# PREDICTION OF FINANCIAL DISTRESS IN INDONESIA FAST MOVING CONSUMER GOODS (FMCG) INDUSTRY

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| Article Info | Abstract |
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| | *This study aims to find and analyze to prove and test differences in health status results between the Altman Z-Score, Springate, Zmijewski, and Grover. Prediction models in the FMCG Industry for the 2016-2020 period. Samples were taken by the purposive sampling method. Of the 25 listed companies, 16 companies meet the criteria. Data collection techniques collect the required information from the company's financial statements downloaded from www.IDX.co.id. The data analysis technique used is Multiple Discriminant Analysis. The hypothesis test uses the Kruskal Wallis H Test and Accuracy Test. This study indicates that there are differences between the Altman Z-Score, Springate, Zmijewski, and Grover methods in predicting corporate bankruptcy. This can be seen from the probability value of all methods smaller than 0.05, which is 0.00. The accuracy test shows that the methods of Altman, Springate, Zmijewski, and Grover have different accuracy levels, namely 75%, 81%, 97.8%, and 88%, respectively. The high level of accuracy obtained by the Zmijewski methods is 97.8%, respectively. This means that the Zmijewski method is more recommended for companies or investors in assessing the financial condition of manufacturing companies to make decisions. The conclusion is that there are differences between the Altman Z-Score, Springate, Zmijewski, and Grover methods. And the highest accuracy prediction method is the Zmijewski method).* |
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## 1. BACKGROUND

A company in financial distress is experiencing financial difficulties prior to bankruptcy or liquidation. Financial distress indicates that the company's financial situation is deteriorating and is the primary cause of company bankruptcy (Fahmi, 2016). Every company is founded with the hope that it will generate profits to survive or develop in the long term. This means that it can be assumed that the company will continue to exist and is not expected to go into liquidation. These assumptions do not always come true. Often companies that have been operating for a certain period are forced to dissolve or be liquidated because they experience financial distress, which leads to bankruptcy, including manufacturing companies in the consumer goods industry in Indonesia. The company shall issue financial statements for a particular time. Financial statements are critical for investors to return investments, like sales, acquisitions and equity. In achieving the goals, management needs the ability to choose the practical action that will reflect the result of the financial statement since a better financial output is a prerequisite for businesses to attract investment. Investors need to understand the performance of the company by doing some analysis. The common analysis being used by the investors is the fundamental and technical analysis. Fundamental analysis is done by

analyzing the financial ratios that have been described in the financial statement (Setiawan, 2021).

The complexity and many operations of manufacturing companies in the consumer goods industry with many emerging negative issues surrounding the consumer goods industrial sector circulating in Indonesia. The negative issue is the presence of hazardous materials in the consumer goods industrial sector circulating in the market. Issues like that can make people less interested in consuming these products. If the public's demand for the product decreases, the company's income will decrease.

This causes the company to be quite vulnerable to experiencing financial distress conditions that can threaten the company's existence in industrial competition. Hence, manufacturing companies in the consumer goods industry need to develop a system that becomes an early warning of financial conditions within the company so that companies can still find solutions if they company is experiencing financial distress. In addition, a phenomenon that has recently occurred in Indonesia is the number of companies being delisted from 2017 to 2020 from the Indonesia Stock Exchange (IDX). Delisting is if the shares listed on the Exchange experience a decrease in criteria so that they do not meet the listing requirements, then the shares can be removed from their listing (Cakranegara, 2021). Before making any decision regarding an investment, an investor should always analyze and have in-depth knowledge about the performance of a related firm. The firm's performance could be discovered through the firm's internal information sourced from the firm's financial statements (Purwanto, 2017)

Table 1.1. Delisting Company

| No | Code | Company | Delisting |
|----|------|---------|-----------|
| 1 | BORN | Borneo Lumbung Energi & Metal Tbk | 20/01/2020 |
| 2 | GREN | Evergreen Invesco Tbk | 23/11/2020 |
| 3 | GMCW | Grahamas Citrawisata Tbk | 1/10/2019 |
| 4 | NAGA | PT Bank Mitraniaga Tbk | 23/08/2019 |
| 5 | JPRS | Jaya Pari Steel Tbk | 8/10/2018 |
| 6 | INVS | Inovisi Intracom Tbk | 23/10/2017 |
| 7 | TKGA | PT Permata Prima Sakti Tbk | 16/11/2017 |

From Table 1.1, it can be seen that within three years, seven companies were delisted from the IDX for reasons of financial distress. The stock exchange enforces a forced delisting process because business continuity is a concern, and the search for an address for the company itself is unclear. In the UNTX case, the delisting was due to operational losses experienced by the company over the last few years, which resulted in negative equity on the balance sheet and no longer being able to distribute dividends to shareholders.

The current condition of Indonesia triggers the vulnerability of financial difficulties (financial distress) occurring in several national companies. This resulted from the United States' recovery from the crisis, which affected developing countries such as Indonesia. One of the most felt impacts was the decline in the rupiah currency. This condition is exacerbated by declining exports and falling commodity prices on world commodity markets.

The company's bankruptcy can be seen from its delisting from the IDX. Although the reason for delisting does not only mean that the company does not have business continuity according to the IDX, some prefer to be a private company for specific reasons. As mentioned above, financial distress is a step toward decreasing a company's financial condition before bankruptcy. For this reason, early recognition of the state of companies experiencing financial distress is essential. Early information about a company's financial emergency provides an opportunity for

management, owners, investors, regulators and other stakeholders to make relevant efforts.

Predicting financial distress can be done by analyzing financial ratios, where financial ratios indicate a company's financial strength (Sawir, 2003). Ratio analysis is an essential tool to determine the company's financial position and the results that have been achieved in connection with the selection of the company's strategy that has been implemented. However, there are problems in using ratio analysis because each ratio has been used and provides a different indication of the company's financial health. Sometimes the ratios also appear to contradict each other. Therefore, if only depending on the ratio calculation individually, investors will find it difficult to decide whether the company is in a healthy condition or vice versa. An analytical tool can be used to connect several ratios at once to predict the potential for a company's bankruptcy. This analysis is known as the Altman, Springate, Zmijewski, and Grover analysis.

Altman developed the Altman Z score model in 1968 by collecting several financial ratios that are considered the most influential in predicting company bankruptcy. Mulich (2003:59) says that Altman uses five types of financial ratios: working capital to total assets, retained earnings to total assets, EBIT to total assets, book value of equity to book value of total debt, and sales to total assets. The cut-off value for this index is $> 2.99$. If the results of the Altman model in a company are below the cut-off, then the company is in the category of financial distress.

Springate states that this model was developed by Springate (1978) following the procedure developed by Altman in the US using multidisciplinary analysis to select four of the 19 most well-known financial ratios that exist between successful businesses and distinguish those that fail, using 40 companies as a sample. Springate bankruptcy prediction model found four ratios used to predict potential financial distress. If $S < 0.862$ proves that the company faces a severe bankruptcy threat (bankruptcy). The Springate bankruptcy prediction model finds four ratios used to predict potential financial difficulties. If $S < 0.862$ indicates the company faces a serious bankruptcy threat (bankruptcy). If the value $0.862 < s < 1.062$ indicates that the management must be careful in managing the company's assets so that bankruptcy does not occur (bankruptcy-prone areas). If the S value $> 1.062$ indicates the company is in sound financial condition (not bankrupt) (Syahyunan, 2013).

Zmijewski developed Zmijewski's forecasting model in 1983 to increase the validity of financial ratios to detect companies' financial mistakes. Juliana (2012) states that Zmijewski conducted a study by reviewing the studies in the field of insolvency of previous research for 20. Year. The financial ratios were selected from the financial ratios of the previous research in a sample of 75 bankrupt companies and 3573 healthy companies from 1972 to 1978, showing a significant difference between healthy and unhealthy companies. With the rating criteria, the more the value of X, the greater the probability/probability that the company will go bankrupt. The cut-off value applied in this model is 0.

Companies whose X-value is greater than or equal to 0 will experience bankruptcy. On the other hand, companies with a value less than 0 are not predicted to go bankrupt. Model predictions used by Grover, Model models that work with the penetration and penetration of the Altman Z-score model. Jeffrey S. Grover uses a sample as a Model Altman Z-Punkt op 1968, with a 13-year-old bar. The sample has been used for 70 years with 35 members and 35 students 35 members from 1982 until 1996 (Putra, 2016). Model Grover categorizes a company as bankrupt, scoring the same of -0.02 ($Z \leq -0.02$).

Meanwhile, the value for companies categorized as non-bankrupt is more than or equal to 0.01 (Z 0.01). In general, the four predictor models use the same ratio. However, they are proxied in different ratios in some predictor models, and in other predictor models, the ratio is increased or decreased.

In previous research, Matondang (2017) stated a significant difference between the Altman Z-score, Springate, Zmijewski, Grover, Foster and Ohlson models in predicting bankruptcy. The research also found that the Ohlson model was the best predictor of bankruptcy in manufacturing companies on the Indonesia Stock Exchange in the 2013-2015 period. Meanwhile, Manik (2015) stated that there was no significant difference between the Altman Z score, Grover, Springate, and Zmijewski models and the Grover model was the best predictor of bankruptcy. Companies need to analyze their financial performance from the phenomena described above before

entering into financial distress or even bankruptcy. However, from the results of the calculations and the level of accuracy, there must be differences between the four predictor models used in predicting financial distress conditions in companies.

1.1         Problem Statement

Based on the background described above, the formulation of the research problem is: Are their differences between the Altman Z score, Springate, Zmijewski, and Grover prediction models in predicting financial distress in Fast Moving Consumer Goods (FMCG) Industry on the Indonesia Stock Exchange and the model which one is more accurate.

1.2         Research Question

The objectives of the study are to analyzed:

1.     Is there a difference between the Altman Z-score, Springate, Zmijewski, and Grover models in predicting financial distress in the Fast Moving Consumer Goods (FMCG) industry on the Indonesia Stock Exchange in 2016-2020?

2.     What is the most accurate predictor model of the four predictor models used in predicting financial distress in the Fast Moving Consumer Goods (FMCG) industry on the Indonesia Stock Exchange in 2016-2020?

## 2. PREVIOUS LITERATURE AND HYPOTHESIS DEVELOPMENT

2.1 Definition of Financial Distress

Financial distress is a condition that occurs when a company experiences a decline in its financial position for several periods. This situation occurs when the company's cash flow conditions experience a decline in the financial condition or the failure to meet its expectations for several periods. In financial distress, cash flow conditions are minimal, which causes maximum earnings losses. This means the financial distress between an insolvent and solvent (Pranowo, 2010). Financial distress begins when a company cannot meet its repayment schedules or when cash flow forecasts indicate that the company will soon be unable to meet its obligations (Fachrudin, 2008).

There are several definitions of financial difficulties, depending on their type, namely, economic failure, business failure, technical insolvency, bankruptcy in bankruptcy, and legal bankruptcy. Brigham and Jabinsky (Fachrudin, 2008). Here is the explanation:

**Economic failure** is when the company's income cannot cover the total costs, including the cost of capital. This business can continue its operations as long as the lender is willing to provide capital and the owner is willing to accept a below-market rate of return.

1.  **Business Failure**

*Business failure* is a business discontinuing operations with consequent losses to creditors.

1.  **Technical Insolvency**

A company is said to be in technical insolvency if it cannot meet current obligations when they fall due. The inability to pay debt technically indicates a temporary liquidity shortage, which, if given time, the company may be able to pay its debts and survive. On the other hand, if technical insolvency is an early symptom of economic failure, it may be the first step to a financial disaster.

1.  **Insolvency in bankruptcy**

It is said to be insolvent in bankruptcy if the book value of debt exceeds the market value of the company's assets. This condition is more severe than technical insolvency because, generally, this is a sign of economic failure and even leads to business liquidation.

1.  **Legal bankruptcy**

The company is legally bankrupt if a lawsuit has been formally filed by law.

Financial distress is increasingly used as a topic of research, the purpose of which is for companies to know how to predict the conditions of financial distress in the company. These expectations can be measured by analyzing the financial statements. Financial statements are reports on the state of the company's financial capabilities and performance and other information requested by users.

2.2 The Reason for Financial Distress

Financial distress is predicted using financial indicators before difficulties occur. The financial indicators are derived from the financial statements. Financial statements usually contain important information about the state of the company and its prospects (Fachrudin, 2008). The bankruptcy prediction model will be interpreted more accurately as an explanation of the situation of a company in financial difficulty than as an explanation of the expectation of bankruptcy in essence.

Forecasting financial difficulties related to financial indicators and statistical techniques have been continuously improved since then. It presents unilabiate statistics using a dual model approach to distinguish between failed and non-failed companies for the five years prior to the

failure (Fachrudin, 2008). A milestone in developing a model for predicting the difficulty of non-financial firms leaving Beaver on a multivariate analysis by Altman (1968). Altman (1968) conducted research on corporate failure in manufacturing firms using multivariate discriminant analysis techniques and produced a Z-Score model with five financial ratios as used in this study.

2.3 Prediction of Financial Distress

Financial distress can occur due to several factors. These reasons can come from the internal or external company. External analysis is performed on data obtained from outside the company, such as commercial reports, statistics and economic indicators issued by the government or the private sector.

The internal analysis is conducted through, among other things, the analysis of the company's strategy as this strategy focuses on the competition faced by the company, the cost structure concerning the competitors, the ability of management to control costs and other managerial qualities. Financial difficulties occur due to economic distress, the downturn in the company's industry, and mismanagement. *Mismanagement* is defined as the tendency to lower the ratio of a company's operating income to an industry's operating income in the past five years. The more debt financing, the higher the fixed interest expense, and the more likely it is that trouble costs will be incurred. So debt can also cause financial difficulties (Brigham, 1998). The causes of difficulties can be grouped based on finances and named with the basic model of bankruptcy or the triad of causes of financial difficulties as follows:

1. **Neoclassical models**

In this case, bankruptcy occurs if the allocation of resources is not appropriate. This restructuring situation occurs when the bankruptcy has an incorrect mix of assets.

1. **Financial models**

The asset mix is correct, but the financial structure is wrong concerning liquidity constraints. This means that although the company can survive in the long run, it must also go bankrupt in the short term. This condition's primary motivator is the relationship between the imperfect capital market and the inherited capital structure. This model estimates the difficulty of financial indicators or performance indicators such as turnover/total assets, revenue/turnover, return

on assets, equity, profit margin, and equity turnover.

1. **Corporate Governance Model**

Here, bankruptcy has the right mix of assets and financial structure but is poorly managed. This inefficiency drives companies out of the market due to unresolved problems in corporate governance.

2.4 Analysis of Bankruptcy Model Altman Z-score

Altman is known as a pioneer in bankruptcy theory with his Z-score. *Z-score* is a multivariable equation used by Altman to predict the bankruptcy rate. Altman uses a statistical model called discriminant analysis, specifically Multiple Discriminant Analysis (MDA).

The Multiple Discriminant Analysis formulation proposed by Altman is:

$$Z = 0{,}717X1 + 0{,}847X2 + 3{,}107X3 + 0{,}420X4 + 0{,}995X5$$

X1 = working capital to total assets
X2 = retained earnings to total assets
X3 = earnings before interest and taxes to total assets
X4 = book value of equity to book value of total debt
X5 = sales to total assets

With the cut-off value Z < 1.81, the company is in the bankrupt category with a score of 1.81-2.67. The company is in the gray area (or zone of ignorance). Z > 2.67. The company is not bankrupt.

**1. Working Capital to Total Assets**

Working capital is the difference between current assets over current liabilities or is part of current assets that can be used to finance the company's operations. Two definitions of working capital are commonly used (Jumingan, 2005), namely as follows:

1. Working capital is the excess of current assets over short-term debt. This surplus is called net working capital. This surplus is the number of current assets derived from long-term debt and private capital.

2. Assets are economic resources owned by a company and measured based on accounting principles. According to FASB (1980), assets (assets) are economic benefits that may occur in the future acquired or controlled by a particular entity due to past transactions or events.

Working capital is the difference between the business's current assets and current liabilities, while assets are the resources owned

by the business. This ratio shows the company's ability to generate networking capital from its total assets (Daulay, 2013). The ratio of working capital to total assets is a measure of liquidity by comparing net liquid assets with total assets (Sawir, 2003).

Net liquid assets or working capitals are total current assets minus total current liabilities. Generally, when a company encounters financial difficulties, its working capital will decline faster than the total assets caused by:

$$X1 = \frac{Working\ Capital}{Total\ Asset}$$

**2. Retained Earnings to Total Assets**

Retained earnings are company profits that have been deducted from taxes that the GMS or meeting of members has decided not to distribute (Jumingan, 2005). Retained earned is the portion of the profit reinvested in the company. Not all profits earned are distributed to the owners (shareholders). However, part of the dividends will be retained and reinvested in the company to generate retained earnings from the company's total assets.

Thus, the retained earnings included in the balance sheet are not a cash and are not available for dividends or other purposes. This ratio is a ratio that measures a company's cumulative earnings ability. To some extent, this ratio also reflects the age of the company because the younger the company, the less time it has to accumulate profits. The formula is as follows:

$$X2 = \frac{Retaines\ Earning}{Total\ Asset}$$

**3. Earnings Before Interest and Taxes to Total Assets**

EBIT to Total Assets measures the company's ability to profit on the assets used. The smaller the level of profitability, the more efficient and effective the company will use all its assets to generate operating profit and vice versa. Bankruptcy occurs when total liabilities exceed the fair valuation of the company's assets, which is determined by the assets' ability to generate profits. In the following form:

$$X3 = \frac{Earning\ Before\ Interest\ and\ Tax}{Total\ Asset}$$

**4. Book Value of Equity to Book Value of Total Debt**

The book value of equity is the amount of capital owned by the company and included in the company's financial statements. This ratio is used to measure a company's level of leverage. Debt that is too large will be dangerous to the

company's survival, especially if there is interest to be paid (Darwis, 2013). This ratio is the opposite of the more popular debt-to-equity ratio. In question, the value of own capital is the market value per share (Sawir, 2003). Generally, companies that fail to accumulate more debt than they have capital will face an unhealthy financial situation. The formula is as follows:

$$X4 = \frac{Book\ Value\ of\ Equity}{Book\ Value\ of\ Total\ Debt}$$

**5. Sales to Total Assets**

Sales are the total amount charged to customers for goods sold, cash and credit sales, sales returns and allowances, and sales discounts are deducted from sales to generate net sales. The sales to total assets ratio are also known as asset turnover and is usually used to measure a company's efficiency level in using its assets (Darwis, 2013). The capital turnover ratio is a standard financial ratio that describes the ability to increase sales of a company's assets and is a measure of management's ability to face competitive conditions, with the following formula:

$$X5 = \frac{Sales}{Total\ Asset}$$

2.5 Springate Model Bankruptcy Analysis

Springate made a financial distress prediction model in 1978. In its manufacture, Springate used the same method as Altman (1968), namely Multiple Discriminant Analysis (MDA). The initial number of pedigrees was 19. After passing the same Altman test, Springate chose four pedigrees that he believed could distinguish between companies in distress and those that were not. The sample used by Springate is 40 companies located in Canada. The model that Springate generates is as follows:

**S= 1.034A + 3.07B + 0.66C + 0.4D**

A = Working capital/total assets
B = Earnings before Interest and taxes/total Assets
C = Net profit before taxes/current liabilities
D = Sales/total assets

Springate divides the company's bankruptcy assessment criteria into three categories:
1. If S < 0.862 indicates the company is facing a severe bankruptcy threat (bankrupt)
2. If the value is 0.862 < S < 1.062, it indicates that the management must be careful in managing the company's assets so that

bankruptcy does not occur (bankruptcy prone areas or grey areas)

3. If the value of S > 1.062 indicates the company is in a healthy financial condition (not bankrupt)

**1. Net Profit Before Taxes/Current Liabilities**

Net profit before tax is the difference between income and all costs, the net increase in the capital before tax. *Current liabilities* are obligations that must be settled in the future due to current events in less than one accounting period. This ratio is calculated by dividing the company's current liabilities by pre-tax income divided by total assets. This ratio describes its ability to cover its current liabilities using net income before taxes (Darwis, 2013). In the following form:

$$C = \frac{\text{Net Profit Before Taxes}}{\text{Current Liabilities}}$$

2.6 Zmijewski Model Bankruptcy Analysis

This bankruptcy analysis model was discovered by Zmijewski in 1983 and is the result of 20 years of research. Zmijewski used a sample of 75 bankrupt companies and 3,573 healthy companies from 1970 to 1978. The financial ratios used in this model were selected from the financial ratios used in previous studies (Syahyunan, 2013).

The Zmijewski models that have been successfully developed are:

**Z = -4.3 - 4.5X1 + 5.7X2 - 0.0004X3**

X1 = ROA (Net income/total assets)

X2 = Leverage (Total debt/total assets)

X3 = Liquidity (Current assets/current liabilities).

The cut-off value used in this model is 0, where if Z is positive (Z>0), it means that the company has the potential to go bankrupt. Meanwhile, the more negative Z (Z≤0) value, the farther the company is from the potential for bankruptcy.

**1. Net Income to Total Assets**

Return on assets is one of the profitability ratios. This ratio is often referred to as economic profitability, which measures a company's ability to generate profits from all of the company's owned assets (Budiarso, 2019). The higher the return on assets value, the more effective it can be explained that the company has made profits by handling and managing all of its assets. The formula is as follows:

**2. Total Debt to Total Assets**

*Total debt* is the total amount owned by the company, where debt is an obligation that must

be paid in the future due to activities carried out in the present (Ikhsan, 2013). Debt financing impacts the company because debt has a fixed burden. The failure of the company to pay the interest on the debt can cause financial difficulties that end in bankruptcy of the company. The formula is as follows:

**3. Current Assets to Current Liabilities**

Current assets are cash and other assets that can be converted into cash within one year or a regular cycle of the company activities. *Current liabilities* are obligations that mature within one year in the ordinary course of the company's activities (Ikhsan T. P., 2021). The current ratio is the most common measure of short-term solvency because it shows how well short-term creditors' demands are met by assets expected to turn into cash in the same period as debt. A low current ratio is usually considered to indicate a liquidity problem. On the other hand, a company with a very high current ratio is also not good because it shows how much money has been invested idle, which can reduce the company's profitability (Jumingan, 2005). The formula is as follows

2.7 Grover Model Bankruptcy Analysis

The Grover model is a model created by designing and reevaluating the Altman Z-Score model. According to the 1968 Altman model, Grover used a sample, adding 13 new financial ratios. The sample used is 70 companies with 35 bankrupt and 35 non-bankrupt companies from 1982 to 1996. According to Syahyunan (2015), Grover produces the following function:

**Score = 1,650 X1 + 3.040 X2 + 0,016 ROA + 0,057**

X1 = Working Capital to Total Assets

X2 = Earnings Before Interest and Taxes to Total Assets

ROA = Net Income to Total Assets

Grover classifies the value of corporate bankruptcy as follows:

1. If the Score ≤ 0.02, then the company is in a state of bankruptcy

2. If the Score ≥ 0.01, then the company is in good health (not bankrupt)

2.9 Research Gap

According to previous research conducted prior to this study, several gaps were identified differently in variables, sample period, scope, and outcome aspects. This study consists of Predicting Financial Distress as the dependent variable and Altman, Springate, Zmijewski, and Grover as the independent variable. The

researcher will compare whether there are differences between these models in predicting a company's financial distress.

Different from previous research, Matondang (2017) stated a significant difference between the Altman Z-score, Springate, Zmijewski, Grover, Foster and Ohlson models in predicting bankruptcy. The Ohlson model was the best predictor of bankruptcy in manufacturing companies on the Indonesia Stock Exchange in the 2013-2015 period. Meanwhile, Manik (2015) stated that there was no significant difference between the Altman Z score, Grover, Springate, and Zmijewski models and the Grover model was the best predictor of bankruptcy. The researchers wanted to compare the four predictor models to see whether there are significant differences in the calculation results between the four predictor models. Furthermore, see which model is more accurately used to predict financial distress in Financial Distress in the Indonesian Fast Moving Consumer Goods (FMCG) Industry.

2.10 Theoretical Framework

A theoretical framework is a model that explains how a theory and known essential factors in a theory relate to known essential factors in a given problem. The conceptual framework will theoretically relate the independent variables to the dependent variable. In this study, the variables used were the Altman, Springate, Zmijewski, and Grover models. Each model uses different variables, meaning that one model with another will be different. This difference means that the level of accuracy of each model in predicting a company's bankruptcy will be different from the other.

Based on the above description, the conceptual framework for the comparison of Altman, Springate, Zmijewski and Grover models can be described as follows:

Diagram 3.1. Research Framework
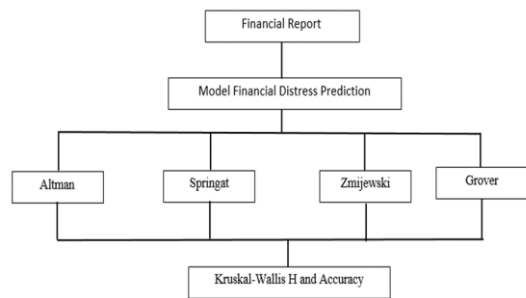


## 3. RESEARCH METHOD

### 3.1 Research Design

The pilot study approach includes two methods, qualitative approaches, and quantitative methods. Quantitative methodology is the way researchers gain experience through observational techniques such as surveys and tests and collect data on predetermined methods that generate statistical results (Creswell, 2017).

In terms of empirical objectives, the quantitative method attempts to identify variance and predict causal interactions, while the qualitative method attempts to identify variance and understand and clarify links. The quantitative model is closed, while the qualitative method has an open query mode (Mack et al., 2005).

The researcher first collects and examines the literature containing information and hypotheses related to the problem to build a theory. By analyzing the literature, the researcher identifies the independent variables that can be included in the analysis and then builds a theoretical structure.

After collecting and analyzing some similar articles and previous studies, the researcher can start this stage of analyzing the theoretical structure to get more insight into the field, such as estimation and inference (Sekaran & Bougie, 2013).

### 3.2 Sampling Design

To obtain details to meet the research requirements, the researcher will use a tool called sample design to assist the researcher or author of this report in identifying the research sample. A *sample design* is a program that draws a specific sample from a particular population. This sampling applies to the method or process that the researcher will follow when collecting the sample objects. Researchers will choose an accurate and appropriate model for the analysis of the test (Neuman, 2014).

The sample design is divided into two, which are probability sampling and non-probability sampling. It includes simple random chance sampling, proportional stratified randomization, hyper-stratified randomization, and random area. By comparison, a random sampling includes routine sampling, allocation sampling, unintended sampling, purposeful sampling, saturation sampling, and snowball sampling (Sekaran & Bougie, 2013). This research uses purposive sampling, in which the sample is carefully selected. This purposeful sampling is ideal for work that does not generalize the sample.

3.4 Data Collection Design

Data collection methods in this study are:

1.  The documentation method is to collect data from written objects. In this study, the source of data used in the form of financial reports on FMCG companies was obtained from www.IDX.co.id and the official website of each company.
2.  The study method reviews various literature such as journals, scientific literature, papers, and references.

3.5 Data Analysis Design

The analytical method used in this research is to perform a quantitative analysis expressed by numbers calculated using statistical methods assisted by the SPSS statistical data management program. The data analysis technique used to analyze the data that has been collected in this study is the Multiple Discriminant Analysis and Kruskal Wallis Test.

3.5.1 Descriptive Statistic Analysis

Descriptive Statistical Analysis is one of the data analysis techniques clearly described as a valuable tool to the author of this study (Creswell, 2017). They analyze and assess the data to consistently and reliably reorder the sample dependent on each specific data.

3.5.2 Multiple Discriminant Analysis

Multiple Discriminant Analysis is a statistical model that can help interpret financial ratios and use them in decision-making. Multiple Discriminant Analysis is used to determine characterization variables that distinguish existing population groups and can be used as grouping criteria.

**1. Analysis of Bankruptcy Model Altman Z-score**

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With the cut-off value Z < 1.81, the company is in the bankrupt category with a score of 1.81-2.67. The company is in the gray area (or zone of ignorance). Z > 2.67 the company is not bankrupt.

**2. Springate Model Bankruptcy Analysis**

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3. If the value of S > 1.062 indicates the company is in a healthy financial condition (not bankrupt)

**3. Zmijewski Model Bankruptcy Analysis**

Zmijewski discovered this bankruptcy analysis model in 1983, resulting from 20 years of research. Zmijewski used a sample of 75 bankrupt companies and 3,573 healthy companies from 1970 to 1978. The financial ratios used in this model were selected from the financial ratios used in previous studies (Syahyunan, 2013).

The Zmijewski models that have been successfully developed are:

$$Z = -4.3 - 4.5X1 + 5.7X2 - 0.0004X3$$

X1 = ROA (Net income/total assets)
X2 = Leverage (Total debt/total assets)
X3 = Liquidity (Current assets/current liabilities)

The cut-off value used in this model is 0, where if Z is positive (Z>0), it means that the company has the potential to go bankrupt. Meanwhile, the more negative Z (Z≤0) value, the farther the company is from the potential for bankruptcy.

**4. Grover Model Bankruptcy Analysis**

The Grover model is a model created by designing and reevaluating the Altman Z-Score model. According to the 1968 Altman model, Grover used a sample, adding 13 new financial ratios. The sample used is 70 companies with 35 bankrupt and 35 non-bankrupt companies from 1982 to 1996.

According to Syahyunan (2015) Grover produces the following function :

**Score = 1,650 X1 + 3.040 X2 + 0,016 ROA + 0,057**

X1 = Working Capital to Total Assets
X2 = Earnings Before Interest and Taxes to Total Assets
ROA = Net Income to Total Assets

Grover classifies the value of corporate bankruptcy as follows:
1. If the score ≤ 0.02, then the company is in a state of bankruptcy
2. If the score≥ 0.01, then the company is in good health (not bankrupt)

3.5.3 Kruskal Wallis Test

The Kruskal Wallis test is a non-parametric statistical test that can test whether there is a significant difference between the independent variable group and the dependent variable. Because to see significant differences between groups, this test is used to compare more than two population groups with data in the form of rankings. This test is also commonly referred to as the Kruskal-Wallis H test.

The Kruskal Wallis test extends the Wilcoxon two-sample test for k > 2 samples, generally used to test the null hypothesis (H₀) that The free sample of k comes from an identical population. The Kruskal Wallis test is an alternative test for the F test and a one-way ANOVA test for testing the similarity of several Middle values and analysis of variance that can be used if the assumption of normality is not met.

Hypothesis testing criteria
Ho: The mean values of the five predictor models are identical
Ha: The mean values of the five predictor models are not identical α = 0.05, Critical area is rejected if Sig < α

3.4.1    Prediction Model Accuracy Test

To see the level of accuracy of the model being compared, the researcher refers that the level of accuracy can be seen from the company's current condition, which is calculated using a predictive model so that the model will be seen (Jumaidi, 2015). Which one predicts according to the calculation results. The level of accuracy of each model is calculated in the following way:

*Level of accuracy =*
$$\frac{Number\ of\ sample\ predictions}{Number\ of\ Sample} x100\%$$

**4.  RESULT AND DISCUSSION**

4.1.  Data Analysis

4.1.1 Descriptive Statistical Analysis

*Descriptive statistical analysis* is an analytical method in which data is collected, categorized, aggregated, analyzed, and interpreted objectively to provide an overview of the object being discussed. The descriptive analysis in this study includes Working Capital to Total Assets, Retained Earnings to Total Assets, EBIT to Total Assets, Book Value of Equity to Book Value of Debt, Return on Asset (ROA), Earnings Before Taxes to Current Liabilities, Total Sales to Total Assets, Debt Ratio, and Current Ratio.

4.1.2 Multiple Discriminant Analysis

Multiple Discriminant Analysis is a statistical model that can help interpret financial ratios and use them in decision-making. Multiple Discriminant Analysis is used to determine characterization variables that distinguish existing population groups and can be used as grouping criteria.

4.2.  Research Results of Altman Z-Score Model

The financial ratio values obtained will be compared with the criteria set by Altman to determine whether the company's position is in

the healthy, gray, or bankrupt zone. The Multiple Discriminant Analysis formulation proposed by Altman is:

**Z = 0,717X1 + 0,847X2 + 3,107X3 + 0,420X4 + 0,995X5**

Table 4.1. Result of Altman Z Score

| No | Company Code | Category | | | | |
|----|----|----|----|----|----|----|
| | | 2016 | 2017 | 2018 | 2019 | 2020 |
| 1 | UNVR | NB | NB | NB | NB | NB |
| 2 | ULTJ | NB | NB | NB | NB | NB |
| 3 | STTP | GA | NB | NB | NB | NB |
| 4 | SKLT | GA | NB | NB | NB | NB |
| 5 | SKBM | GA | GA | GA | GA | GA |
| 6 | ROTI | GA | B | B | B | B |
| 7 | PSDN | GA | GA | NB | NB | NB |
| 8 | MYOR | NB | NB | NB | NB | NB |
| 9 | MLBI | NB | NB | NB | NB | NB |
| 10 | INDF | GA | B | GA | GA | GA |
| 11 | ICBP | NB | NB | NB | NB | NB |
| 12 | HMSP | NB | NB | NB | NB | NB |
| 13 | GGRM | NB | NB | NB | NB | NB |
| 14 | CEKA | NB | NB | NB | NB | NB |
| 15 | ALTO | B | B | B | B | B |
| 16 | AISA | GA | B | B | B | B |

Information:
B = Bankrupt
NB = Not Bankrupt
GA = Grey Area (Bankruptcy Prone Areas)

Based on the Table as a whole, from 2016- to 2020, four companies are predicted to be in the bankrupt category: ROTI, INDF, ALTO, AISA, and seven companies in the grey area position.

Altman Z Score in the consumer goods industry sector shows that four companies are predicted to be in the bankrupt category. Companies categorized as bankrupt are AISA and ROTI in 2017, 2017, 2018, 2019, and 2020. This is due to the company's low operating profit that year. Furthermore, the company that was also categorized as bankrupt was ALTO. This company was categorized as bankrupt throughout the year of the study, this was due to low operating profit and fluctuating working capital, and some were negative. The next one was INDF in 2017. The problems in each company were caused by low sales, which resulted in low operating profit. In addition, Altman's prediction shows that there are 15 companies in the gray category. In this case, the company is expected to evaluate management policies and performance to avoid financial distress. The gray category means that the company is not in a healthy condition, although also not in a state of financial distress.

4.3. Research Results of Springate Model

Springate collects popular financial ratios that can predict whether a company is in bankruptcy, not bankrupt, or prone to bankruptcy. The model generated by Springate (1978) is as follows:

**S= 1.034A + 3.07B + 0.66C + 0.4D**

The results of the Springate Model calculation in the FMCG industrial sector on the IDX can be seen in Table 4.2 below:

Table 4.2 Springate Model Result

| No | Company Code | Category | | | | |
|----|----|----|----|----|----|----|
| | | 2016 | 2017 | 2018 | 2019 | 2020 |
| 1 | UNVR | NB | NB | NB | NB | NB |
| 2 | ULTJ | NB | NB | NB | NB | NB |
| 3 | STTP | NB | NB | NB | NB | NB |
| 4 | SKLT | NB | GA | GA | GA | GA |
| 5 | SKBM | GA | GA | GA | GA | GA |
| 6 | ROTI | NB | B | B | B | B |
| 7 | PSDN | B | NB | NB | NB | NB |
| 8 | MYOR | NB | NB | NB | NB | NB |
| 9 | MLBI | NB | NB | NB | NB | NB |
| 10 | INDF | GA | GA | GA | GA | GA |
| 11 | ICBP | NB | NB | NB | NB | NB |
| 12 | HMSP | NB | NB | NB | NB | NB |
| 13 | GGRM | NB | NB | NB | NB | NB |
| 14 | CEKA | NB | NB | NB | NB | NB |
| 15 | ALTO | B | B | B | B | B |
| 16 | AISA | NB | GA | GA | GA | GA |

Information:
B = Bankrupt
NB = Not Bankrupt
GA = Grey Area (Bankruptcy Prone Areas)

Based on the Table as a whole, from 2016- to 2020, there are three companies predicted to be in the bankrupt category and four companies in the grey area position. Based on the analysis using the Springate predictor model, the results obtained to state that seven companies are predicted to be in the bankrupt category and 14 companies in the non-bankrupt category. In general, the results displayed by Springate are not much different from Altman's. This similarity is because the ratios used tend to be the same. According to Springate, the companies that went bankrupt were ALTO, which went bankrupt throughout the year, PSDN in 2016, and ROTI in 2017, 2018, 2019, and 2020.

The prediction value of Springate bankruptcy uses a comparison of the total sales

value of the company's total assets in predicting the company's bankruptcy. The higher the value generated by the ratio, the more meaningful the use of company assets. However, still, it is influenced by the company's working capital because the need for working capital can be immediately disbursed to cover its financial shortage.

4.4. Research Results of the Zmijewski Model

Zmijewski discovered this bankruptcy analysis model in 1983, which results from 20 years of research that can predict whether a company is bankrupt or not bankrupt. The Zmijewski models that have been successfully developed are:

**Z = -4.3 - 4.5X1 + 5.7X2 - 0.0004X3**

The results of the Zmijewski Model calculation in the FMCG industrial sector on the IDX can be seen in Table 4.3 below:

Table 4.3. Zmijewski Model Result

| No | Company Code | Category | | | | |
|----|---------|------|------|------|------|------|
| | | 2016 | 2017 | 2018 | 2019 | 2020 |
| 1 | UNVR | NB | NB | NB | NB | NB |
| 2 | ULTJ | NB | NB | NB | NB | NB |
| 3 | STTP | NB | NB | NB | NB | NB |
| 4 | SKLT | NB | NB | NB | NB | NB |
| 5 | SKBM | NB | NB | NB | NB | NB |
| 6 | ROTI | NB | NB | NB | NB | NB |
| 7 | PSDN | NB | NB | NB | NB | NB |
| 8 | MYOR | NB | NB | NB | NB | NB |
| 9 | MLBI | NB | NB | NB | NB | NB |
| 10 | INDF | NB | NB | NB | NB | NB |
| 11 | ICBP | NB | NB | NB | NB | NB |
| 12 | HMSP | NB | NB | NB | NB | NB |
| 13 | GGRM | NB | NB | NB | NB | NB |
| 14 | CEKA | NB | NB | NB | NB | NB |
| 15 | ALTO | NB | NB | NB | NB | NB |
| 16 | AISA | NB | NB | NB | NB | NB |

Information:

B = Bankrupt

NB = Not Bankrupt

GA = Grey Area (Bankruptcy Prone Areas)

Based on the Table as a whole, from 2016- to 2020, there are not any companies predicted to be in the bankrupt category. The bankruptcy prediction value with the Zmijewski model shows that the Zmijewski model can predict most companies that are not bankrupt. Based on the Zmijewski value, it can be seen that the debt ratio value affects more than the Return On Assets and current ratio values on the health of the company.

4.4. Research Results of Grover Model

The Grover model is a model created by designing and evaluating the Altman Z-score model. This model can predict whether the company is in the bankrupt category or not. Grover produces the following function:

**Score = 1,650 X1 + 3.040 X2 + 0,016 ROA + 0,057**

The results of the Grover Model calculation in the FMCG industrial sector on the IDX can be seen in Table 4.4 below:

Table 4.4. Grover Model

| No | Company Code | Category | | | | |
|----|---------|------|------|------|------|------|
| | | 2016 | 2017 | 2018 | 2019 | 2020 |
| 1 | UNVR | B | NB | NB | NB | NB |
| 2 | ULTJ | NB | NB | NB | NB | NB |
| 3 | STTP | NB | NB | NB | NB | NB |
| 4 | SKLT | NB | NB | NB | NB | NB |
| 5 | SKBM | NB | NB | NB | NB | NB |
| 6 | ROTI | NB | NB | NB | NB | NB |
| 7 | PSDN | NB | NB | NB | NB | NB |
| 8 | MYOR | NB | NB | NB | NB | NB |
| 9 | MLBI | NB | NB | NB | NB | NB |
| 10 | INDF | NB | NB | NB | NB | NB |
| 11 | ICBP | NB | NB | NB | NB | NB |
| 12 | HMSP | NB | NB | NB | NB | NB |
| 13 | GGRM | NB | NB | NB | NB | NB |
| 14 | CEKA | NB | NB | NB | NB | NB |
| 15 | ALTO | B | NB | NB | NB | NB |
| 16 | AISA | NB | NB | NB | NB | NB |

Information:

B = Bankrupt

NB = Not Bankrupt

GA = Grey Area (Bankruptcy Prone Areas)

4.5. Interpretation of Result

The results of the first hypothesis test using the Kruskal-Wallis H test showed a significant difference between the use of destruction using the Altman Z-score, Springate, Zmijewski, and Grover models. Based on the normality test table, a significance level of 0.000 was obtained. The significance level obtained is smaller than 0.05 and causes H0 to be rejected, and Ha accepted. This finding means that there are differences in the potential for bankruptcy between the Altman Z Score, Springate, Zmijewski, and Grover analysis models on the FMCG in Company on the IDX in 2016-2020. The results of this study are the same as the previous researchers. The results of this study are the same as previous researchers Matondang (2017), who stated that there were significant differences between the Altman Z-

score, Springate, Zmijewski, Grover, Foster, and Ohlson models in predicting bankruptcy. This study finds the Ohlson model the best predictor of bankruptcy for manufacturing companies on the Indonesia Stock Exchange from 2013-to 2015.

Based on the analysis, we can see the level of accuracy obtained by each model. The Altman model has an accuracy rate of 75%. Furthermore, the Springate model has an accuracy rate of 81%. The Zmijewski model has an accuracy rate of 100%, and Grover has 88%. From the table, we can see that the model with the highest accuracy rate is the Zmijewski model of 100%. Here the results of his research stated that the Zmijewski model was the best predictor of bankruptcy, although the level of accuracy obtained was different.

## 5. CONCLUSION

### 5.1. Conclusion

Based on data analysis and hypothesis testing that has been carried out, conclusions can be drawn from this study, which are:

There is a significant difference between the Altman, Z-score, Springate, Zmijewski, and Grover models in predicting bankruptcy in FMCG industrial companies on the IDX in 2016-2020.

The Zmijewski model is the best predictor of bankruptcy for FMCG industrial companies on the IDX in 2016-2020.

### 5.2 Recommendation for Future Research

Every finding and deeper analysis within this research leads to some beneficial recommendations for related parties, which are elaborated as follows:

**1. Indonesia FMCG industry**

They are considering the potential of the Indonesian FMCG industry in the future as one of the leading industries and one of the essential fields for Indonesian citizens. Companies in this industry must keep annual reports as a risk control to prevent bankruptcy or financial crises.

Therefore, the companies listed in the industry should improve their performance so that the results of these ratios indicate the state of the company results are promising, avoid bankruptcy, and be more attractive to investors to push the industry in a better direction in the future—Indonesia's economic progress.

**2. Investors**

They know the potential of the FMCG industry in moving the Indonesian economy in a better direction. A better understanding of

financial ratios and financial distress will help investors gain better insight into making investments by evaluating fundamental investment analysis. Getting better returns by evaluating financial ratios will allow investors to make better choices and capital investment decisions, which means that investors will avoid investing in companies facing financial difficulties. Therefore, as part of risk management, investors can avoid losses. Thus, the industry can be stronger than before if it is supported by investors who can see potential points and are willing to assist the industry concerning the national economy.

**3. Future Researcher**

Due to the limitations of this study, it is recommended that prospective researchers extend the study time beyond five years to achieve better test results. Therefore, future researchers intend to expand the population size that is not constrained by the Indonesian consumer goods industry to expand financial ratio research to the financial crisis forecasting process. Then, it is recommended to add other variables to find other effects on financial hardship. Last but not least, future researchers need to evaluate research on non-financial ratios to provide additional insights and more explicit definitions of financial stress prediction.

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