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Analysis Financial Distress Potential in Asean Industrial Companies Using Altman Z-Score and Springate Methods

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A B S T R A C T

This research aims to analyze the potential for financial distress in the industrial sector companies across five ASEAN countries, using the Altman Z-score (1993) and Springate (1978) methods. Subsequently, these estimations are utilized to determine the error rate in classifying companies into specific groups, such as failed, safe, and grey-area companies. To measure the significance of differences among these groups, an independent sample t-test is employed. The bankruptcy analysis results from the Altman Z-Score and Springate methods within the industrial sector companies across ASEAN countries (Indonesia, Malaysia, Philippines, Singapore, and Thailand) in 2018 until 2020 indicate varying levels of financial distress.

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INTRODUCTION

Financial distress depicts a situation where a company experiences a financial downturn before facing bankruptcy. Platt (2002), states that all companies, particularly those operating during economic crises, may encounter this situation. Management should monitor the company's finances to prevent or minimize bankruptcy.

According to Damodaran (1997), there are several micro-level causes of financial distress in companies: Cash Flow Difficulties: Company earnings fail to cover debts, High Total Debt: When a company lacks funds to pay its debts, Operational Losses: When operational costs exceed income, resulting in negative cash flow.

Methods used to predict bankruptcy have evolved. Univariate analysis is utilized for specific ratios. Beaver (1966, 1968) discovered that some ratios have excellent predictive abilities. By developing a multiple discriminant analysis (MDA) model, known as the Z-Score model, Altman (1968), made significant advancements in financial distress research over the following two decades.

For example, Ohlson (1980) suggested a logit model, Taffler (1984) proposed the Z-Score model for the UK, and Zmijewski (1984) utilized probit methods. Dimitras et al. (1996) examined 47 studies related to business prediction models. They also summarized various techniques used and the variations in ratios applied. The commonly used method is discriminant analysis. The most critical financial ratios come from the solvency category, including profitability ratios.

Gordon Springate developed a financial model known as the Springate method in 1978 to predict the likelihood of a business failing or going bankrupt. The Springate model involves Multiple Discriminant Analysis (MDA), using four financial ratios out of nineteen commonly employed to determine the likelihood of financial difficulty. This model is used to objectively and accurately evaluate a company's performance and identify elements contributing to financial difficulties.

One economic sector that significantly influences a country's economic growth is the manufacturing industry. However, in the ever-changing and complex business environment, companies often face serious financial issues. One problem in the manufacturing sector is the potential financial crisis or the risk of bankruptcy. Financial crises can threaten business sustainability, disrupt financial performance, and have negative impacts on stakeholders such as shareholders, employees, and parties associated with the company.

Expertise in companies within the industrial sector in Indonesia and ASEAN countries is highly sought after by the public. This is especially true as Indonesia stands as a significantly large country with a substantial population. There are six sub-sectors within the consumer goods industry, namely: Food and Beverage, Cigarette, Pharmaceuticals, Cosmetics, and Household Equipment. Products manufactured within the consumer goods sector are favored or needed by everyone, resulting in high sales and profits, thus impacting business growth within this sector.

The Altman Z-Score method is one of the techniques used to predict a company experiencing financial distress. This method employs five financial ratios for analysis: liquidity, solvency, profitability, activity, and market ratios. Additionally, the Springate Method can also be utilized to analyze a company in identifying the likelihood of financial distress. This method employs several financial ratios, including liquidity, solvency, and profitability. Research findings indicate that the Altman Z-Score, Springate, Zmijewski, and Grover methods differ in analyzing a company undergoing financial distress.

In the Consumer Goods industry, companies can utilize the Altman Z-Score and Springate methods to identify the potential for financial distress. By understanding this potential, companies can take appropriate actions to avoid or address any potential financial issues that may arise. The Altman Z-Score and Springate methods can serve as tools to analyze a company's financial condition and make informed decisions to ensure business sustainability.

THEORETICAL REVIEW

Signaling Theory

Companies can send signals and anticipate that these signals will be received and correctly understood by investors Hartono (2005). The principle of signaling states that every action provides information to its users. In this theory, managers act as agents to provide information about financial reports. Financial reports can indicate if a company is facing financial issues, allowing managers to consider liquidation and signal externally regarding the company's financial condition.

Financial Distress Prediction Models

The Altman Z-Score method was created in 1968 by Edward I. Altman and is used to identify the likelihood of bankruptcy. This method generates a score indicating the level of bankruptcy risk for a company using five financial ratios measured simultaneously. The method utilizes financial ratios such as liquidity, profitability, solvency, activity, and market ratios.

Philip Springate developed the Springate method in 1991. This method also employs financial ratios to determine the potential for financial distress in a company, but in a slightly different manner. The Springate method uses financial ratios measured simultaneously but assigns different weights to each ratio. Financial ratios within the Springate method include liquidity ratios, profitability ratios, solvency ratios, and activity ratios.

According to Curry and Banjarnahor (2018), financial distress occurs when a company's finances decline before bankruptcy or liquidation. Fahmi Hernadianto, Yusmaniarti, and Fraternesi (2020) state that financial distress is a condition where a company cannot meet its obligations, especially those related to short-term liabilities, such as liquidity and solvency obligations. They also emphasize that financial distress is not bankruptcy but a cause of a company's bankruptcy.

Plat and Plat (2012) define financial distress as a condition of financial decline in a company before bankruptcy occurs. According to Trijadi (1999), financial distress is a situation where a company faces difficulty in fulfilling its

obligations. This financial difficulty can manifest as liquidity issues hindering the company from functioning effectively. According to Ross et al (2013), financial distress occurs in a company when cash flow cannot meet current obligations, such as credit or trade interest.

Dewi Utari et al (2014) define financial distress as a company's inability to meet its obligations. Hanafi (2014) explains that financial distress is a financial condition where a company experiences temporary financial problems before facing liquidity issues. However, this situation can worsen if not addressed promptly, potentially leading to the company's bankruptcy.

Several studies have been conducted to compare the effectiveness of the Altman Z-Score method and the Springate method in identifying financial distress. The research on both the Altman Z-Score and Springate methods shows a relatively high level of predictability regarding the likelihood of bankruptcy in companies. However, there are differences in how these methods are utilized and interpreted.

A study conducted by Gusti Ferri Irawan (2018) analyzed pharmaceutical companies using the Altman Z-Score method. This research indicates that companies with low Altman Z-Score tend to experience financial distress.Research by Hajati H (2018) that analyzed companies in the food and beverage sector listed on the Indonesia Stock Exchange using the Altman Z-Score and Springate methods. According to this research, both methods can be used to predict the potential for bankruptcy in companies.

Research by Karissa Sekar Pertiwi (2020) that analyzed insurance companies in Indonesia using the Altman Z-Score, Springate, Grover, and Zmijewski methods. According to this study, the Altman Z-Score and Springate methods demonstrate accuracy in analyzing financial distress in insurance companies. Al Fiona Sinta (2021) that analyzed companies listed on the Indonesia Stock Exchange in the oil and gas mining subsector using the Altman Z-Score, Springate, and Zmijewski methods. According to this study, the Altman Z-Score and Springate methods can be used to analyze financial distress in companies.

According to several studies, the Altman Z-Score method and the Springate method can be used to predict the likelihood of bankruptcy in companies, including those in the industrial sector. However, further research is needed to determine the accuracy and effectiveness of both methods specifically within the industrial sector.

H1: There is a relationship between the Altman Z-Score method and the potential occurrence of financial distress in companies within the industrial sector.

H2: There is a relationship between the Springate method and the potential occurrence of financial distress in companies within the industrial sector.

H3: Companies in the industrial sector have a significant potential for financial distress.

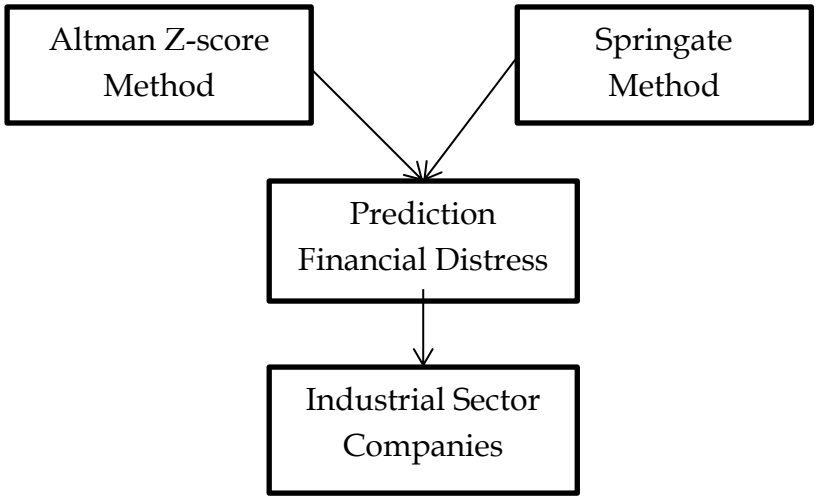

Figure 1. Conceptual Framework

METHODOLOGY

This study examines companies within the industrial sector across ASEAN countries during the period from 2018 to 2020 to identify those facing financial difficulties. Consequently, it identifies 15 companies concerning their business viability based on sustained losses, liquidity conditions, and companies with negative net assets indicating financial challenges.

The study excludes companies listed for less than four years due to various factors affecting company performance besides operational activities. Banks and other financial institutions are not included in the sample due to the difficulty in comparison owing to differing assets and capital structures.

Data Collection Techniques and Tools

This research collects data through documentation, which means utilizing available written records or reports without altering the data. In this case, the referred written records or reports are the company's financial and annual reports.

Source: http://office.banker.thomsonib.com/ta

Method

This study employs the Z-score methods from Altman (1993) and Springate (1978) to estimate the solvency/difficulty status of the companies. The estimation outcomes are then utilized to identify the error rate in classifying companies into groups, such as failed, safe, and grey-area companies. The significance of differences among groups is tested using an independent sample t-test.

Formula for the Altman Z-Score:

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

Description:

X1 = Working Capital / Total Assets

X2 = Retained Earning / Total Assets

X3 = Earning Before Interest and Taxes / Total Assets

X4 = Equity / Total Liabilities

The Z value or final result for each company will be categorized based on criteria established by Altman:

a) In this case, if the company's Z-Score > 2.90, then the company is in a safe zone, meaning: an area where the company is considered safe and unlikely to go bankrupt.
b) If the Z-Score value falls between 1.81 and 2.90, it is in the grey area, indicating uncertainty, where the company might face bankruptcy or not.
c) If the Z-Score < 1.80, the company is in the distress zone, where there's a higher likelihood of bankruptcy.

Formula for the Springate method:

Description:

S = 1.03X1 + 3.07X2 + 0.66X3 + 0.4X4

X1 : Working Capital / Total Assets

X2 : Net Profit Before Interest and Taxes / Total Assets

X3: Net Profit Before Taxes / Current Liabilities

X4 : Sales / Total Assets

So, the S value for companies is classified based on the following criteria:

a) If the Springate value > 0.862, it means the company falls under the healthy category, which includes the safe or non-bankrupt category.
b) Conversely, if the Springate value < 0.862, it means the company faces the potential for bankruptcy.

Sample

The sample in this study used 15 companies in industrial sector companies in 5 Asean countries to predict the possibility of financial distress.

Table 1: Industrial Sector Companies in ASEAN Countries

Company Name	Country
PT Cahayaputra Asa Keramik Tbk	Indonesia
PT Capitol Nusantara Indonesia Tbk	Indonesia
PT Century Textile Industri Tbk	Indonesia
Bermaz Auto Berhad	Malaysia
Barakah Offshore Petroleum Berhad	Malaysia
B.I.G. Industries Berhad	Malaysia
D&L Industries Inc	Philippines
Eei Corporation	Philippines
First Gen Corporation	Philippines
Hafary Holdings Limited	Singapore
Indofood Agri Resources Ltd	Singapore
Hiap Tong Corporation Ltd	Singapore
Khonburi Sugar Public Company Limited	Thailand
Kulthorn Kirby Public Company Limited	Thailand
Nation Group (Thailand) Public Company Limited	Thailand

Source: http://office.banker.thomsonib.com/ta

RESULTS

Analysis of the Altman Z-Score Method

Analysis results for the Altman Z-Score method:

Table 2 Calculation of Altman Z-Score analysis

Company	Year	X1	X2	X3	X4	Z-score	Prediction
CAKK	**2020**	0,1197	0,0591	0,00657	2,2900	3,42702	**Safe**
	2019	0,0988	0,1007	0,01262	2,2527	3,42730	**Safe**
	2018	0,1466	0,1285	0,05532	2,2064	4,06964	**Safe**
CANI	**2020**	-1,6735	1,0721	-2872,7	0,4360	-19311,4	**FD**
	2019	-1,0609	0,4604	-1425,5	0,2103	-9584,30	**FD**
	2018	-0,8804	0,2807	-1012,4	0,1148	-6808,24	**FD**
CNTB	**2020**	-0,3394	0,4760	-563,26	0,0518	-3785,72	**FD**
	2019	-0,2863	0,3957	96,3935	0,0062	647,1827	**Safe**

	2018	-0,3014	0,3908	-323,49	0,0061	-2174,57	**FD**
BAUTO	**2020**	0,2621	0,1124	0,08603	0,6674	3,36542	**Safe**
	2019	0,4922	0,0361	0,31725	1,8487	7,42045	**Safe**
	2018	0,4851	0,1399	0,21697	1,6723	6,85305	**Safe**
BARAKAH	**2020**	-0,8039	1,2997	0,08079	0,3467	-0,12941	**FD**
	2019	-0,5575	1,6356	-1,1477	0,4193	-5,59795	**FD**
	2018	0,0668	0,2246	-0,1084	0,4052	0,86767	**FD**
BIG	**2020**	0,0896	0,4621	-0,0428	1,1181	2,98090	**Safe**
	2019	0,0808	0,4022	0,03214	1,0228	3,13153	**Safe**
	2018	0,0134	0,3747	-0,0916	0,7708	1,50386	**FD**
DNL	**2020**	1,5038	0,2838	0,101	2,3567	6,05017	**Safe**
	2019	0,3711	0,2906	0,14773	3,3076	7,84798	**Safe**
	2018	0,4398	0,2634	0,17207	2,8400	7,88227	**Safe**
EEI	**2020**	0,0615	0,1604	-0,1707	0,3362	0,13283	**FD**
	2019	0,1145	0,2218	0,04126	0,4431	2,21717	**Grey**
	2018	0,0009	0,2775	0,04889	0,5192	1,78512	**FD**
FGEN	**2020**	0,1026	0,1864	4,17324	0,4264	29,7733	**Safe**
	2019	0,0884	0,1772	4,78677	0,4098	33,7548	**Safe**
	2018	0,0954	0,1559	4,21705	0,3684	29,8602	**Safe**
5VS	**2020**	0,1440	0,1974	0,01965	0,4709	2,21520	**Grey**
	2019	0,0820	0,1757	0,03117	0,4107	1,75158	**FD**
	2018	0,0761	0,1568	0,03983	0,3758	1,67294	**FD**
5JS	**2020**	-0,0378	0,2198	2,2643	0,6867	1,18992	**FD**
	2019	-0,0643	0,2213	-5,7830	0,6850	1,01870	**FD**
	2018	-0,0526	0,2361	-1,6653	0,7587	1,22123	**FD**
5PO	**2020**	-0,0521	0,3335	-0,0481	0,9444	1,41326	**FD**
	2019	-0,0207	0,4012	0,01016	1,2668	2,57084	**Grey**
	2018	-0,0328	0,4267	0,01101	1,5062	2,83100	**Grey**
KBS	**2020**	-0,1281	0,0037	-0,0641	0,3889	-0,85025	**FD**
	2019	-0,2818	0,0739	0,02014	0,5795	-0,86370	**FD**
	2018	-1209,0	0,0619	0,02941	0,5378	-79309,4	**FD**
KKC	**2020**	-0,3359	0,1803	-0,0942	0,1734	-2,06649	**FD**
	2019	-0,4061	0,2417	-0,1805	0,1393	-2,94221	**FD**
	2018	-0,0726	0,0478	-0,1055	0,2945	-0,72052	**FD**
NATION	**2020**	-0,3573	2,1233	-0,0952	0,0863	4,02902	**Safe**
	2019	-0,1615	2,3466	-0,0028	0,2457	6,82948	**Safe**
	2018	-0,2733	0,8442	0,1682	0,0700	2,16272	**Grey**

Description:

FD (Financial Distress)

Analysis of the Springate Method

Analysis results for the Springate method:

Table 3 Calculation of Springate Analysis

Company	Year	X1	X2	X3	X4	Springate	Prediction
CAKK	**2020**	0,1197	0,0065	0,0436	0,6242	0,57296	**FD**
	2019	0,0988	0,0126	0,0509	0,9033	0,75723	**FD**
	2018	0,1466	0,0553	0,2158	0,8551	0,97156	**Safe**
CANI	**2020**	-1,6735	-2872,6	-1632,7	815,89	-8935,47	**FD**
	2019	-1,0609	-1425,4	-1135,7	738,29	-4344,27	**FD**
	2018	-0,8804	-1012,4	-905,69	547,65	-3109,88	**FD**
CNTB	**2020**	-0,3394	-563,26	-784,98	12387,	6132,167	**Safe**
	2019	-0,2863	96,393	140,45	12467,	8580,352	**Safe**
	2018	-0,3014	-323,49	-474,39	9285,7	4945,429	**Safe**
BAUTO	**2020**	0,2621	0,0860	0,1813	1,4324	1,55207	**Safe**
	2019	0,4922	0,3172	1,1527	2,7530	3,75913	**Safe**
	2018	0,4851	0,2169	0,6702	2,4615	3,05853	**Safe**
BARAKAH	**2020**	-0,8039	0,0807	0,0531	0,7321	-0,0755	**FD**
	2019	-0,5575	-1,1477	-0,9711	0,9070	-3,88763	**FD**
	2018	0,0668	-0,1083	-0,3123	0,5159	-0,04835	**FD**
BIG	**2020**	0,0896	-0,0428	-0,1257	0,6344	0,32929	**FD**
	2019	0,0808	0,0321	0,0934	0,8644	0,78986	**FD**
	2018	0,0134	-0,0916	-0,2261	0,6707	0,08489	**FD**
DNL	**2020**	0,3005	0,101	0,3538	0,8590	1,32813	**Safe**
	2019	0,3711	0,1477	0,6403	1,0044	1,75491	**Safe**
	2018	0,4398	0,1720	0,8019	1,1850	2,08417	**Safe**
EEI	**2020**	0,0615	-0,1706	-0,3018	0,5460	-0,2208	**FD**
	2019	0,1145	0,0412	0,0766	0,8443	0,83258	**FD**
	2018	0,0009	0,0488	0,0871	0,9930	0,84136	**FD**
FGEN	**2020**	0,1026	4,1732	21,899	15,945	32,2011	**Safe**
	2019	0,0883	4,7867	29,467	21,397	40,6960	**Safe**
	2018	0,0954	4,2170	31,565	20,696	39,3304	**Safe**
5VS	**2020**	0,1440	0,0196	0,0747	0,3749	0,48608	**FD**
	2019	0,0820	0,0311	0,0937	0,4537	0,51710	**FD**
	2018	0,0761	0,0398	0,1087	0,5074	0,57906	**FD**
5JS	**2020**	-0,0378	2,2643	0,0009	0,0035	-0,03891	**FD**
	2019	-0,0643	-5,7830	-0,0023	0,0037	-0,06626	**FD**
	2018	-0,0526	-1,6653	-0,0067	0,0034	-0,05419	**FD**
5PO	**2020**	-0,0521	-0,0481	-0,2299	0,3649	-0,05263	**FD**
	2019	-0,0207	0,0101	0,0606	0,3509	0,26573	**FD**
	2018	-0,0328	0,0110	0,0751	0,3090	0,23396	**FD**
KBS	**2020**	-0,1281	-0,0640	-0,2149	0,4507	-0,11707	**FD**

	2019	-0,2818	0,0201	-0,2149	0,6804	0,23552	**FD**
	2018	-0,2277	0,0294	0,0521	0,8370	0,42898	**FD**
KKC	**2020**	-0,3359	-0,0941	-0,1329	0,8322	-0,13893	**FD**
	2019	-0,4061	-0,1804	-0,2086	0,9830	-0,40697	**FD**
	2018	-0,0726	-0,1055	-0,1696	1,0777	0,24472	**FD**
NATION	**2020**	-0,3573	-0,0951	-0,1455	0,8168	-0,17939	**FD**
	2019	-0,1615	-0,0027	-0,0050	0,8886	0,40951	**FD**
	2018	-0,2733	0,1682	0,3583	0,3659	0,619703	**FD**

Description:

FD (Financial Distress)

DISCUSSION

Based on the overall analysis results in predicting financial distress using the Altman Z-Score and Springate methods within the industrial sector companies in ASEAN countries, namely Indonesia, Malaysia, the Philippines, Singapore, and Thailand during the 2018/2020 period, different levels of financial distress were experienced. Companies identified as being in a healthy condition (safe zone) using the Altman Z-Score model include PT Cahayaputra Asa Keramik Tbk from 2018 to 2020, PT Century Textile Industry Tbk in 2019, Bermaz Auto Berhad from 2018 to 2020, B.I.G. Industries Berhad in 2019-2020, D&L Industries Inc from 2018 to 2020, First Gen Corporation from 2018 to 2020, and Nation Group (Thailand) Public Company Limited in 2019-2020. This condition indicates that a company can generate profits over time. This is supported by an increase in sales volume followed by an increase in EBIT and retained earnings, consequently having a positive impact on market share value.

In the Springate model, companies in the safe zone include PT Cahayaputra Asa Keramik Tbk in 2018, PT Century Textile Industry Tbk from 2018 to 2020, Bermaz Auto Berhad from 2018 to 2020, D&L Industries Inc from 2018 to 2020, and First Gen Corporation from 2018 to 2020. This scenario explains that several companies in the safe zone have the ability to manage company assets in generating pre-tax profits to meet current liabilities or short-term debts more effectively. This is reinforced by an increase in EBT driven by net sales and enhanced work productivity, enabling the settlement of current obligations.

In the grey area, there are several companies positioned in this category according to the Altman Z-Score analysis model: Eei Corporation in 2019, Hafary Holdings Limited in 2020, Hiap Tong Corporation Ltd from 2018 to 2019, and Nation Group (Thailand) Public Company Limited in 2018. This occurs due to significant sales volumes influenced by optimized profit values, allowing the net profits generated by the company to be reinvested as capital. Additionally, according to the Springate model, no companies fall within the grey area.

Next, companies detected to experience financial distress within the industrial sector from 2018 to 2020 using the Altman Z-Score analysis model include PT Capitol Nusantara Indonesia Tbk from 2018 to 2020, PT Century

Textile Industry Tbk in 2018 and 2020, Barakah Offshore Petroleum Berhad from 2018 to 2020, B.I.G. Industries Berhad in 2018, Eei Corporation in 2018 and 2020, Hafary Holdings Limited from 2018 to 2020, Indofood Agri Resources Ltd from 2018 to 2020, Khonburi Sugar Public Company Limited from 2018 to 2020, and Kulthorn Kirby Public Company Limited from 2018 to 2020. This condition arises due to a significant decline in working capital, affecting the company's asset management. Additionally, the return on total assets is insufficient to cover the expenses, resulting in decreased EBIT and sales values, triggering bankruptcy.

In Springate's model, a company that is in trouble PT Cahayaputra Asa Keramik Tbk in 2019-2020, PT Capitol Nusantara Indonesia Tbk in 2018-2020, Barakah Offshore Petroleum Berhad in 2018-2020, B.I.G. Industries Berhad in 2018-2020, Eei Corporation in 2018-2020, Hafary Holdings Limited in 2018-2020, Indofood Agri Resources Ltd in 2018-2020, Hiap Tong Corporation Ltd in 2018-2020, Khonburi Sugar Public Company Limited in 2018-2020, Kulthorn Kirby Public Company Limited in 2018-2020, and Nation Group (Thailand) Public Company Limited in 2018-2020. This arises because several companies face liquidity difficulties. It means the rate of return on the company's sales obligations continues to decline due to high inventory levels. This condition indicates decreasing sales, making it unable to cover expenses.

Significance of Group Differences Tested Through Independent Sample T-Test

Table 4 Sample T-Test Calculation

Group Statistics

	Method	N	Mean	Std. Deviation	Std. Error Mean
Statistical Value	**Altman**	15	-2126225.33	1147351.147	296244.792
	Springate	15	395455.20	1608214.977	415239.322

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means	
		F	**Sig.**	**t**	**df**
Statistical Value	**Equal variances assumed**	.020	.899	-1.199	28
	Equal variances not assumed			-1.199	25.319

Independent Samples Test

		t-test for Equality of Means			
		Significance			
		One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference
Statistical Value	Equal variances assumed	510083.004	.120	.241	-611680.533
	Equal variances not assumed	510083.004	.121	.242	-611680.533

Independent Samples Test

		t-test for Equality of Means	
		95% Confidence Interval of the Difference	
		Lower	Upper
Statistical Value	**Equal variances assumed**	-16565538.202	433177.135
	Equal variances not assumed	-1661545.077	438184.010

So, the significance level is 0.05 due to two-sided testing (two tails) the significance of 0.05/2= 0.025

Significance of test results p = 0.241

Since the test result's significance (sig) > significance level (0.241 > 0.025), H_0 is accepted, meaning there is no difference between the Altman Z-Score and Springate methods.

CONCLUSIONS AND RECOMMENDATIONS

Based on the analysis using Altman's Z-Score and Springate methods in the industrial sector companies from 2018 to 2020 in ASEAN countries, conclusions can be drawn as follows:

Industrial sector companies in ASEAN countries, when predicting bankruptcy using the Altman Z-Score method, include PT Cahayaputra Asa Keramik Tbk from 2018 to 2020, PT Century Textile Industri Tbk in 2019,

Bermaz Auto Berhad from 2018 to 2020, B.I.G. Industries Berhad from 2019 to 2020, D&L Industries Inc from 2018 to 2020, First Gen Corporation from 2018 to 2020, and Nation Group (Thailand) Public Company Limited in 2019-2020. Additionally, these companies experienced the gray area and financial distress.

Industrial sector companies in ASEAN countries, when predicting bankruptcy using the Springate method, include PT Cahayaputra Asa Keramik Tbk in 2018, PT Century Textile Industri Tbk from 2018 to 2020, Bermaz Auto Berhad from 2018 to 2020, D&L Industries Inc from 2018 to 2020, First Gen Corporation from 2018 to 2020. Additionally, these companies experienced financial distress and did not fall within the gray area.

The t-test calculation resulted in a significance level thus accepting H_0, indicating no difference between the Altman Z-Score and Springate methods. So between the use of the Altman Z-score and Springate methods are the same because there is no difference in the use of these methods.

FURTHER STUDY

Researchers are advised to increase the sample size and research duration to acquire more insights into predicting corporate bankruptcies. As this study employed two bankruptcy analysis methods, it's suggested for future research to consider using analysis methods such as Ohlson and Zmijewski or other bankruptcy analysis approaches.

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