3,276	Healthy	0
			2019	-3,323	Healthy	0
			2020	-3,202	Healthy	0
			2021	-3,253	Healthy	0

Source: Processed secondary data, 2022

Based on table 4.8, it shows that when using the Zmijewski prediction, Gudang Garam Tbk company is a company that is financially healthy. This is shown from the results of the Zmijewski X-Score in 2017-2021, which are -2,652; -2,718; -2,822; -2,906 and -3,305, which means that all values less than the cut off of 0 indicate that the Gudang Garam company is not predicted to go financial distress.

For the prediction results of Hanjaya Mandala Sampoerna Tbk, Zmijewski model also indicated that in the 2017-2021 period, the company did not experience financial difficulties because all of Zmijewski's results showed less than the cut off value of 0. In 2017 it was -4,513, in 2018 it was -4,408, in 2019 it

was -4,215, in 2020 it was -3,795 and for 2021 it was -3,761. So it can be predicted that this company will not go financial distress.

The results of the Zmijewski calculation at Bentoel International Investama Tbk show that from 2017 to 2021 is very different from the results of the previous method. Previously, in Springate, the results showed that almost every year it went financial distress, then in Zmijewski, it showed the opposite, namely from 2017 to 2021 RMBA was in a healthy financial position and was not indicated to be financial distress because Zmijewski's score showed all below the cut off value of 0. In 2017 it was equal to -1.889, then in 2018 it was -2.051, in 2019 it was -1.614, in 2020 it was -1.423, in 2021 it was -0.239.

The results of the Zmijewski X-Score calculation at Indonesia Tobacco Tbk show that from 2018 to 2021 not experiencing financial distress except in 2017. All scores in 2018-2021 are not higher than the cut off value of 0 which is -2.964, -2.005, -1.915, and -1.809, so that it can be categorized as a company in a financially healthy condition. However, in 2017 the Zmijewski score showed a number above the cut off value of 1.144, which means it is said to be potentially financial distress.

The result of the Zmijewski calculation at Wismilak Inti Makmur Tbk showed that from 2017 to 2021 is in healthy financial condition. All scores indicate that the results are less than the cut off value of 0. In 2017 it was -3,113, in 2018 it was -3,276, then in 2019 it was -3,323, in 2020 it was -3,202 and in 2021 it was the biggest score of -3,253. Even though the results all show healthy in WIIM, the numbers still go up and down every year.

4. Descriptive statistics

The descriptive statistics of this research describe the mean (maximum), maximum, minimum, and standard deviation of each variable. The descriptive statistical results of the Altman Model, Springate Model, and Zmijewski Model variables are shown in the table below:

Table 4.9 Descriptive Statistics of Altman, Springate, and Zmijewski models

	N	Minimum	Maximum	Mean	Std. Deviation
ALTMAN_PREDICT	25	0	2	.56	.768
SPRINGATE_PREDICT	25	0	1	.36	.490
ZMIJEWSKI_PREDICT	25	0	1	.04	.200
Valid N (listwise)	25				

Source: Processed secondary data, 2022

The results of descriptive statistical seen in Table 4.9 can be explained as follows:

- a. The Altman model has a total of 25 data with a minimum value of 0, a maximum value of 2, an average value of 0.56 and a standard deviation of 0.768.
- b. The Springate model has a total of 25 data with a minimum value of 0, a maximum value of 1, an average value of 0.36 and a standard deviation of 0.490.
- c. The Zmijewski model has a total of 25 data with a minimum value of 0, a maximum value of 1, an average value of 0.04 and a standard deviation of 0.200.

5. Normality Test

Data normality is something that must be done in every parametric test. One of the normality tests is by using the Kolmogorov-Smirnov method. A data can be said to be normal if it has a significance value of more than 0.05 (sig. > 0.05). On the other hand, the data is said to be abnormal if it has a significance value of less than 0.05 (sig. < 0.05).

Table 4.10 Tests of Normality

	METODE	Kolmogorov-Smirnov ^a		
		Statistic	df	Sig.
status_with_grey	ALTMAN ZSCORE	.367	25	.000
	SPRINGATE S-SCORE	.409	25	.000
	ZMIJEWSKI X-SCORE	.539	25	.000

a. Lilliefors Significance Correction

Source: Processed secondary data, 2022

As shown in the normality table 4.10, the result is that Altman gets a significant value of 0.000, Springate gets a significant value of 0.000, and Zmijewski also gets a significant value of 0.000. These three values are smaller than the significant value of 0.05 to produce data that are normally distributed. So it can be said that the data in this study are not normally distributed. If the data are not normally distributed, the next step that can be taken to test whether there is a significant difference between the results of the three models is using non parametric model Kruskal Wallis test on SPSS 20.00.

6. Hypothesis Testing

1. Hypothesis 1

Kruskal Wallis Statistic Test

Table 4.11a
Ranks of Altman, Springate, and Zmijewski for Kruskal Wallis test

	METODE	N	Mean Rank
status	ALTMAN ZSCORE	25	43.80
	SPRINGATE S- SCORE	25	40.78
	ZMIJEWSKI X- SCORE	25	29.42
	Total	75	

Source: Processed secondary data, 2022

Table 4.11b

Kruskal Wallis Test Statistics^{a,b}

	Prediction status
Chi-Square	10.156
df	2
Asymp. Sig.	.006

a. Kruskal Wallis Test

b. Grouping Variable: METODE

Source: Processed secondary data, 2022

Ho: There are no differences in the results of financial distress prediction using the Altman Z-Score, Springate and Zmijewski methods

Ha: There are differences in the results of financial distress prediction using the Altman Z-Score, Springate and Zmijewski method methods

The results of the Kruskal Wallis test (table 4.11b) showed that the Asymp Sig. Value is 0.006, which means that the value is less than the significant value of 0.05. This means that Ho is rejected and Ha is accepted. In this research cleared that there are differences in the results of financial distress prediction using the Altman Z-Score, Springate and Zmijewski method methods in Tobacco Company that listed in Indonesian Stock Exchange periode 2017-2021. This difference can be seen from the prediction results of RMBA, ITIC, and WIIM.

In RMBA, Altman and Zmijewski predict that the company's condition in 2017-2019 is in good health, but Springate considers that RMBA is in a state of financial distress/financial distress. After that in 2020 Springate and Zmijewski assessed that the company was in good health, but Altman assessed that RMBA was in a state of financial distress/financial distress. In 2021, Altman and Springate assessed that the RMBA company would be in a state of Financial distress, but the results from Zmijewski assessed that the company was in a healthy condition.

In ITIC, Altman and Zmijewski predict that the company's condition in 2017 is in financial distress condition, but Springate considers that ITIC is in healthy condition. After that in 2018 and 2019, Springate and Zmijewski assessed that the company was in good/healthy condition, but Altman assessed that ITIC is in a state of financial distress/financial distress. In 2020 all of three models get the same result.then in 2021, Springate and

Zmijewski assessed that the ITIC would be in a healthy condition, but the results from Altman assessed that the company was in a state of financial distress. In WIIM, Altman Z-Score result is 2019-2020 the company predicted to be in grey condition.

Table 4.12

The difference prediction results of Altman, Springate, and Zmijewski all companies

Company Code	Year	ALTMAN ZSCORE	SPRINGATE S-SCORE	ZMIJEWSKI X-SCORE
GGRAM	2017	0	0	0
	2018	0	0	0
	2019	0	0	0
	2020	0	0	0
	2021	0	0	0
HMSP	2017	0	0	0
	2018	0	0	0
	2019	0	0	0
	2020	0	0	0
	2021	0	0	0
RMBA	2017	0	1	0
	2018	2	1	0
	2019	2	1	0
	2020	1	0	0
	2021	1	1	0
ITIC	2017	1	0	1
	2018	1	0	0
	2019	1	0	0
	2020	0	0	0
	2021	1	0	0
WIIM	2017	0	0	0
	2018	0	0	0
	2019	2	0	0
	2020	2	0	0
	2021	0	0	0

Source: Processed secondary data, 2022

2. Hypothesis 2

In determining to test the hypothesis, first thing must be done namely by calculating the first comparison of the results of the Altman, Springate, and Zmijewski models against real conditions based on the BI rate and ROE formula (appendix 4.13) from 2017-2021 at the tobacco company. If the results are the same it will be categorized as 'accurate', and if the results are not the same it will be categorized as “not accurate”, it shows in table 4.13.

Table 4.13
Accuration result of Altman, Springate, and Zmijewski for chi square test

Compa ny Code	Year	ALTMAN ZSCORE	SPRING ATE S- SCORE	ZMIJEW SKI X- SCORE
GGRM	2016	Accurate	Accurate	Accurate
	2017	Accurate	Accurate	Accurate
	2018	Accurate	Accurate	Accurate
	2019	Accurate	Accurate	Accurate
	2020	Accurate	Accurate	Accurate
HMSP	2016	Accurate	Accurate	Accurate
	2017	Accurate	Accurate	Accurate
	2018	Accurate	Accurate	Accurate
	2019	Accurate	Accurate	Accurate
	2020	Accurate	Accurate	Accurate

RMBA	2016	*Not Accurate	Accurate	*Not Accurate
	2017	*Not Accurate	Accurate	*Not Accurate
	2018	Accurate	*Not Accurate	*Not Accurate
	2019	Accurate	*Not Accurate	*Not Accurate
	2020	Accurate	Accurate	*Not Accurate
ITIC	2016	*Not Accurate	Accurate	*Not Accurate
	2017	*Not Accurate	*Not Accurate	*Not Accurate
	2018	Accurate	*Not Accurate	*Not Accurate
	2019	*Not Accurate	*Not Accurate	*Not Accurate
	2020	*Not Accurate	Accurate	Accurate
WIIM	2016	*Not Accurate	*Not Accurate	*Not Accurate
	2017	*Not Accurate	*Not Accurate	*Not Accurate
	2018	Accurate	*Not	*Not

			Accurate	Accurate
	2019	*Not Accurate	Accurate	Accurate
	2020	Accurate	Accurate	Accurate

Source: Processed secondary data, 2022

Table 4.13 shows that almost half of the scores calculated by Altman, Springate and Zmijewski are categorized as accurate. Most of the inaccuracies occurred when processing data belonging to RMBA, ITIC, and WIIM. Then the next step is to do the Chi square test.

Chi Square Test (for H2)

Table 4.14

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	1.462 ^a	2	.481
Likelihood Ratio	1.453	2	.484
Linear-by-Linear Association	.749	1	.387
N of Valid Cases	75		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 9.67.

Source: Processed secondary data, 2022

Ho: There are no significant differences in accuracy level of the Altman Z-Score, Springate and Zmijewski methods in predicting financial distress.

Ha: There are significant differences in accuracy level of the Altman Z-Score, Springate and Zmijewski methods in predicting financial distress.

The results of the chi square test (Table 4.14) on the three models in the level of accuracy stated that Asymp. Sig. (2-sided) is 0.481, which means that this value is greater than the significant value of 0.05, so it can be concluded that Ho is accepted and Ha is rejected. In other words, in this research, the accuracy of the three models do not experience a significant difference in predicting financial distress against the real condition of tobacco companies. This can be proven by the results of the calculation of the accuracy level in table 4.15 where the results of the calculations of Altman Z-Score on 5 companies, there are 16 times accurate results and 9 times not accurate results from 25 total prediction, then Springate S-Score with the result 17 times accurate results and 8 times not accurate results from 25 total prediction, and Zmijewski is followed by 13 times accurate results and 12 times inaccurate results from 25 total prediction.

Table 4.15
Accuration Status Of Altman, Springate, and Zmijewski

MODELS	ACCURACY_STATUS		Total
	Not_Accurate	Accurate	
ALTMAN ZSCORE	9	16	25
SPRINGATE S-SCORE	8	17	25
ZMIJEWSKI X-SCORE	12	13	25
Total	29	46	75

Source: Processed secondary data, 2022

3. Accuration level

The calculation of the accuracy level here is calculated based on the weight of each result (Table 4.16). If 1 result is correct it will be given a

value of 1, if the result of 1 prediction is half correct then it will be given a weight of 0.5, and if the result of 1 prediction is wrong it will be given a value of 0. The accuracy level is obtained from the total value of each model then divided by the total of all predictions then multiplied by 100%.

Based on the results of calculating the accuracy values of the three models, the results obtained if the Springate S-Score model is the most accurate model among the three models, namely with a percentage value of 80% (error rate 20%), then followed by Altman Z-Score with an accuracy percentage value of 72% (error rate 28%), and the last namely the Zmijewski model with a percentage value of 64% (error rate 36%).

Table 4.16

Accuration level percentage of Altman, Springate, and Zmijewski

Company Code	Year	Altman Z-Score	Springate S-Score	Zmijewski X-Score
GGRAM	2017	1	1	1
	2018	1	1	1
	2019	1	1	1
	2020	1	1	1
	2021	1	1	1
HMSP	2017	1	1	1
	2018	1	1	1
	2019	1	1	1
	2020	1	1	1
	2021	1	1	1
RMBA	2017	0	1	0
	2018	0	1	0
	2019	1	0,5	0,5
	2020	1	0	0
	2021	1	1	0
ITIC	2017	0	1	0
	2018	0,5	0,5	0,5
	2019	1	0	0

	2020	0,5	0,5	0,5
	2021	0	1	1
WIIM	2017	0,5	0,5	0,5
	2018	0,5	0,5	0,5
	2019	1	0,5	0,5
	2020	0	1	1
	2021	1	1	1
		18	20	16
Accuracy level percentage		72%	80%	64%
Error rate		28%	20%	36%

Source: Processed secondary data, 2022

4.3. Implications

For Researcher/author

This research can be used as a tool to increase knowledge about how to know the condition of the company and predict the financial distress of a company where the Altman, Springate, and Zmijewski calculation methods have calculations that can be said to have a good level of accuracy.

For Other Parties

Investors, creditors, and the government also need information about the financial condition of a company, especially a tobacco company in Indonesia, in order to be able to make the right economic and business decisions to deal with possible corporate financial distress in the future. It can be seen from the results of this study, Springate have a higher accuracy rate than Altman Z-Score and Zmijewski, which is 80% in predicting financial distress/financial distress of Tobacco Companies that go public. Furthermore, based on the predictions of Altman Z-Score, Springate and Zmijewski, the company that has the brightest performance is HMSP because it has the highest score in both models, followed by GGRM in the second position. then WIIM, ITIC and RMBA are in a position where stakeholders/investors must be careful in investing their money because

these three companies are predicted to have the potential to go financial distress, and sure enough, especially RMBA, this company is unfortunate to have to be delisted in 2021 from IDX because it experienced legal financial distress.

For Companies

This research is expected to be used as an early warning sign to anticipate financial distress, especially for tobacco companies that are still listed on IDX, namely GGRM, HMSP, ITIC, and WIIM, so that evaluations can be carried out to prevent the recurrence of other companies experiencing delisting events (RMBA case). happens again and becomes a material for improvement to identify and even improve conditions before they reach critical conditions so that management can take quick and appropriate action.

For Academics

This research is expected to be a reference for academics who will conduct further research regarding the prediction of a company's financial distress, using the Z-Score Altman, Springate, and Zmijewski models that examine tobacco companies in Indonesia. This research is expected to be a reference for academics who will conduct further research on the prediction of a company's financial distress, using the Z-Score Altman, Springate, and Zmijewski models that examine tobacco companies in Indonesia. Based on the results of calculating the accuracy values of the three models, the results obtained if the Springate S-Score model is the most accurate model among the three models, namely with a percentage value of 80% (error rate 20%), then followed by Altman Z-Score with an accuracy percentage value of 72% (error rate 28%), and the last namely the Zmijewski model with a percentage value of 64% (error rate 36%). So that this research supported by the results of research conducted by Meiliawati & Isharijadi (2016, p.20) the Springate model is the most accurate model in predicting the potential for financial distress of cosmetic sector companies listed on the Indonesia Stock Exchange with an accuracy percentage of 91.66%, where the accuracy of the model is 91.66%.

CHAPTER V

CONCLUSIONS AND RECOMMENDATION

5.1. Conclusions

Based on the research objectives and findings of research, here are the first conclusions, in this research the results obtained that first model used, the Altman z-score model can predict tobacco companies to go financial distress or not with an accuracy level of 72%. This is evidenced by the observations of the companies GGRM, HMSP, RMBA, ITIC, and WIIM, from a total of 5 years of observations or as many as 25 observations, there were 17 correct predictions and 8 inaccurate predictions.

For the second model, namely Springate, the result is that this model can predict the condition of the company in a state of financial distress or not with an accuracy level of 80%, This is evidenced by the observations of the companies GGRM, HMSP, RMBA, ITIC, and WIIM, from a total of 5 years of observations or as many as 25 observations, there were 19 correct predictions and 6 inaccurate predictions.

The third model, Zmijewski is also categorized as being able to predict the condition of the company going financial distress or not with an accuracy level of 64%. This figure is not as high as the results of the Altman and Springate models because in predicting companies GGRM, HMSP, RMBA, ITIC, and WIIM, from a total of 5 years of observation or 25 observations, they can only predict accurately 13 times and 12 results are inaccurate.

In this research cleared that there are differences in the results of financial distress prediction using the Altman Z-Score, Springate and Zmijewski method methods in Tobacco Company that listed in the Indonesian Stock Exchange period 2017-2021. Based on the results of the Kruskal Wallis test, it is indicated that there are differences in the

prediction results (before the prediction result are compared with the real situation).

In terms of accurate prediction models between Altman z-score, Springate, and Zmijewski in predicting the condition of the company (after comparing with real situation), it turns out that these three models have different accuracy results but not that significantly different. In this research the most accurate prediction among three models is Springate with the accuracy of 80% (error rate 20%), then followed by Altman Z-Score with an accuracy percentage value of 72% (error rate 28%), and the last namely the Zmijewski model with a percentage value of 64% (error rate 36%).

5.2. Recommendations

Based on the conclusions obtained in this research, early prediction of the company's potential to be in financial distress/financial distress is very necessary because every company has the potential to be in financial distress/financial distress. It is hoped that future research will consider further research using other financial distress methods that were not included in this study. In addition, it is expected for research using other industry comparisons.

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APPENDICES

Appendix 4.6.

**Altman Z-Score Method result of GGRM, HMSP, RMBA, and WIIM
(complete calculations)**

FORMULA	Z-Score = 0.717(WCTA) + 0.847(RETETA) + 3.107(EBIT TA) + 0.420(MCTL) + 0.998(SALES TA)				
GGRM	Year				
	2017	2018	2019	2020	2021
WCTA	0,294603	0,28748	0,33693	0,34105	-0,1197
RETETA	0,582981	0,61394	0,63607	0,55884	0,73333
EBIT TA	0,26396	0,27294	0,26983	0,28969	0,22238
MCTL	5,25707	6,56181	6,71433	3,67927	4,01077
SALES TA	1,211631	1,24784	1,38512	1,40531	0,73333
ALTMAN ZSCORE	4,942316	5,57548	5,82105	4,56572	3,6426
STATUS	Healthy	Healthy	Healthy	Healthy	Healthy
Code	0	0	0	0	0
HMSP	Year				
	2017	2018	2019	2020	2021
WCTA	0,640323	0,64202	0,62309	0,56911	0,490152
RETETA	0,294781	0,28945	0,2926	0,27376	0,170685
EBIT TA	0,561177	0,56132	0,54698	0,51319	0,377888
MCTL	53,46024	60,9747	38,379	16,0459	9,008505
SALES TA	2,245837	2,29692	2,29048	2,08348	1,860634
ALTMAN ZSCORE	27,14701	30,3512	20,7991	11,053	7,310593
STATUS	Healthy	Healthy	Healthy	Healthy	Healthy
Code	0	0	0	0	0
RMBA	Year				
	2017	2018	2019	2020	2021
WCTA	0,3773	0,30654	0,23897	0,324386	0,3622
RETETA	-0,43	-0,44787	-0,46139	-0,40174	-0,76399

EBIT TA	-0,056	-0,02227	-0,01446	0,018584	-0,19439
MCTL	4,3722	2,68074	1,7436	1,396957	1,83211
SALES TA	1,4274	1,43847	1,47336	1,225547	1,11448
ALTMAN ZSCORE	2,9926	2,33275	1,93833	1,759873	0,89037
STATUS	Healthy	Grey	Grey	Financial distress	Financial distress
Code	0	1	1	1	1
ITIC	Year				
	2017	2018	2019	2020	2021
WCTA	-0,7156169	-0,671443	0,268727	-0,1132504	-0,030485
RETA	-0,1483066	-0,104409	0,020904	-0,0335555	-0,016389
EBIT TA	0,0693301	0,149392	0,068860	0,0625676	0,074169
MCTL	0	0	0	13,463905	2,714608
SALES TA	0,4931379	0,703716	0,378202	0,3719543	0,444083
ALTMAN ZSCORE	0,0688472	0,596609	0,381011	6,1108259	1,778034
STATUS	Financial distress	Financial distress	Financial distress	Healthy	Financial distress
code	1	1	1	0	1
WIIM	Year				
	2017	2018	2019	2020	2021
WCTA	0,5195	0,57141	0,5884	0,6087	0,5803
RETA	0,3477	0,37178	0,38396	0,3919	0,4093
EBIT TA	0,0993	0,03604	0,04547	0,0237	0,1289
MCTL	2,5485	2,45926	1,18273	1,3245	2,6457
SALES TA	1,2454	1,20455	1,11932	1,0724	1,2351
ALTMAN ZSCORE	3,2887	3,07159	2,5022	2,4685	3,5071
STATUS	Healthy	Healthy	Grey	Grey	Healthy

Code	0	0	1	1	0
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Appendix 4.7

Springate S-Score Method result of GGRM, HMSP, RMBA, and WIIM (complete calculation).

FORMULA	S-score = 1.03(WCTA) + 3.07(EBIT TA) + 0.66(EBTCL) + 0.4(SALES TA)				
GGRM	Year				
	2017	2018	2019	2020	2021
WCTA	0,294603	0,28748	0,33693	0,34105	-0,1197
EBIT TA	0,26396	0,27294	0,26983	0,28969	0,22238
EBTCL	0,432799	0,45731	0,50705	0,59675	0,56809
SALES TA	1,211631	1,24784	1,38512	1,40531	0,73333
SPRINGATE SCORE	1,884098	1,93501	2,06411	2,1966	1,22765
STATUS	Healthy	Healthy	Healthy	Healthy	Healthy
Code	0	0	0	0	0
HMSP	Year				
	2017	2018	2019	2020	2021
WCTA	0,640323	0,64202	0,62309	0,56911	0,49015
EBIT TA	0,561177	0,56132	0,54698	0,51319	0,37788
EBTCL	2,646264	2,60603	2,04245	1,43462	0,66660
SALES TA	2,245837	2,29692	2,29048	2,08348	1,86063
SPRINGATE SCORE	5,027215	5,02327	4,58523	3,94193	2,84918
STATUS	Healthy	Healthy	Healthy	Healthy	Healthy
Code	0	0	0	0	0
RMBA	Year				

	2017	2018	2019	2020	2021
WCTA	0,3773	0,30654	0,23897	0,324386	0,3622
EBIT TA	-0,056	-0,02227	-0,01446	0,018584	0,19439
EBTCL	-0,384	-0,08535	-0,05384	0,00479	0,70303
SALES TA	1,4274	1,43847	1,47336	1,225547	1,11448
SPRINGATE SCORE	0,5336	0,76642	0,75555	0,884551	0,24192
STATUS Code	Financial distress 1	Financial distress 1	Financial distress 1	Healthy 0	Financia l distress 1
ITIC	Year				
	2017	2018	2019	2020	2021
WCTA	-0,7156169	-0,671443	-0,268727	0,113250 4	- 0,03048 5
EBIT TA	0,0693301	0,149392	0,0688602	0,062567 6	0,07416 9
EBTCL	-0,0073221	0,086292	0,0878248	- 0,023511 4	0,08775 5
SALES TA	0,4931379	0,703716	0,378202	0,371954 3	0,44408 3
SPRINGATE SCORE	-0,3318195	0,105485	0,1438576	0,208698 9	0,43185 1
STATUS Code	Financial distress 1	Financial distress 1	Financial distress 1	Financial distress 1	Financia l distress 1
WIIM	Year				
	2017	2018	2019	2020	2021
WCTA	0,5195	0,57141	0,5884	0,6087	0,5803
EBIT TA	0,0993	0,03604	0,04547	0,0237	0,1289

EBTCL	0,4653	0,3389	0,4709	0,2723	0,6118
SALES TA	1,2454	1,20455	1,11932	1,0724	1,2351
SPRINGATE SCORE	1,6451	1,40468	1,50417	1,3084	1,8913
STATUS Code	Healthy 0	Healthy 0	Healthy 0	Healthy 0	Healthy 0



Appendix 4.8.

Zmijewski X-Score's method result of GGRM, HMSP, RMBA, and WIIM (complete calculations).

FORMULA	X-Score = $-4.3 - 4.5(\text{ROA}) + 5.7(\text{LEVERAGE}) - 0.004(\text{Current Ratio})$				
GGRM	Year				
	2017	2018	2019	2020	2021
ROA NPTA	0,105997	0,11617	0,11278	0,13835	0,09781
LEVERAGE DEBT RATIO TLTA	0,371514	0,36807	0,34681	0,35242	0,25155
LIQUIDITY CURRENT RATIO CACL	1,792981	1,78105	2,05806	2,06191	0,4496
ZMIJEWSKI SCORE	-2,65219	-2,71764	-2,8225	-2,9056	-3,3045
STATUS Code	Healthy 0	Healthy 0	Healthy 0	Healthy 0	Healthy 0
HMSP	Year				
	2017	2018	2019	2020	2021
ROA NPTA	0,300229	0,2937	0,29051	0,26956	0,37788 8
LEVERAGE DEBT RATIO TLTA	0,196039	0,20927	0,24128	0,29906	0,39120 2
LIQUIDITY CURRENT RATIO CACL	5,234131	5,27233	4,30197	3,27609	2,45413 6
ZMIJEWSKI SCORE	-4,512675	-4,40773	-4,21479	-3,79528	- 3,76082 7
STATUS Code	Healthy 0	Healthy 0	Healthy 0	Healthy 0	Healthy 0
RMBA	Year				

	2017	2018	2019	2020	2021
ROA NPTA	-0,155	-0,03409	-0,04089	0,002977	- 0,21398
LEVERAGE DEBT RATIO TLTA	0,2991	0,36638	0,43776	0,505795	0,54197
LIQUIDITY CURRENT RATIO CACL	2,4019	1,92094	1,58983	1,906512	2,19775
ZMIJEWSKI SCORE	-1,889	-2,05057	-1,61442	-1,42274	- 0,23912
STATUS Code	Healthy 0	Healthy 0	Healthy 0	Healthy 0	Healthy 0
ITIC	Year				
	2017	2018	2019	2020	2021
ROA NPTA	-0,0089154	0,053825	0,023192 2	- 0,015631 9	0,01211 7
LEVERAGE DEBT RATIO TLTA	0,9478874	0,276825	0,420777 1	0,405664 7	0,44597 3
LIQUIDITY CURRENT RATIO CACL	0,2032261	0,204371	0,265615 9	0,63928	0,90269 1
ZMIJEWSKI SCORE	1,14389	-2,963493	-2,004873	- 1,914810 5	- 1,80886 8
STATUS Code	Financial distress 1	Healthy 0	Healthy 0	Healthy 0	Healthy 0
WIIM	Year				
	2017	2018	2019	2020	2021
ROA NPTA	0,0785	0,03312	0,04073	0,021	0,1069

LEVERAGE DEBT RATIO TLTA	0,2678	0,20202	0,19938	0,205	0,2655
LIQUIDITY CURRENT RATIO CACL	3,3942	5,35586	5,91856	6,0239	3,6633
ZMIJEWSKI SCORE	-3,1132	-3,2761	-3,3232	-3,202	-3,253
STATUS Code	Healthy 0	Healthy 0	Healthy 0	Healthy 0	Healthy 0



Appendix 4.13a

BI Rate and ROE of the tobacco company as real condition indicator.

Company Code	Year	Net Profit	Total Equity	ROE	BI RATE	STATUS	code
GGRAM	2017	7.755.347	42.187.664	18,38%	4,25%	Healthy	0
	2018	7.793.068	45.133.285	17,27%	6,00%	Healthy	0
	2019	10.880.704	50.930.758	21,36%	5,00%	Healthy	0
	2020	7.647.729	58.522.468	13,07%	3,75%	Healthy	0
	2021	5.605.321	59.288.274	9,45%	3,50%	Healthy	0
HMSP	2017	12.670.534	34.112.985	37,14%	4,25%	Healthy	0
	2018	13.538.418	35.358.253	38,29%	6,00%	Healthy	0
	2019	13.721.513	35.679.730	38,46%	5,00%	Healthy	0
	2020	18.771.235	30.241.426	62,07%	3,75%	Healthy	0
	2021	7.137.097	29.191.406	24,45%	3,50%	Healthy	0
RMBA	2017	- 480.063	8.923.670	-5,38%	4,25%	Financial distress	1
	2018	- 608.463	8.365.971	-7,27%	6,00%	Financial distress	1
	2019	50.612	8.401.643	0,60%	5,00%	Grey	2
	2020	- 2.666.991	5.708.950	- 46,72%	3,75%	Financial distress	1
	2021	-	-	0,00%	3,50%	Financial distress	1
ITIC	2017	8.672	16.512	52,52%	4,25%	Healthy	0
	2018	8.249	206.017	4,00%	6,00%	Grey	2
	2019	- 7.000	266.150	-2,63%	5,00%	Financial distress	1
	2020	6.120	279.826	2,19%	3,75%	Grey	2

	2021	18.369	324.680	5,66%	3,50%	Healthy	0
WIIM	2017	40.590	978.091	4,15%	4,25%	Grey	2
	2018	51.143	1.005.237	5,09%	6,00%	Grey	2
	2019	27.328	1.033.171	2,65%	5,00%	Grey	2
	2020	172.507	605.555	28,49%	3,75%	Healthy	0
	2021	176.877	1.318.385	13,42%	3,50%	Healthy	0



Appendix 4.13b

Comparison of the results of the Altman, Springate, and Zmijewski models against real conditions based on the BI rate and ROE formula from 2017-2021 at the tobacco companies.

Company Code	Year	ALTIMA		Real Condition	ALTIMA		SPRINGATE S-Score	ZMIJEWSKI X-Score	ZMIJEWSKI X-Score							
		ZSCORE	SCORE		ZSCORE	SCORE										
GGRAM	2017	0	0	0	Accurate	Accurate	Accurate	Accurate	1	1	1	1	1	1	1	
	2018	0	0	0	Accurate	Accurate	Accurate	Accurate	1	1	1	1	1	1	1	
	2019	0	0	0	Accurate	Accurate	Accurate	Accurate	1	1	1	1	1	1	1	
	2020	0	0	0	Accurate	Accurate	Accurate	Accurate	1	1	1	1	1	1	1	
	2021	0	0	0	Accurate	Accurate	Accurate	Accurate	1	1	1	1	1	1	1	
HMSP	2017	0	0	0	Accurate	Accurate	Accurate	Accurate	1	1	1	1	1	1	1	
	2018	0	0	0	Accurate	Accurate	Accurate	Accurate	1	1	1	1	1	1	1	
	2019	0	0	0	Accurate	Accurate	Accurate	Accurate	1	1	1	1	1	1	1	
	2020	0	0	0	Accurate	Accurate	Accurate	Accurate	1	1	1	1	1	1	1	
	2021	0	0	0	Accurate	Accurate	Accurate	Accurate	1	1	1	1	1	1	1	
RMB A	2017	0	1	1	*Not Accu	*Not Accu	*Not Accu	*Not Accu	0	1	1	0	0	0	0	
	2018	2	1	0	*Not Accu	*Not Accu	*Not Accu	*Not Accu	0	1	1	0	0	0	0	
	2019	2	1	0	Accurate	*Not Accu	*Not Accu	*Not Accu	1	0	0	0	0	0,5	0,5	
	2020	1	0	0	Accurate	*Not Accu	*Not Accu	*Not Accu	1	0	0	0	0	0	0	
	2021	1	1	0	Accurate	Accurate	*Not Accu	*Not Accu	1	1	1	0	0	0	0	
ITIC	2017	1	0	1	*Not Accu	Accurate	*Not Accu	*Not Accu	0	1	1	0	0	0	0	
	2018	1	0	0	*Not Accu	*Not Accu	*Not Accu	*Not Accu	0	0	0	0	0	0,5	0,5	
	2019	1	0	0	Accurate	*Not Accu	*Not Accu	*Not Accu	1	0	0	0	0	0	0	
	2020	0	0	0	*Not Accu	*Not Accu	*Not Accu	*Not Accu	0	0	0	0	0	0,5	0,5	
	2021	1	0	0	*Not Accu	Accurate	Accurate	Accurate	0	1	1	1	1	1	1	
WTIM	2017	0	0	0	*Not Accu	*Not Accu	*Not Accu	*Not Accu	0	0	0	0	0	0,5	0,5	
	2018	0	0	0	*Not Accu	*Not Accu	*Not Accu	*Not Accu	0	0	0	0	0	0,5	0,5	
	2019	2	0	0	Accurate	*Not Accu	*Not Accu	*Not Accu	1	0	0	0	0	0,5	0,5	
	2020	2	0	0	*Not Accu	Accurate	Accurate	Accurate	0	1	1	1	1	1	1	
	2021	0	0	0	Accurate	Accurate	Accurate	Accurate	1	1	1	1	1	1	1	
														18	20	16