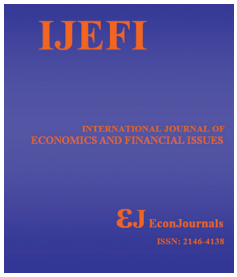

International Journal of Economics and Financial Issues

ISSN: 2146-4138

available at http: www.econjournals.com

International Journal of Economics and Financial Issues, 2015, 5(Special Issue) 354-359.

2nd AFAP INTERNATIONAL CONFERENCE ON ENTREPRENEURSHIP AND BUSINESS MANAGEMENT (AICEBM 2015), 10-11 January 2015, Universiti Teknologi Malaysia, Kuala Lumpur, Malaysia.

Bankruptcy Prediction Analysis of Manufacturing Companies Listed in Indonesia Stock Exchange

Sinarti[1]*, Tia Maria Sembiring[2]

[1]Department of Managerial Accounting, Politeknik Negeri Batam, Batam Centre, Batam, Indonesia, [2]Department of Managerial Accounting, Politeknik Negeri Batam, Batam Centre, Batam, Indonesia. *Email: sinar@polibatam.ac.id

ABSTRACT

Bankruptcy prediction gives an overview to management and investors about actual condition of the company briefly and clearly, because the poor condition does not happenall of a sudden it can be seen regularly. Bankruptcy prediction in this study uses three approaches, namely the model Z-Score, Springate, and Zmijewski. This study is aimed to determine the metals and manufacturing companies' health level which listed in Indonesia Stock Exchange and also find out if there are significant differences of the three models were used to examine the approach of a company defaults. This study uses secondary data of 11 companies in th ebasic industry and the metal type and etc. Linear regression and t-test are used to prove the hypothesis. The results of this study concludes that there is no significant difference to the prediction of model Z-Score and Springate, but there is a significant difference to the prediction model Z-Score with Zmijewski and Springate with Zmijewski. Z-Score model predictions show many companies are in a state of potential bankruptcy, as well as Springate, but Zmijewski stating that the company more healthy.

Keywords: Z-Score, Springate, Zmijewski, Bankruptcy
JEL Classifications: M000

1. INTRODUCTION

Ratio analysisis divided into five types, namely liquidity ratio, activity ratio, solvency ratio, profitability ratio, and market ratio, the five basic ratios have a role in assessing the financial condition of a company in accordance with the components of the data used in this ratio. These five basic ratios in this accounting are combined therefore the ratio analysis model capable of predicting the bankruptcy of acompany. Bankruptcy issues become widely used as previous research the mesas suggestions provide multi-use information for many parties, such as the Aghaei et al. (2013) who studied the bankruptcy prediction largest subsidiary in Iran which indicated overall condition of a healthy company with a Z-Score model research. Bellovary et al. (2007) who conducted discussions regarding bankruptcy prediction models find that the Z-Score model is abankruptcy prediction model most popular used. In Indonesia bankruptcy prediction has been widely applied, one by Peter and Yoseph (2011) and Qureshi et al. (2014) conducted the analysis bankruptcy Z-Score model, Springate, and Zmijewski in the food industry.

Anticipating the company's financial condition early is essential conducted by each company for the continuation of the company's operations and better marketing strategies. Condition scompanies that show signs of concern should start anticipating since the beginning of the bankruptcy of the company. Iron and steel industry in Indonesia should be developed from now on, this can be done through various ways such as that carried out by the Iron and Steel Industry Association of Indonesia which encourage the government to help support the strengthening of the steel industry sector by simplifying a number of regulations in order to compete the Asean Economic Community (AEC) in 2015. Iron and steel production in the country, only around 7.2 million tons, while the national demand reaching nearly 10 million tons, to lack of stock are to be met through imports from other countries. This will affectthe condition of the manufacturing company in Indonesia

which must compete with foreign companies therefore the condition of excellence enterprise should be the main requirement prior to the AEC in 2015 later. In 2025 there will be government programs regarding connectivity infrastructure, including roads, seaports, airports, railways, and energy generation that will be synchronized with the Indonesian economic corridors. To continue to survive in a keen competition soon after the market opened freely would become a huge chore for manufacturing companies, so that the need for disclosure of companies' condition in order to anticipate can be done from the beginning (Shezad et al., 2014).

Predicting bankruptcy of a company can be done by using the ratio of the model that had been developed since 1968 invarious countries. The model used is the Z-Score, Springate, and Zmijewski. Z-Score model uses five ratios, Springate uses four ratios, while Zmijewski only uses three ratios, calculation and analysis using the three models is certainly very possible to produce different conclusions so that the need fortesting using three models.

2. LITERATURE REVIEW

According to the Hanafi and Halim (2007), the analysis of bankruptcy made to obtain early warning of bankruptcy (early signs of bankruptcy). The earlier signs of the bankruptcy, the better for the management as management can make improvements (Khan, 2014). Lenders and also the shareholders can make preparations to cope with the worse possibility. Signs of bankruptcy in this case are viewed by using accounting data. In practical and also inempirical research, financial hardshipis difficult to define. That of kind difficulties could mean the start of a liquidity problem (short-term), which is the lightest financial difficulties, up to the declaration of bankruptcy, which are the most severe difficulties. Thus financial difficulties can be seen as a long difficulty, ranging from the mild to the most severe.

2.1. Z-Score Model

The bankruptcy models have been developed in several countries, Altman (1968) conducted a survey of models developed in the United States, Japan, Germany, Switzerland, Brazil, Australia, England, Ireland, Canada, the Netherlands, and France. Bankruptcy prediction model Z-Score can be used with the following formula:

Z-Score=0.012X1+0.033X3+0.014X2+0.006X4+0.999X5

Remarks:

X1=Current assets-current liabilities/total assets

X2=Retained earnings/total assets

X3=Earnings before interest and taxes/total assets

X4=Market value of common and preferred stock/book value of debt

X5=Sales/total assets

The criteria which is used to predict company bankruptcy with this model is that the company that scored Z>2.99 were classified as healthy companies, while companies that have a Z-Score <1.81 were classified as potentially bankrupt company. Z-Score <1.81 were classified as a company in the gray area or areas of gray, with a value of "cut-off" for this index is 2.675 (Muslich, 2007).

2.2. Springate Model

This model was developed in 1978 by the Gorgon LV Springate. Springate model is a model that uses the ratio of multiple discriminant analysis (MDA). In the MDA method takes more than one financial ratio related to the bankruptcy of the company to establish a good model. To determine the ratios anywhere that can detect the possibility of bankruptcy, Springate use MDA to choose 4 ratios of 19 financial ratios were popular in the literature, which was able to distinguish between sound business insolvent and bankrupt. Springate models are:

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

Remarks:

A=Working capital/total assets

B=Earnings before interest and taxes/total assets

C=Profit before tax/current liabilities

D=Sales/total assets

This Springate model have a standard calculation in which the company has a value S>0.0862 classified as a healthy company, while companies with a value of S<0.862 classified as potential company bankrupt.

2.3. Zmijewski Model

Zmijewski model (1984) used ratio analysis that measures the performance, leverage and liquidity of a company for the model predictions. Zmijewski used the analysis which was applied to the 40 companies that have gone bankrupt and the 800 companies that still survive at that time. Zmijewski model assessment criteria is the greater the value of X, the more likely the company went bankrupt, the model successfully developed as follows:

X=−4.3−4.5X1+5.7X2−0.004X3

Remarks:

X1=Profit after tax/total assets

X2=Total debt/total assets

X3=Current assets/current liabilities

3. RESEARCH DESIGN

Has a research like this before, like Chava and Jarrow (2004) did analysis predicting accuracy of bankruptcy with Hazard model

using seven ratios to company in America since 1962 till 1999 and make a decision that Hazard model prediction is contra with Z-Score model and Zmijewski model. Mansi et al. (2010) made accuracy comparisons 4 bankruptcy prediction model usually used to predicting bankrupcty of a company, such as Z-Score, Ohlson, KMV-Mertin Distance to Default, and Cambell et al. what make result is Cambell et al. is the best model to give explanation about variation cross section. In Indonesia bankruptcy prediction research already did before, like Kuncoro (2012) about bankruptcy of PT Betonjaya Manunggal Tbk since 2007 till 2012 used Springate and Zmijewski model which the both model give us the same conclusion, that is PT Betonjaya Manungga Tbk was not bankrupt, but the value of Springate and Zmijewski was different amount. Adnan and Arisudhana (2011) make a research of company bankruptcy used Z-Score and Springate model in property company what make conclusion Z-Score model give a different conclusion with Springate model since 2005-2009 at property company. Peter and Yoseph (2011) also make a backruptcy prediction research with three model, such as Z-Score, Springate, and Zmijewski to PT Indofood Sukses Makmur Tbk period 2005-2009 which make a different conclusion between three model prediction, Z-Score model with Zmijewski model give a contradictive conclusion. Some research already did before our research about bankruptcy prediction, but we have to know the result of three model if we use the bankruptcy prediction model to metal company.

4. RESULTS AND DISCUSSION

4.1. Data Analysis using Z-Score

Bankruptcy prediction using Z-Score approach for the 11 companies which listed on the Stock Exchange stated the result that only PT Alakasa Industrindo Tbk and PT Tembaga Mulia Semanan Tbk who were otherwise healthy over the past 5 years, but PT Tembaga Mulia Semanan had experienced a "gray area" in 2009. PT Alumindo Light Metal Industry Tbk experienced adverse conditions in 2009 and increased the next 2 years, but fellback to the area potentially bankrupt in 2012 and 2013. PT Betonjaya Manunggal Tbk already had a gray area condition since 2009 and continued to decline until 2013. PT Citra Tubindo Tbk, PT Indah Aluminium Industry Tbk, Jakarta Kyoei Steel Works Tbk, PT Jaya Pari Steel Tbk, PT Lion Metal Works Tbk, and PT Pelangi Indah Canindo Tbk experienced potentially bankrupt condition for 5 consecutive years from 2009 to 2013. PT Lionmesh Prima Tbk experienced up and down of condition that was also not good. Therefor, using Z-Score formula for predicting defaults metal manufacturing companies was only in dicates two healthy companies for the last 5 years.

4.2. Data Analysis using Springate

Springate bankruptcy prediction model stated that all companies had experienced a healthy period, but only 6 companies that were healthy for 5 consecutive years namely PT Alakasa Industrindo Tbk, PT Betonjaya Manunggal Tbk, PT Citra Tubindo Tbk, PT Lion Metal Works Tbk, PT Lionmesh Prima Tbk, and PT Tembaga Mulia Semanan Tbk, while PT Jakarta Kyoie Steel Works Tbk and PT Pelangi Indah Canindo Tbk continue experienced bad conditions in the last 5 years.

PT Alumindo Light Metal Industry Tbk had a potentially bankrupt condition in 2009 but there was improvement therefore the conditions improved in the next year and fellback on the conditions of potential bankruptcy in 2013. PT Indah Aluminum Industry Tbk had experienced a potential bankruptcy in 2009 and 2011 but conditions improved in the following years until 2013. PT Jaya Pari Steel Tbk never had experienced bad condition in 2009 and continued to improve until the next 4 years the company in a healthy condition. The result of calculations using the model indicated only PT Betonjaya Springate Semanan Manunggal Tbk and PT Alakasa Industrindo Tbk, which had the same calculation results with the Z-Score model.

4.3. Data Analysis using Zmijewski

Bankruptcy prediction calculation using Zmijewski provided more results stating that the company was more towards a healthy company or potentially bankrupt. This was because there was no definite scale used to convey a healthy company or potentially bankrupt. Bankruptcy Prediction Calculation using Zmijewski model did not have a definite scale in assessing a company when it to be good or poor condition, but the value of X (Zmijewski value) can be seen as resulting from any average company in a negative number or in small numbers, which means the company can be categorized in good condition.

4.4. Linear Regression Analysis

In the Z-Score prediction model, the components of the formula used are: Current assets, current liabilities, total assets, retained earnings, total assets, earnings before interest and taxes, stock market value, book value of debt, and sales. through linear regression, we can see that the value of sales of significance 0.016 with α value (significance level) of 0.05 means that 0.016<0.05 or significant influence on the value of the Z-Score, while the current assets have sig 0.817, 0.268 current liabilities, total assets of 0.504, 0.649 retained earnings, earnings before interest and taxes 0.652, the market value of common shares and preference 0.247, 0.328 and book value of debt which means that all the values >0.05 value α (degree of significance) or no effect significant to the calculation of Z-Score (Table 1).

Springate prediction model using figures working capital, total assets, earnings before interest and taxes, profit before tax, current liabilities, and sales in the calculation to predict the bankruptcy of a company. through linear regression, the value of working capital has significance 0.437, 0.707 total assets, profit before taxes 0.513, earnings before interest and taxes 0.461, 0.969 current liabilities, and sales of 0.969 which means that all the values >0.05 value α (significance level) which is used in calculating the value Springate with SPSS Version 17 or no significant effect. None of the components in the calculation of a company's bankruptcy prediction Springate model very significantly affect the results of the calculation (Table 2).

Zmijewski prediction model also have a formula that uses a number of components derived from the financial statements, namely; profit after tax, total assets, total liabilities, current assets and current liabilities. This calculation model is the simplest when viewed from the components that make up the calculation of

bankruptcy prediction compared to the two previous prediction models. through linear regression, we can see that the value of current assets to be significant 0.562 with α value (significance level) of 0.05 means that 0.562>0.05, or no significant effect on the value of Zmijewski, while profit after tax has sig 0.055, the total assets of 0.002, a total of 0.000 debt and current liabilities 0.000 which means that all these values <0.05 value α (significance level) which is used in calculating the value of the Z-Score with SPSS Version 17 or there is a significant influence on the results of the calculation (Table 3).

4.5. Correlation Analysis

Simple correlation analysis was conducted on two models to determine whether there was a link between the calculations of Z-Score model and the calculations of Springate model using SPSS Version 17 it was obtained the degree of correlation between the prediction model which showed the relation figure of 0.664 indicated a strong link between the two. The relationship between these two predictions was unidirectional because the numberwas positive relationship (Table 4).

Simple correlation analysis for the Z-Score model and Zmijewski was conducted to determine the relationship between the two bankruptcy prediction models. The conclusion was that the relationships of dependent variable were strong with figures showing the relationship between the two of 0.769. The relationship between these two predictions was unidirectional because the numberis positive relationship (Table 5).

Simple correlation analysis was used to determine the relationship between the two predictions of bankruptcy between Springate models and Zmijewski model that resulted the relationship between the Springate prediction model and Zmijewski models prediction very low with 0.000 numbers link ages between the two. The relationship between these two predictions was unidirectional because the number was positive relationship (Table 6).

4.6. Hypothesis Testing

Criteria for acceptance of the hypothesis is that if $t_{arithmetic} \leq t_{table}$ or $t_{arithmetic} \geq t_{table}$ and not acceptable if otherwise, the error probability of 5% and df 54. The first hypothesis is that there is a significant difference between the analysis bankruptcy Z-Score model and Springate in manufacturing companies.

From Table 7 it can be seen that the *t* value for the Z-Score prediction model with Springate is −0.205 and t value prediction table for the Z-Score and Springate is 2.00488. Based on the provisions the existing hypothesis it can be concluded that there is no significant difference between the Z-Score prediction models

Tabel 1: Regresion result of Z-Score model

Model	Unstandardized coefficients		Standardized coefficients	*t*	Significance
	B	Standard error	Beta		
Constant	1.855	0.259		7.16	0
Current asset	5.38E-13	0	0.232	0.232	0.817
Current liabilities	2.14E-12	0	0.822	1.122	0.268
Total asset	−1.44E-12	0	−0.871	−0.674	0.504
Retain earning	−9.73E-13	0	−0.3	−0.458	0.649
Earning before interest and tax	−2.05E-12	0	−0.2	−0.454	0.652
market value of common and preferred stock	8.54E-07	0	0.535	1.173	0.247
Book value of debt	−1.88E-12	0	−0.773	−0.988	0.328
Sales	6.20E-13	0	0.78	2.506	0.016

Tabel 2: Regresion result of Springate model

Model	Unstandardized coefficients		Standardized coefficients	*t*	Signifiacnce
	B	Standard error	Beta		
Constant	1.882	0.456		4.125	0
Working capital	3.60E-12	0	0.451	0.784	0.437
Total assets	−9.18E-13	0	−0.4	−0.378	0.707
Income before tax	1.86E-11	0	1.284	0.658	0.513
Income before interest and tax	−2.05E-11	0	−1.444	−0.743	0.461
Current liabilities	−1.43E-13	0	−0.04	−0.039	0.969
Sales	3.28E-13	0	0.298	0.703	0.485

Tabel 3: Regresion result of Zmijewski model

Model	Unstandardized coefficients		Standardized coefficients	*t*	Signifcance
	B	Standard error	Beta		
Constant	−1.7	0.317		−5.369	0
Income after tax	1.07E-11	0	0.27	1.967	0.055
Total assets	−5.48E-12	0	−1.173	−3.214	0.002
Total liabilities	1.81E-11	0	2.643	16.974	0
Current assets	−1.84E-12	0	−0.281	−0.584	0.562
Current liabilities	−8.66E-12	0	−1.183	−4.5	0

with predictive models in calculating the bankruptcy Springate metal manufacturing companies.

The second hypothesis is to test whether there are significant differences between the analytical model of the Z-Score bankruptcy and Zmijewski in manufacturing companies.

Tabel 4: Correlation result of *Z*-Score and Springate model

Model	*Z*-Score	Springate
Z-Score		
Pearson correlation	1	0.06
Significant (2-tailed)		0.664
N	55	55
Springate		
Pearson correlation	0.06	1
Significant (2-tailed)	0.664	
N	55	55

Tabel 5: Correlation result of *Z*-Score and Zmijewski model

Model	*Z*-Score	Zmijewski
Z-Score		
Pearson correlation	1	−0.04
Significant (2-tailed)		0.769
N	55	55
Zmijewski		
Pearson correlation	−0.04	1
Significant (2-tailed)	0.769	
N	55	55

Tabel 6: Correlation result of Springate and Zmijewski model

Model	Springate	Zmijewski
Springate		
Pearson correlation	1	−0.456**
Significant (2-tailed)		0
N	55	55
Zmijewski		
Pearson correlation	−0.456**	1
Significant (2-tailed)	0	
N	55	55

Tabel 7: T-test results of hypotesis 1

Model	Standard deviation	*t*	df	Significant (2-tailed)
Pair Z-Score - Springate	2.2459972 4.00E+00	−0.205	54	0.838

Tabel 8: T-test results of hypotesis 2

Model	Standard deviation	*t*	df	Significant (2-tailed)
Pair Z-Score - Zmijewski	4.1044358 5.54E+03	4.316	54	0

Tabel 9: T-test results of hypotesis 3

Model	Standard deviation	*t*	df	Significant (2-tailed)
Pair Springate - Zmijewski	4.9635153 3.07E+03	3.662	54	0.001

From Table 8, it can be seen that the *t* value for the Z-Score prediction model with Zmijewski prediction models are 4.316 and *t*-test using tables for both prediction model is valued 2.00488 with a probability of error of 5% and df 54, therefor it can be stated that there is significant differences between the Z-Score prediction models with Zmijewski prediction models in calculating the bankruptcy prediction metal manufacturing companies.

The third hypothesis is to test whether there is a significant difference between bankruptcy analysis Springate models and Zmijewski models in manufacturing companies.

From Table 9 it can be seen that the value of the *t*-test for the Springate and Zmijewski prediction calculation is 3.662 and the value of the t-test using table valued is 2.00488 with an error probability of 5% and 54 df, therefor it could be argued that there are significant differences between Zmijewski and Springate predictive models in bankruptcy prediction calculates a metal manufacturing company and the like.

5. CONCLUSION

In general, the manufactures steel and Metals Company like iron are mostly in good health despite a condition of ups and down sincertain years. However, when using the Z-Score prediction model many companies that declared potentially bankrupt, this can occur because of differences in scale calculations on each model. Z-Score approach to predict bankruptcy of manufacturing companies showed that only 16% of the 11 companies over the past 5 years are otherwise healthy, 13% fall into the gray area, and 71% other potentially declared bankrupt. Springate approach stated 73% of manufacturing companies are experiencing good condition (healthy), while the other 27% is declared potentially bankrupt. Where as Zmijewski approach has concluded that 89% of manufacturing companies surveyed during the last 5 years experienced good condition (healthy) and 11% other potentially declared bankrupt. The conclusions of the three models showed a significant difference to the approach of Z-Score with Zmijewski and Springate with Zmijewski, but there is no significant difference between the approach of the Z-Score with Springate. The results of Model Z-score are significantly influenced by firm sales data, and in the last 5 years stated that only 2 companies that are otherwise healthy, respectively. Springate model does not have any components of the calculation which significantly affect the results of these predictions, the results of these predictions are equally influenced by each component of the prediction counters. As for the prediction model has four components Zmijewski calculations significantly affect the results of the calculation of the prediction, there are profit after tax, total assets, total debt and current debt, it indicates any change in each of these components will affect the predicted outcome significantly.

REFERENCES

Adnan, H., Arisudhana, D. (2011), Analisis Kebangkrutan Model Altman Z-Score dan Springate pada Perusahaan Industri Property. Jakarta, Indonesia: Universitas Budi Luhur.

Aghaei, M., Kazemi, A., Moezzi, D.A., Rajabian, M., Beigi, M.,

Asadollahi, A. (2013), Financial distress and bankruptcy prediction in subsidiaries of the largest bussiness holding in Iran using the model of Altman. Research Journal or Recent Sciences, 2(8), 40-46.

Bellovary, J., Giacomino, D., Akers, M. (2007), A review of bankruptcy prediction studies: 1930 to present. Journal of Financial Education, 33, 1-42.

Chava, S., Jarrow, R.A. (2004), Bankruptcy Prediction With Industry Effects. Social Science Research Network, 8(4), 537-569.

Hanafi, M., Halim, A. (2007), Analisis Laporan Keuangan. Yogyakarta: Unit Penerbit dan Percetakan Sekolah Tinggi Ilmu Manajemen YKPN.

Khan, A. (2014), How does stock prices respond to various macroeconomic factors? A case study of Pakistan. Journal Of Management Info, 4(1), 75-95.

Kuncoro, A.W. (2012), Analisis Kebangkrutan dengan Metode Springate dan Zmijewski pada PT Betonjaya Manunggal Tbk Periode 2007-2011. Jakarta: Universitas Budi Luhur.

Mansi, S.A., Maxwell, W.F., Zhang, A. (2010), Bankruptcy Prediction Model and The Cost of Debt. Social Science Research Network. Available from: http://www.papers.ssrn.com/sol3/papers.cfm?abstract_id=1622407.

Muslich, M. (2007), Modern Financial Management Analysis, Planning, and Policy. 4th ed. Jakarta: PT. Bumi Aksara.

Peter, Yoseph. (2011), Bankruptcy analysis with method of Z-Score Altman, Springate, and Zmijewski at PT Indofood Sukses Makmur Tbk. for the Period of 2005-2009. Akurat Jurnal Ilmiah Akuntansi, 2(4). Available from: http://www.repository.maranatha.edu/id/eprint/390.

Qureshi, M.I., Rasli, A.M., Zaman, K. (2014), A new trilogy to understand the relationship among organizational climate, workplace bullying and employee health. Arab Economic and Business Journal, 9(2), 133-146.

Shezad, A., Jan, F.A., Gulzar, S., Ansari, M.A. (2014), A study on co-integration of Pakistani stock market with selected Asian stock markets. Journal of Management Info, 4(1), 52-74.