Altman Z-Score, Springate, and Zmijewski Methods' Analysis for Predicting Financial Distress In Manufacturing Companies Listed On The Indonesia Stock Exchange

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ABSTRACT

This study aims to determine the condition of manufacturing companies in the consumer goods industry listed on the Indonesia Stock Exchange based on the results of bankruptcy predictions using the Altman Z-Score, Springate, and Zmijewski methods. The data used in this study is secondary data in the form of audited financial statements of companies listed on the Indonesia Stock Exchange. The data period for this research started in 2014-2018. The data processing method uses the Altman Z-Score, Springate, and Zmijewski methods. The results of this study indicate that in the Altman Z-Score and Springate models there are several companies that are predicted to go bankrupt and are in the gray area. Using Zmijewski's analysis, all samples are estimated to be in a non-bankrupt condition. The results of this study indicate that in the Altman Z-score and Springate models there are several companies that are in a state of bankruptcy and are in the gray area. Likewise, if using the Zmijewski model analysis, all company samples are in a healthy condition.

Keywords : Bankruptcy, Altman Z-score model, Springate model, Zmijewski model.

1. INTRODUCTION

The In the current era of globalization, the industrial world has developed comprehensively. This makes companies around the world have to be more competitive in the midst of this increasingly fierce competition. Free and open trade and investment make every company have to improve performance in order to achieve the vision and mission that was the initial goal of the company's establishment, one of which is a manufacturing company in the consumer goods industry sector. This is because the consumer goods industry still offers the potential for growth and is the main choice for investors to invest their funds. The consumer goods industry consists of 5 consumer goods industrial sectors, namely the food and beverage consumption goods industry, the cigarette consumption goods industry, the pharmaceutical consumer goods industry, the cosmetic and household consumer goods industry sector and the household appliances consumer goods industry sector.

The potential for bankruptcy owned by each company will give concern from various parties, both internal and external parties, the investors will lose all the shares that have been invested in the company and the creditors will suffer losses because all the funds that have been lent to the company cannot be repaid or uncollectible, so bankruptcy prediction is very necessary in making investment decisions. Given the many parties who have an interest in the company's financial statements, the company's analysis is also very important to better understand the condition of the company. Financial statement analysis commonly used is ratio analysis. In its development ratio analysis only emphasizes one financial aspect, it is a weakness of ratio analysis, therefore a method is needed that can combine these financial aspects into an analytical tool to analyze corporate bankruptcy.

This research is important because the results of this study will provide an overview of the accuracy of the Altman Z-Score, Springate, and Zmijewski models in predicting the level of corporate bankruptcy in Indonesia. The results of this study can provide information to various parties, for example the company being analyzed and investors who will invest their funds in a company. According to Hery (2017: 33), is a condition where the company is facing financial difficulties. According to Fachrudin in Hery (2017: 33), financial difficulties begin when the company cannot meet the payment schedule, or when cash flow projections indicate that the company will soon be unable to meet its obligations. The factors causing bankruptcy according to Hery (2017:35) are as follows:
Internal factors
1) Inefficient management will result in continuous losses which ultimately causes the company to be unable to pay its obligations
2) Imbalance in the capital owned by the amount of debts owned.

3) Moral hazard by management. Fraud committed by company management can result in bankruptcy.

External Factors
1) Changes in customer desires that are not anticipated by the company causing a decrease in revenue.
2) Difficulty in raw materials because suppliers can no longer supply the raw materials used for production.
3) Unharmonious relationships with creditors can also be fatal for the survival of the company.
4) The increasingly fierce business competition requires companies to always improve themselves so that they can compete with other companies in meeting customer needs.
5) The condition of the global economy must always be anticipated by the company.

According to Hery (2017: 36) there are many models that have been developed to predict bankruptcy. One of them is Altman's discriminant analysis model. Altman combines several ratios into a predictive model with statistical techniques. Altman model is often known as the Z-score. The Z-score model was developed in 1968 by Edward Altman. In his research, Altman took a sample of 66 companies consisting of 33 companies that have experienced bankruptcy during the last 20 years and 33 randomly selected companies that have never experienced bankruptcy. Springate formulated a bankruptcy prediction model in 1978. In its formulation, Springate used the Multiple Discriminant Analysis (MDA) method. Initially the S-Score consisted of 19 popular financial ratios. After going through the Springate test, we chose 4 ratios that were believed to be able to distinguish between companies that went bankrupt and those that did not. This model can be used to predict bankruptcy with an accuracy rate of 92.5% (Hadi and Anggraeni, 2008). Zmijewski (1984) uses ratio analysis that measures the performance, leverage, and liquidity of a company for his prediction model. Zmijewski used a probit analysis that was applied to 40 companies that had gone bankrupt and 800 companies that were still surviving at that time. (Margaretta and Saputra, 2005).

METHODS

This research is descriptive research. This study describes the data obtained and analyzes the existing data. Researcher conducted research on the Manufacturing Companies in the consumer goods industry sector listed on the Indonesia Stock Exchange, namely: PT. Prashida Aneka Niaga Tbk, PT. Wilmar Cahaya Indonesia Tbk , PT. Tiga Pilar Sejeahtera Food Tbk, PT. Mayora Indah Tbk, PT. Multi Bintang Indonesia Tbk, PT. Nippon Indosari Corpindo Tbk, PT. Bentoel Internasional Investama Tbk, PT. Gudang Garam Tbk, PT. Wismilak Inti Makmur Tbk, PT. HM Sampoerna Tbk, PT. Darya-Varia Laboratoria Tbk, PT. Kalbe Farma Tbk, PT. Sido Muncul Herbal and Pharmaceutical Industry Tbk, PT. Tempo Scan Pacific Tbk, PT. Aksha Wira International Tbk, PT. Mandom Indonesia Tbk, PT. Mustika Ratu Tbk, PT. Unilever Indonesia Tbk, PT. Chitose International Tbk, PT. Kedaung Indah Can Tbk. The population is the whole group of people, events, objects that interest researchers to study (Indrawati, 2015:164). The population to be studied in this study are food and beverage companies listed on the Indonesia Stock Exchange and whose financial statements have been audited for 2014-2018. The sampling method used in this study is purposive sampling, this is based on a certain consideration made by the researcher himself, based on the characteristics or characteristics of the population that have been previously known. The sample in this study is a food and beverage company that meets the following criteria:
1) Manufacturing company listed on the Indonesia Stock Exchange.
2) Manufacturing companies in the consumer goods industry sector that have complete and audited financial reports for the 2014-2018 period.
3) Manufacturing company that never been delisted from the Indonesia Stock Exchange.

The data collection methods used are:
1) Documentation Method. Documentation Method is a method of collecting data which is done by examining the documents contained in the company (Narimawati, Anggadini, and Ismawati, 2010:39). This method is used to obtain data about food and beverage companies listed on the IDX and their financial statements.
2) Literature Study Method. Literature Study Method is a method used by understanding the literature that contains a discussion with research. This method is used to obtain data related to the theories of bankruptcy analysis.

The operational definition of the variable are:
1) Z_1 and S_1, Working Capital to Total Assets. This ratio shows the company's ability to generate net working capital from the total assets it owns (Sofyan Syafri Harahap, 2009: 353) in ST. Ibrah Mustafa Kamal (2012).
2) Z_2 and S_2, Retained Earnings to Total Assets. This ratio shows the company's ability to generate retained earnings from the company's total assets. Retained earnings occur because ordinary shareholders allow companies to reinvest profits that are not distributed as dividends (Sofyan Syafri Harahap, 2009: 353) in ST. Ibrah Mustafa Kamal (2012).
3) Z_3, Earning Before Interest and Tax to Total Assets. This ratio shows the company's ability to generate profits from company assets, before interest and tax payments. (Weston & Copeland, 2004:255) in ST. Ibrah Mustafa Kamal (2012).
4) Z_4, Market Value of Equity to Book Value of Debt. This ratio shows the company's ability to meet obligations from the market value of its own capital (common stock). The market value of equity itself is obtained by multiplying the number of ordinary shares outstanding by the market price per common share. The book value of debt is obtained by adding up current liabilities with long-term liabilities. (Sofyan Syafri Harahap, 2009: 353) in ST. Ibrah Mustafa Kamal (2012).
5) S_4, Sales to Total Assets. This ratio shows whether the company generates sufficient volume of business compared to investment in its total assets. This ratio reflects the efficiency of management in using the

company's overall assets to generate sales and earn profits Sales to Total Assets (S.Munawir, 2002: 309) in ST. Ibrah Mustafa (2012).

6) X_1, Return on Assets (ROA). This ratio shows the company's ability to use all of its assets to generate profit after tax, the greater the ROA the more efficient the use of company assets or in other words with the same number of assets, greater profits can be generated or vice versa (Sudana 2015:25).

7) X_2, Debt ratio. This ratio measures the proportion of funds sourced from debt to finance the company's assets, the greater this ratio indicates the greater the portion of debt used in financing investment in assets, which means that the financial risk is increasing and vice versa (Sudana, 2015:23)

8) X3, Current ratio. This ratio measures the company's ability to pay current debt by using its current assets, the greater this ratio means the greater the company's liquid (Sudana 2015:24).

The Data Analysis Method can be describe as follow:

1) Modification of Altman's 1995 bankruptcy analysis method (Hery, 2017:36)

$Z = 6.56Z_1 + 3.26Z_2 + 6.72Z_3 + 1.05Z_4$

Where:

Z_1 = working capital to total assets

Z_2 = retained earnings to total assets

Z_3 = earnign before interest and taxes to total assets

Z_4 = book value of equity to total liabilities

The results of the Z - Score calculation will be explained as follows:

a. Z < 1.1: the company is having serious financial problems.

b. b. 1.1 < Z < 2.6 : the company is included in the gray area (cannot be determined whether the company is classified as healthy or bankrupt).

c. Z > 2.6 : the company has no problems with its financial condition.

2) Springate bankruptcy analysis method (Hadi and Anggraeni, 2008:5)

$S=1.03S_1+3.07S_2+0.66S_3+0.4S_4$

Where:

S_1 = Ratio of working capital to total assets

S_2 = Ratio of profit before interest and tax to total assets

S_3 = Ratio of profit before tax to current debt

S_4 = Ratio of sales to total assets. The model has a standard where:

a. S < 0.862 : The company has the potential to go bankrupt

b. S > 0.862 : Healthy company

3) Zmijewski bankruptcy analysis method (Margaretta and Saputra, 2005:4)

$X = -4.3 - 4.5X_1 + 5.7X_2 - 0.004X_3$

Where:

X_1 = Return on Assets

X_2 = Debt Ratio

X_3 = Current Ratio

The cut off value that applies to this model is 0 (zero), this means:

X≥ 0 : The company is predicted to go bankrupt

X<0 : The company is not predicted to go bankrupt.

RESEARCH RESULT

To obtain research results, researchers process data from the company's financial statements as the research sample. The first step is to find data related to the variables of each model. The following is data relating to the variables in the Altman Z-score model.

Table 1
Food and Beverage Companies Listed on The Indonesia Stock Exchange,
Variable Data on The Altman Z-Score Model In 2014-2018

No	Company	Year	Z_1	Z_2	Z_3	Z_4	Score	Prediction
1	PT.Wilmar Cahaya Indonesia Tbk	2014	-	0,21	0,0	1,7	-1,83	Gray Area
		2015	-	0,26	0,1	1,7	-1,28	Gray Area
		2016	-	0,44	0,2	2,6	0,94	Bankrupt
		2017	-	0,47	0,1	2,8	0,87	Bankrupt
		2018	-	0,61	0,1	6,0	5,03	not Bankrupt
2	PT.Tiga Pilar Sejeahtera Food Tbk	2014	-	0,10	0,0	1,9	-0,83	Bankrupt
		2015	-	0,12	0,0	3,2	-1,79	Gray Area
		2016	-	0,18	0,1	1,8	-0,51	Bankrupt
		2017	-	0,56	-	0,3	-4,53	not Bankrupt
		2018	0,41	-	-	0,3	-2,09	Gray Area
		2014	-	-	-	2,4	-4,35	not Bankrupt

No	Company	Year	Z_1	Z_2	Z_3	Z_4	Score	Prediction
3	PT.Prashida Aneka Niaga Tbk	2015	-	-	-	2,1	-10,46	not Bankrupt
		2016	-	-	0,0	1,7	-0,42	Bankrupt
		2017	-	-	0,1	1,7	-0,19	Bankrupt
		2018	-	-	0,0	1,5	-0,81	Bankrupt
4	PT.Mayora Indah Tbk	2014	-	0,34	0,0	1,6	-0,95	Bankrupt
		2015	-	0,41	0,1	1,8	-0,22	Bankrupt
		2016	-	0,44	0,1	1,9	-0,10	Bankrupt
		2017	-	0,45	0,1	1,9	0,18	Bankrupt
		2018	-	0,45	0,1	1,9	0,31	Bankrupt
5	PT.Multi Bintang Indonesia Tbk	2014	2,89	0,24	0,4	1,4	5,01	not Bankrupt
		2015	4,16	0,35	0,3	1,7	6,56	not Bankrupt
		2016	5,35	0,35	0,5	1,7	8,00	not Bankrupt
		2017	11,0	0,41	0,7	1,9	14,09	not Bankrupt
		2018	8,26	0,40	0,5	1,8	11,06	not Bankrupt
6	PT.Nippon Indosari Corpindo Tbk	2014	-	0,32	0,1	1,8	-16,76	not Bankrupt
		2015	-	0,34	0,1	1,7	-4,20	not Bankrupt
		2016	-	0,38	0,1	1,9	-2,13	Gray Area
		2017	-	0,46	0,1	0,1	-1,31	Gray Area
		2018	-	0,30	0,0	2,9	0,87	Bankrupt
7	PT.Bentoel Internasional InvestamaTbk	2014	-	2,94	6,3	-	9,26	not Bankrupt
		2015	-	-	0,2	-	-10,17	not Bankrupt
		2016	-	-	0,1	-	-9,16	not Bankrupt
		2017	-	-	0,0	-	-10,65	not Bankrupt
		2018	-	-	0,0	-	-13,13	not Bankrupt
8	PT.Gudang Garam Tbk	2014	-	-	-	-	-3,14	not Bankrupt
		2015	-	-	-	-	-3,36	not Bankrupt
		2016	-	-	-	-	-3,60	not Bankrupt
		2017	-	-	-	-	-3,64	not Bankrupt
		2018	-	-	-	-	-3,82	not Bankrupt
9	PT.Wismilak Inti Makmur Tbk	2014	-	-	-	-	-2,48	not Bankrupt
		2015	-	-	-	-	-3,07	not Bankrupt
		2016	0,14	2,43	0,6	0,5	3,80	not Bankrupt
		2017	-	-	-	-	-4,11	not Bankrupt
		2018	-	-	-	-	-4,28	not Bankrupt
10	PT.HM Sampoerna Tbk	2014	-	-	-	-	-4,35	not Bankrupt
		2015	-	-	-	-	-5,84	not Bankrupt
		2016	-	-	-	-	-4,99	not Bankrupt
		2017	-	-	-	-	-4,77	not Bankrupt
		2018	-	-	-	-	-4,30	not Bankrupt
11	PT.Darya-Varia Laboratoria Tbk	2014	-1,68	0,47	0,08	4,22	3,08	not Bankrupt
		2015	-1,84	0,43	0,09	3,42	2,10	not Bankrupt
		2016	-2,20	0,46	0,13	3,39	1,77	not Bankrupt
		2017	-2,24	0,46	0,13	3,13	1,48	not Bankrupt
		2018	-2,14	0,49	0,16	3,49	2,00	not Bankrupt
12	PT.Kalbe Farma Tbk	2014	-2,17	0,71	0,02	4,65	3,21	not Bankrupt
		2015	-2,15	0,72	0,00	4,97	3,54	not Bankrupt
		2016	-2,10	0,74	0,02	5,51	4,17	not Bankrupt
		2017	-2,13	0,76	0,02	5,99	4,65	not Bankrupt
		2018	-2,17	0,33	0,02	6,36	4,54	not Bankrupt
13	PT.Industri Jamu Dan Farmasi Sido Muncul Tbk	2014	-1,68	0,00	0,11	15,1	13,53	not Bankrupt
		2015	-1,84	0,16	0,14	14,1	12,61	not Bankrupt
		2016	-1,89	0,21	0,17	13,0	11,50	not Bankrupt
		2017	-2,25	0,17	0,20	12,0	10,16	not Bankrupt
		2018	-2,83	0,13	0,25	7,67	5,22	not Bankrupt
		2014	-1,01	0,01	0,27	1,64	0,90	not Bankrupt
		2015	-2,41	0,05	0,11	3,23	0,97	not Bankrupt

No	Company	Year	Z_1	Z_2	Z_3	Z_4	Score	Prediction
14	PT.Tempo Scan Pacific Tbk	2016	-2,51	0,57	0,10	3,52	1,67	not Bankrupt
		2017	-2,44	0,56	0,09	3,16	1,37	not Bankrupt
		2018	5,16	0,57	0,09	3,23	9,05	not Bankrupt
15	PT.Aksha Wira International Tbk	2014	-6,01	-1,02	1,75	2,41	-2,87	not Bankrupt
		2015	-8,49	-0,74	0,09	2,03	-7,11	not Bankrupt
		2016	-6,18	-0,56	0,50	2,00	-4,24	not Bankrupt
		2017	-	0,46	0,09	2,01	-14,46	not Bankrupt
		2018	-8,66	0,38	0,34	2,21	-5,74	not Bankrupt
16	PT.Mandom Indonesia Tbk	2014	-5,13	0,52	0,14	3,81	-0,66	not Bankrupt
		2015	18,9	0,68	0,11	5,67	25,44	not Bankrupt
		2016	35,7	0,00	0,11	5,45	41,29	not Bankrupt
		2017	-0,22	0,66	0,10	6,42	6,95	not Bankrupt
		2018	-2,84	0,68	0,08	6,08	4,00	not Bankrupt
17	PT.Mustika Ratu Tbk	2014	-1,83	0,01	0,02	4,34	2,55	not Bankrupt
		2015	-1,79	0,00	0,01	4,14	2,37	not Bankrupt
		2016	-1,73	0,01	0,00	4,24	2,52	not Bankrupt
		2017	-1,79	0,44	0,01	3,81	2,47	not Bankrupt
		2018	-1,97	0,43	0,01	3,56	2,02	not Bankrupt
18	PT.Unilever Indonesia Tbk	2014	5,65	0,31	0,54	1,47	7,98	not Bankrupt
		2015	4,49	0,31	0,50	1,44	6,75	not Bankrupt
		2016	3,90	0,03	0,52	1,39	5,84	not Bankrupt
		2017	4,13	0,26	0,50	1,38	6,26	not Bankrupt
		2018	6,95	0,38	0,63	1,63	9,59	not Bankrupt
19	PT.Chitose Internasional Tbk	2014	-2,63	0,10	0,10	4,85	2,41	Gray Area
		2015	-2,62	0,17	0,10	5,65	3,30	not Bankrupt
		2016	-2,56	0,23	0,14	4,65	2,46	Gray Area
		2017	-2,57	0,25	0,01	4,23	1,93	Gray Area
		2018	-3,55	0,21	0,12	4,78	1,57	Gray Area
20	PT.Kedaung Indah Can Tbk	2014	-1,77	-0,03	0,07	3,10	1,37	Gray Area
		2015	-2,20	0,14	0,02	3,31	1,26	Gray Area
		2016	-2,17	0,15	0,01	2,75	0,75	Bankrupt
		2017	-1,92	-0,11	0,08	2,58	0,63	Bankrupt
		2018	-1,88	0,08	0,00	2,59	0,79	Bankrupt

The following is data relating to the variables in the Springate model:

Table 2
Food and Beverage Companies Listed on The Indonesia Stock Exchange
Variable Data on Springate Model in 2014-2018

No	Company	Year	S_1	S_2	S_3	S_4	Score	Prediction
1	PT.Wilmar Cahaya Indonesia Tbk	2014	-3,84	0,08	0,08	2,88	-0,81	Bankrupt
		2015	-3,40	0,11	0,17	2,35	-0,77	Bankrupt
		2016	-2,38	0,22	0,57	2,89	1,30	not Bankrupt
		2017	-2,56	0,12	0,32	3,06	0,94	Bankrupt
		2018	-1,80	0,14	0,78	3,10	2,23	not Bankrupt
2	PT.Tiga Pilar Sejeahtera Food Tbk	2014	-2,97	0,09	0,32	0,70	-1,86	not Bankrupt
		2015	-5,29	0,08	0,18	0,66	-4,36	not Bankrupt
		2016	-2,69	0,14	0,29	0,71	-1,55	not Bankrupt
		2017	-5,18	-	-	0,98	-5,73	not Bankrupt
		2018	0,41	-	-	0,87	1,26	not Bankrupt
		2014	-6,78	-	-	1,57	-5,34	not Bankrupt
		2015	-	-	-	1,48	-11,11	not Bankrupt

No	Company	Year	S_1	S_2	S_3	S_4	Score	Prediction
3	PT.Prashida Aneka Niaga Tbk	2016	-2,02	0,01	-	1,43	-0,62	Bankrupt
		2017	-1,94	0,10	0,16	2,03	0,35	Bankrupt
		2018	-2,14	0,00	-	1,91	-0,28	Bankrupt
4	PT.Mayora Indah Tbk	2014	-3,03	0,09	0,17	1,38	-1,40	not Bankrupt
		2015	-2,64	0,16	0,52	1,31	-0,64	Bankrupt
		2016	-2,66	0,18	0,48	1,42	-0,59	Bankrupt
		2017	-2,41	0,16	0,49	1,40	-0,36	Bankrupt
		2018	-2,23	0,15	0,50	1,37	-0,21	Bankrupt
5	PT.Multi Bintang Indonesia Tbk	2014	2,89	0,48	0,68	1,34	5,39	not Bankrupt
		2015	4,16	0,32	0,56	1,28	6,32	not Bankrupt
		2016	5,35	0,58	1,00	1,43	8,36	not Bankrupt
		2017	11,04	0,71	1,36	1,35	14,47	not Bankrupt
		2018	8,26	0,58	1,06	1,26	11,16	not Bankrupt
6	PT.Nippon Indosari Corpindo Tbk	2014	-	0,14	0,82	0,88	-17,17	not Bankrupt
		2015	-6,49	0,17	0,96	0,80	-4,56	not Bankrupt
		2016	-4,64	0,15	1,15	0,77	-2,57	not Bankrupt
		2017	-2,01	0,10	0,18	5,47	3,74	not Bankrupt
		2018	-2,45	0,04	0,36	0,82	-1,23	not Bankrupt
7	PT.Bentoel Imnternasional Investama Tbk	2014	-0,01	-	0,26	1,34	1,50	not Bankrupt
		2015	-0,33	-	0,56	1,33	1,49	not Bankrupt
		2016	-0,38	-	0,38	1,43	1,38	not Bankrupt
		2017	-0,31	-	0,09	1,44	1,20	not Bankrupt
		2018	-0,24	-	0,05	1,43	1,23	not Bankrupt
8	PT.Gudang Garam Tbk	2014	-0,59	0,15	0,31	1,12	0,98	not Bankrupt
		2015	-0,62	0,16	0,36	1,11	1,00	not Bankrupt
		2016	-0,66	0,16	0,41	0,95	0,86	not Bankrupt
		2017	-0,66	0,17	0,46	0,97	0,94	not Bankrupt
		2018	-0,68	0,16	0,48	1,12	1,07	not Bankrupt
9	PT.Wismilak Inti Makmur Tbk	2014	-0,42	0,12	0,34	1,25	1,29	not Bankrupt
		2015	-0,48	0,15	0,52	1,37	1,56	not Bankrupt
		2016	0,14	0,10	0,47	1,25	1,95	not Bankrupt
		2017	-0,57	0,04	0,34	1,20	1,01	not Bankrupt
		2018	-0,60	0,04	0,47	1,15	1,06	not Bankrupt
10	PT.HM Sampoerna Tbk	2014	-0,25	0,48	1,01	2,84	4,08	not Bankrupt
		2015	-0,66	0,37	3,07	2,34	5,11	not Bankrupt
		2016	-0,64	0,40	2,63	2,25	4,63	not Bankrupt
		2017	-0,64	0,39	2,61	2,30	4,65	not Bankrupt
		2018	-0,62	0,39	2,04	2,29	4,10	not Bankrupt
11	PT.Darya-Varia Laboratoria Tbk	2014	-1,6842	0,08	0,57	0,89	-0,15	Bankrupt
		2015	-1,8411	0,09	0,49	0,95	-0,31	Bankrupt
		2016	-2,2049	0,13	0,57	0,95	-0,55	Bankrupt
		2017	-2,2354	0,13	0,51	0,96	-0,63	Bankrupt
		2018	-2,1387	0,16	0,66	1,01	-0,31	Bankrupt
12	PT.Kalbe Farma Tbk	2014	-2,1691	0,02	1,16	1,40	0,41	Bankrupt
		2015	-2,1459	0,00	1,15	1,31	0,31	Bankrupt
		2016	-2,0986	0,02	1,33	1,27	0,53	Bankrupt
		2017	-2,1258	0,02	1,46	1,21	0,56	Bankrupt
		2018	-2,17	0,02	1,45	1,16	0,46	Bankrupt
13	PT.Industri Jamu Dan Farmasi Sido Muncul Tbk	2014	-1,6797	0,11	3,01	0,78	2,21	not Bankrupt
		2015	-1,8364	0,14	3,03	0,79	2,14	not Bankrupt
		2016	-1,8928	0,17	2,90	0,86	2,03	not Bankrupt
		2017	-2,252	0,20	2,43	0,81	1,19	not Bankrupt
		2018	-2,8307	0,25	2,24	0,83	0,48	Bankrupt
14	PT.Tempo Scan Pacific Tbk	2014	-1,0118	0,27	0,60	3,00	2,85	not Bankrupt
		2015	-2,4094	0,11	0,42	1,30	-0,58	Bankrupt
		2016	-2,5108	0,10	0,43	1,33	-0,65	Bankrupt

No	Company	Year	S_1	S_2	S_3	S_4	Score	Prediction
		2017	-2,4403	0,09	0,37	1,29	-0,70	Bankrupt
		2018	5,1572	0,09	0,36	1,28	6,89	not Bankrupt
15	PT.Aksha Wira International Tbk	2014	-6,0106	1,75	0,26	1,15	-2,85	not Bankrupt
		2015	-8,4879	0,09	0,22	1,03	-7,16	not Bankrupt
		2016	-6,182	0,50	0,32	1,16	-4,21	not Bankrupt
		2017	-17,024	0,09	0,21	0,97	-15,76	not Bankrupt
		2018	-8,6619	0,34	0,27	0,91	-7,14	not Bankrupt
16	PT.Mandom Indonesia Tbk	2014	-5,1341	0,14	0,49	1,25	-3,26	not Bankrupt
		2015	18,993	0,11	2,62	1,11	22,83	not Bankrupt
		2016	35,731	0,11	0,99	1,16	37,99	not Bankrupt
		2017	-0,2192	0,10	0,94	1,15	1,96	not Bankrupt
		2018	-2,8407	0,08	0,50	1,08	-1,19	not Bankrupt
17	PT.Mustika Ratu Tbk	2014	-1,8309	0,02	0,10	0,87	-0,84	Bankrupt
		2015	-1,7875	0,01	0,02	0,86	-0,89	Bankrupt
		2016	-1,7322	0,00	0,04	0,71	-0,98	Bankrupt
		2017	-1,7926	0,01	0,01	0,69	-1,08	Bankrupt
		2018	-1,9733	0,01	0,02	0,59	-1,36	not Bankrupt
18	PT.Unilever Indonesia Tbk	2014	5,6498	0,54	0,87	2,42	9,48	not Bankrupt
		2015	4,4886	0,50	0,77	2,32	8,09	not Bankrupt
		2016	3,9035	0,52	0,80	2,39	7,62	not Bankrupt
		2017	4,1265	0,50	0,75	2,18	7,56	not Bankrupt
		2018	6,9481	0,63	1,09	2,14	10,81	not Bankrupt
19	PT.Chitose Internasional Tbk	2014	-2,6339	0,10	0,55	0,77	-1,20	not Bankrupt
		2015	-2,6214	0,10	0,69	0,82	-1,00	not Bankrupt
		2016	-2,5642	0,14	0,46	0,96	-1,00	not Bankrupt
		2017	-2,5669	0,01	0,70	0,94	-0,92	Bankrupt
		2018	-3,5478	0,12	0,28	0,75	-2,40	not Bankrupt
20	PT.Kedaung Indah Can Tbk	2014	-1,7662	0,07	0,82	1,03	0,15	Bankrupt
		2015	-2,2031	0,02	0,21	0,69	-1,28	not Bankrupt
		2016	-2,1656	0,01	0,04	0,71	-1,41	not Bankrupt
		2017	-1,9166	0,08	0,86	0,76	-0,22	Bankrupt
		2018	-1,8762	0,00	-0,01	0,56	-1,32	not Bankrupt

The following is data relating to the variables in the Zmijewski model, as follow:

Table 3
Food and Beverage Companies Listed on The Indonesia Stock Exchange
Variable Data on Zmijewski Model in 2014-2018

No	Company	Year	X_1	X_2	X_3	Score	Prediction
1	PT.Wilmar Cahaya Indonesia Tbk	2014	0,03	0,58	1,47	-2,08	not Bankrupt
		2015	0,07	0,57	1,53	-2,18	not Bankrupt
		2016	0,18	0,38	2,19	-2,74	not Bankrupt
		2017	0,08	0,35	2,22	-2,65	not Bankrupt
		2018	0,08	0,16	5,11	-5,36	not Bankrupt
2	PT.Tiga Pilar Sejeahtera Food Tbk	2014	0,05	0,51	2,66	-3,23	not Bankrupt
		2015	0,05	0,30	1,62	-1,98	not Bankrupt
		2016	0,08	0,54	2,38	-2,99	not Bankrupt
		2017	2,64	2,69	1,09	-6,42	not Bankrupt
		2018	0,07	2,90	0,15	-3,12	not Bankrupt
3	PT.Prashida Aneka Niaga Tbk	2014	0,04	0,40	1,46	-1,91	not Bankrupt
		2015	0,07	0,48	1,21	-1,76	not Bankrupt
		2016	0,06	0,57	1,98	-2,61	not Bankrupt
		2017	0,05	0,57	2,07	-2,68	not Bankrupt
		2018	0,07	0,65	1,90	-2,62	not Bankrupt

No	Company	Year	X_1	X_2	X_3	Score	Prediction
4	PT.Mayora Indah Tbk	2014	0,04	0,60	2,09	-2,73	not Bankrupt
		2015	0,11	0,54	2,37	-3,02	not Bankrupt
		2016	0,11	0,52	2,25	-2,87	not Bankrupt
		2017	0,11	0,51	2,39	-3,00	not Bankrupt
		2018	0,10	0,51	2,65	-3,27	not Bankrupt
5	PT.Multi Bintang Indonesia Tbk	2014	0,36	0,71	0,51	-1,58	not Bankrupt
		2015	0,24	0,58	0,58	-1,40	not Bankrupt
		2016	0,43	0,58	0,68	-1,69	not Bankrupt
		2017	0,53	0,52	0,83	-1,88	not Bankrupt
		2018	0,42	0,55	0,78	-1,75	not Bankrupt
6	PT.Nippon Indosari Corpindo Tbk	2014	0,09	0,56	1,37	-2,01	not Bankrupt
		2015	0,10	0,56	2,05	-2,71	not Bankrupt
		2016	0,10	0,51	2,96	-3,56	not Bankrupt
		2017	0,05	6,69	2,26	-9,00	not Bankrupt
		2018	0,03	0,34	4,42	-4,78	not Bankrupt
7	PT.Bantoel Internasional Investama Tbk	2014	0,21	0,53	1,02	-1,76	not Bankrupt
		2015	0,13	0,98	2,20	-3,31	not Bankrupt
		2016	0,15	0,03	2,40	-2,59	not Bankrupt
		2017	0,03	0,03	1,92	-1,99	not Bankrupt
		2018	0,04	0,03	1,59	-1,66	not Bankrupt
8	PT.Gudang Garam Tbk	2014	0,09	0,43	2,45	-2,97	not Bankrupt
		2015	0,10	0,40	2,64	-3,15	not Bankrupt
		2016	0,11	0,37	2,91	-3,39	not Bankrupt
		2017	0,12	0,37	2,95	-3,44	not Bankrupt
		2018	0,11	0,35	3,14	-3,60	not Bankrupt
9	PT.Wismilak Inti Makmur Tbk	2014	0,08	0,36	2,27	-2,72	not Bankrupt
		2015	0,10	0,30	2,89	-3,29	not Bankrupt
		2016	0,08	0,27	0,34	-0,69	not Bankrupt
		2017	0,03	0,20	5,36	-5,59	not Bankrupt
		2018	0,04	0,20	5,92	-6,16	not Bankrupt
10	PT.HM Sampoerna Tbk	2014	0,38	0,52	1,53	-2,43	not Bankrupt
		2015	0,27	0,16	6,57	-7,00	not Bankrupt
		2016	0,30	0,20	5,23	-5,73	not Bankrupt
		2017	0,29	0,21	5,27	-5,78	not Bankrupt
		2018	0,29	0,24	4,30	-4,83	not Bankrupt
11	PT.Darya+Varia Laboratoria Tbk	2014	0,07	0,24	4,91	-5,22	not Bankrupt
		2015	0,08	0,29	3,52	-3,89	not Bankrupt
		2016	0,10	0,30	2,85	-3,25	not Bankrupt
		2017	0,10	0,32	2,66	-3,08	not Bankrupt
		2018	0,12	0,29	2,89	-3,29	not Bankrupt
12	PT.Kalbe Farma Tbk	2014	0,22	0,22	3,40	-3,84	not Bankrupt
		2015	0,20	0,20	3,70	-4,10	not Bankrupt
		2016	0,20	0,18	4,13	-4,52	not Bankrupt
		2017	0,20	0,17	4,51	-4,87	not Bankrupt
		2018	0,18	0,16	4,66	-5,00	not Bankrupt
13	PT. Industri Jamu dan Farmasi Sido Muncul Tbk	2014	0,15	0,07	10,25	-	not Bankrupt
		2015	0,16	0,07	9,24	-9,46	not Bankrupt
		2016	0,16	0,08	8,32	-8,56	not Bankrupt
		2017	0,18	0,08	6,00	-6,26	not Bankrupt
		2018	0,20	0,13	4,20	-4,53	not Bankrupt
14	PT. Tempo Scan Pacific Tbk	2014	0,23	0,61	3,00	-3,85	not Bankrupt
		2015	0,09	0,31	2,54	-2,94	not Bankrupt
		2016	0,08	0,28	2,65	-3,02	not Bankrupt
		2017	0,07	0,32	2,52	-2,91	not Bankrupt
		2018	0,07	0,31	0,25	-0,63	not Bankrupt
15	PT. Aksha Wira International Tbk	2014	0,06	0,41	1,54	-2,01	not Bankrupt
		2015	0,05	0,49	1,39	-1,93	not Bankrupt
		2016	0,07	0,50	1,64	-2,21	not Bankrupt
		2017	0,05	0,50	1,20	-1,74	not Bankrupt

No	Company	Year	X_1	X_2	X_3	Score	Prediction
		2018	0,06	0,45	1,39	-1,90	not Bankrupt
16	PT. Mandom Indonesia Tbk	2014	0,09	0,26	1,74	-2,10	not Bankrupt
		2015	0,26	0,18	0,51	-0,94	not Bankrupt
		2016	0,07	0,18	0,66	-0,92	not Bankrupt
		2017	0,08	0,16	22,40	-	not Bankrupt
		2018	0,07	0,16	2,82	-3,06	not Bankrupt
17	PT. Mustika Ratu Tbk	2014	0,01	0,23	3,61	-3,86	not Bankrupt
		2015	0,00	0,24	3,70	-3,95	not Bankrupt
		2016	0,01	0,24	3,97	-4,22	not Bankrupt
		2017	0,00	0,26	3,60	-3,86	not Bankrupt
		2018	0,00	0,28	3,11	-3,40	not Bankrupt
18	PT.Unilever Indonesia Tbk	2014	0,40	0,68	0,71	-1,79	not Bankrupt
		2015	0,37	0,69	0,65	-1,72	not Bankrupt
		2016	0,38	0,72	0,61	-1,71	not Bankrupt
		2017	0,37	0,73	0,63	-1,73	not Bankrupt
		2018	0,47	0,61	0,75	-1,83	not Bankrupt
19	PT. Chitose Internasional Tbk	2014	0,07	0,21	3,06	-3,34	not Bankrupt
		2015	0,08	0,23	3,48	-3,79	not Bankrupt
		2016	0,06	0,21	3,14	-3,42	not Bankrupt
		2017	0,07	0,24	3,83	-4,14	not Bankrupt
		2018	0,03	0,21	2,71	-2,94	not Bankrupt
20	PT. Kedaung Indah Can Tbk	2014	0,05	0,32	7,90	-8,28	not Bankrupt
		2015	0,10	0,30	5,79	-6,19	not Bankrupt
		2016	0,00	0,36	5,35	-5,71	not Bankrupt
		2017	0,05	0,39	7,29	-7,74	not Bankrupt
		2018	0,01	0,39	6,44	-6,83	not Bankrupt

By the three models, the Altman Z-Score model in predicting Financial Distress in manufacturing companies in the consumer goods industry sector, there are 20 condition amount out of 13 Manufacturing Companies in the Consumer Goods Industry Sector which are predicted to not being in a bankruptcy condition in 2014-2018, namely: PT. Bentoel Internasional Investama Tbk, PT. Gudang Garam Tbk, PT. Wismilak Inti Makmur Tbk, PT. HM Sampoerna Tbk, PT. Darya-Varia Laboratoria Tbk, PT. Kalbe Farma Tbk, PT. Sido Muncul Herbal and Pharmaceutical Industry Tbk, PT. Tempo Scan Pacific Tbk, PT. Aksha Wira International Tbk, PT. Mandom Indonesia Tbk, PT. Mustika Ratu Tbk, PT. Unilever Indonesia Tbk. Meanwhile, 20 condition of the 7 Manufacturing Companies in the Consumer Goods Industry Sector are predicted to be in bankruptcy condition and the Gray areas in 2014-2018 are: PT. Wilmar Cahaya Indonesia Tbk, PT. Tiga Pilar Sejeahtera Food Tbk, PT. Prashida Aneka Niaga Tbk, PT. Mayora Indah Tbk, PT. Nippon Indosari Corpindo Tbk, PT. Chitose Internasional Tbk, PT. Kedaung Indah Can Tbk. The manufacturing company in the consumer goods industry sector at PT. Prashida Aneka Niaga Tbk is predicted to be in bankruptcy condition in 2016-2018 and PT.Mayora Indah Tbk in 2014-2018 is predicted to be in bankruptcy condition.

The results of Springate's analysis in predicting Financial Distress in manufacturing companies in the consumer goods industry sector, there are 20 condition out of 10 Manufacturing Companies in the Consumer Goods Industry Sector that are predicted not to be in bankruptcy condition in 2014-2018, namely: PT. Tiga Pilar Sejeahtera Food Tbk, PT. Multi Bintang Indonesia Tbk, , PT. Nippon Indosari Corpindo Tbk, PT. Bentoel Imnternasional Tbk, PT. Gudang Garam Tbk, PT. Wismilak Inti Makmur Tbk, PT. HM Sampoerna Tbk, PT. Aksha Wira International Tbk, PT. Mandom Indonesia Tbk, PT. Unilever Indonesia . Meanwhile for PT. Wilmar Cahaya Indonesia Tbk, PT. Prashida Aneka Niaga Tbk, PT. Mayora Indah Tbk, PT. Darya-Varia Laboratoria Tbk, PT. Kalbe Farma, PT. Sido Muncul Herbal and Pharmaceutical Industry Tbk, PT. Tempo Scan Pacific Tbk, PT. Mustika Ratu Tbk, PT. Chitose International Tbk, PT. Kedaung Indah Can Tbk is predicted to be in an uncertain conditions, namely bankrupt and not bankrupt. The manufacturing company in the consumer goods industry sector at PT. Prashida Aneka Niaga Tbk is predicted to be in bankruptcy condition in 2016-2018 and PT.Mayora Indah Tbk in 2015-2018 is predicted to be in bankruptcy condition. While the Zmijewski method in predicting Financial Distress in manufacturing companies in the consumer goods industry sector, there are 20 Manufacturing Companies in the Consumer Goods Industry Sector which are predicted not to go bankrupt in 2014-2018, namely: PT. Prashida Aneka Niaga Tbk, PT. Wilmar Cahaya Indonesia Tbk , PT. Tiga Pilar Sejeahtera Food Tbk, PT. Mayora Indah Tbk, PT. Multi Bintang Indonesia Tbk, PT. Nippon Indosari Corpindo Tbk, PT. Bentoel Internasional Investama Tbk, PT. Gudang Garam Tbk, PT. Wismilak Inti Makmur Tbk, PT. HM Sampoerna Tbk, PT. Darya-Varia Laboratoria Tbk, PT. Kalbe Farma Tbk, PT. Sido Muncul Herbal and Pharmaceutical Industry Tbk, PT. Tempo Scan Pacific Tbk, PT. Aksha Wira International Tbk, PT. Mandom Indonesia Tbk, PT. Mustika Ratu Tbk, PT. Unilever Indonesia Tbk, PT. Chitose International Tbk, PT. Kedaung Indah Can Tbk. The manufacturing company in the consumer goods industry sector at PT. Prashida Aneka Niaga Tbk is predicted to be in bankruptcy condition in 2016-2018 and PT. Mayora Indah Tbk in 2014-2018 is predicted to go bankrupt but the Zmijewski method predicts that the company will not go bankrupt.

The following table is the accuracy of the Altman, Springate and Zmijewski Methods' Accuracy:

Table 4
Altman Z-Score Accuracy Calculation

Year	Correct Prediction	Sample	Year	Wrong Prediction	Sample
2014	15	20	2014	2	20
2015	16	20	2015	1	20
2016	13	20	2016	4	20
2017	14	20	2017	4	20
2018	14	20	2018	4	20
Amount	72	100	Amount	15	100
Level of accuracy	72%		Error level	15%	

Table 5
Springate Accuracy Calculation

Year	Correct Prediction	Sample	Year	Wrong Prediction	Sample
2014	16	20	2014	5	20
2015	15	20	2015	6	20
2016	15	20	2016	6	20
2017	12	20	2017	9	20
2018	13	20	2018	3	20
Amount	71	100	Amount	29	100
Level of accuracy	71%		Error level	29%	

Table 6
Zmijewski Accuracy Calculation

Year	Correct Prediction	Sample
2014	20	20
2015	20	20
2016	20	20
2017	20	20
2018	20	20
Amount	100	100

Level of accuracy	100%

According to the results of the analysis of predictions using the Altman Score, Springate and Zmijewski methods, the most accurate method from the comparison of the three methods is the Zmijewski Method which has an accuracy rate of 100% more accurate than the Altman Z-Score 72% and Springate 71% methods.

CONCLUSION

Based on the results of the comparison and discussion conducted on the comparison of the Altman Z-Score, Springate and Zmijewski method in predicting the bankruptcy of manufacturing companies in the Consumer Goods Industry sector listed on the Indonesia Stock Exchange for the period 2014-2018, it is concluded that:

a. The Altman Z-Score method predicts that there are 20 out of 13 Manufacturing Companies in the Consumer Goods Industry Sector that are predicted not to go bankrupt in 2014-2018, while 20 of 7 Manufacturing Companies in the Consumer Goods Industry Sector are predicted to experience bankruptcy and Gray area in 2014-2018. Altman Z-Score has an accuracy rate of 72% with an error type of 15%%.

b. The Springate method predicts that there are 20 out of 10 Manufacturing Companies in the Consumer Goods Industry Sector that are predicted not to go bankrupt in 2014-2018, while for PT. Wilmar Cahaya Indonesia Tbk, PT. Prashida Aneka Niaga Tbk, PT. Mayora Indah Tbk, PT. Darya-Varia Laboratoria Tbk, PT. Kalbe Farma, PT. Sido Muncul Herbal and Pharmaceutical Industry Tbk, PT. Tempo Scan Pacific Tbk, PT. Mustika Ratu Tbk, PT. Chitose International Tbk, PT. Kedaung Indah Can Tbk is predicted to experience uncertain conditions, namely bankrupt and not bankrupt. This shows that the Springate method has an accuracy rate of 71% with an error type of 29%.

c. The Zmijewski method predicts that there are 20 Manufacturing Companies in the Consumer Goods Industry Sector that are predicted not to go bankrupt in 2014-2018. This shows that the Springate Method has an accuracy rate of 100% with an error type of 0%.

Based on the conclusions above, the implications of this study can be stated that investors as owners of capital can know the signals of company failure, creditors as lenders can know the health condition of the company, and company management as internal parties can take concrete steps to overcome the threat of bankruptcy.

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