AN ANALYSIS OF BANKRUPTCY PREDICTION IN MANUFACTURING FIRM BY USING BANKRUPTCY MODELS (CASE STUDY IN CHEMICAL SUB SECTOR LISTED IN INDONESIA STOCK EXCHANGE 2013-2017)

ANALISIS PREDIKSI KEBANGKRUTAN DIPERUSAHAAN MANUFAKTUR DENGAN MENGGUNAKAN MODEL KEBANGKRUTAN (STUDI KASUS PADA SUB SEKTOR KIMIA YANG TERDAPAT DI BURSA EFEK INDONESIA 2013-2017)

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Abstract: Indonesia has a big problem in the economic factor that caused by sharp declining value of the rupiah, the exchange rate rupiah toward US dollar fluctuations The declining value of rupiah right now can cause the bad impact for the manufacturing sector, especially in chemical sub sector, because the raw materials that used in that sector are import and they must use dollar for the payment. The aim of this research is to find out the bankruptcy prediction in manufacturing firm by using bankruptcy models. This research is an empirical study in the manufacturing firm, and using Altman Z-score and Zmijewski X-score to predict the bankruptcy. Based on the analysis with using the Altman Z-Score test show the results of companies manufacturing chemical sub-sectors those listed on the IDX do not all have bankrupt predictions. But have predictions bankrupt, gray area, and not bankrupt. In the last five years since 2013 until 2017 PT. Unggul Indah Cahaya and PT. Ekadharma International are in the not bankrupt category or health category. The investor should do the calculation z-score and x-score as a basis for consideration to make a decision whether to be used as an investment land.

Keywords: *bankruptcy prediction, bankruptcy model, altman z-score, zmijewski x-score.*

Abstrak: *Indonesia memiliki masalah besar dalam faktor ekonomi yang disebabkan oleh penurunan tajam nilai tukar rupiah, nilai tukar rupiah terhadap fluktuasi dolar AS Penurunan nilai rupiah sekarang dapat menyebabkan dampak buruk bagi sektor manufaktur, terutama di sub sektor kimia, karena bahan baku yang digunakan di sektor itu adalah impor dan mereka harus menggunakan dolar untuk pembayaran. Tujuan penelitian ini adalah untuk mengetahui prediksi kebangkrutan di perusahaan manufaktur dengan menggunakan model kebangkrutan. Penelitian ini merupakan studi empiris di perusahaan manufaktur, dan menggunakan Altman Z-score dan Zmijewski X-score untuk memprediksi kebangkrutan. Berdasarkan analisis dengan menggunakan uji Altman Z-Score menunjukkan bahwa perusahaan manufaktur sub-sektor kimia yang terdaftar di BEI tidak semuanya memiliki prediksi bangkrut. Tetapi memiliki prediksi bangkrut, grey area, dan tidak bangkrut. Dalam lima tahun terakhir sejak 2013 hingga 2017 PT. Unggul Indah Cahaya dan PT. Ekadharma International berada dalam kategori tidak pailit atau kategori kesehatan. Investor sebaiknya melakukan perhitungan z-score dan x-score sebagai dasar pertimbangan untuk membuat keputusan apakah akan digunakan sebagai lahan investasi.*

Kata Kunci: *prediksi kebangkrutan, model kebangkrutan, altman z-score, zmijewski x-score.*

INTRODUCTION

Research Background

The manufacturing sector has a fundamental role to play in global economic growth which includes job creation for emerging economies and developed markets. Manufacturing provides the necessary foundation for an economically, socially and environmentally sustainable society. Indonesia has a big problem in the economic factor that caused by sharp declining value of the rupiah, the exchange rate rupiah toward US dollar fluctuations. The declining value of rupiah right now can cause the bad impact for the manufacturing sector, especially in chemical sub sector, because the raw materials that used in that sector are import and they must use dollar for the payment. It can cause the increasing cost of production and sales. So, the demand in export had decreased.

Market competition in Indonesia is getting tighter, which the other countries might have cheaper products because they are have a strong exchange rate, compared to the rupiah. There a lot of manufacture product that made from overseas which inundate the market in Indonesia, especially product from China. It is make the domestic producers hurriedly, because the product price is far below the price of domestic product and the quality is good. The domestic product should keep the quality of the product with pressing the cost as low as possible, to compete with product made from overseas because they over the cost relative cheaper than domestic products. The company must have a competitive advantage to compete and survive in the market.

All sorts of condition above might be aggravated the condition of some of manufacture firm and can cause the bankruptcy in their business. One of the indicator that we used to see the company will be survived, grow and develop even had bankruptcy is net profit. Actually, the risk of bankruptcy for the company can be measured by using financial report.

Empirically, this bankruptcy prediction can be proven, as has been done by several researchers using bankruptcy model. Rybarova, Braunova and Jantosova (2016) explain The bankruptcy or predictive models are the early warning system based on an analysis of selected indicators that have the ability to indicate a threat in the company's financial health. Research by Rybarova, Sagatova and Braunova (2015) supports that the models are based on the assumption that a few years before bankruptcy it is possible to identify symptoms of future problem, which are characteristic for these companies. They could detect the indicators of potential future problems with the early solution which can prevent serious consequences for the company.

Based on those thoughts then the researchers take the Altman Model and Zmijewski model to analysis the bankruptcy prediction in Manufacturing listed in Indonesia Stock Exchange period 2013-2017.

Research Objective

To analyze the bankruptcy prediction by Altman and Zmijewski Model in Chemical sub sector listed in Indonesia Stock Exchange.

THEORETICAL FRAMEWORK

Bankruptcy

According to Fahmi (2011) Bankruptcy as failure is defined in several meanings, which are: Failure in the economic view means that the company loses money or income, the company is unable to cover its own costs, this means that its profit level is less than the obligation. This failure occurs when the actual cash flow from the company is far below the expected cash flow. Financial failure can be interpreted as insolvency. insolvency on the basis of cash flow there are two forms: technical insolvency and Insolvency in terms of bankruptcy.

The advantage of bankruptcy information

According to Halim (2000) the bankruptcy information will be useful for some side, such as the following:

1. Lender

   The bankruptcy information can be useful for making decisions about who will be given a loan, and then useful for loan monitoring policies.

2. Investor

   Investors who adopt an active strategy will develop bankruptcy prediction models to see signs of bankruptcy as early as possible and then anticipate these possibilities.

3. Government

In some business sectors, government agencies have the responsibility to oversee the running of the business. The government also has business entities that must always be monitored. Government agencies have an interest in seeing signs of bankruptcy early so that actions need to be done early.

4. Accountant

   The accountant has an interest in the information of the continuity of a business because the accountant will assess the going concern ability of a company.

5. Management

   If management can detect bankruptcy earlier, then austerity measures can be done related to the emergence of bankruptcy costs. For example, with a merger or financial restructuring so that bankruptcy costs can be avoided.

Financial Performance

Financial performance is an analysis carried out to see the extent to which a company has implemented by using the rules of financial implementation well and correctly (Fahmi, 2011).

Financial Statement

Financial statement is the information that describes the condition of a company, where it will become information that describes the performance of a company (Fahmi, 2011). In the other hand Farid and Siswanto in Fahmi (2011) said financial report is the information which is expected to provide information to users to make financial decisions that are financial.

Financial Ratio

According to Fahmi (2011) financial ratio is very important for analyzing the company's financial condition. For the investor in general short and medium-term, they are more interested in short-term financial conditions and the company's ability to pay adequate dividends.

Previous Research

Marcinkevicius and Kanapickiene (2014) studied about the prediction bankruptcy in the constructuin sector by using bankruptcy models. The research aims to reveal if conventional bankruptcy prediction models are applicable in construction sector. In order to evaluate the accuracy of bankruptcy prediction models and ensure the quality of the acquired data, empirical calculation of 521 companies whose bankruptcy processes were initiated in 2009-2013 was carried out. To evaluate the applicability of bankruptcy prediction models in Lithuanian companies of construction sector, the researcher used 5 classical statistical bankruptcy prediction models, 3 linear discriminant analytical models (Altman, Springate, Taffler&Tisshaw) and 2 logistic regression models (Chesser, Zavgren). The funding of this research is: the least accurate bankruptcy prediction model is the Taffler & Tisshaw model. The results of this bankruptcy prediction model were the least in comparison with all the rest bankruptcy prediction models.

Almamy, Aston and Ngwa (2015) explained about investigates the extension of the Z-score model in predicting the health of UK companies; using discriminant analysis, and performance ratios to test which ratios are statistically significant in predicting the health of UK companies from 2000 to 2013. The purpose of this study is to contribute towards Altman's (1968) original Z-score model by adding a new variable. The result of this research is cash flow when combined with the original Z-score variable is highly significant in predicting the health of UK companies.

Rybarova, Braunova and Jantosova (2016) studied to evaluate the financial condition of the businesses operating in the construction industry in Slovakia through the selected bankruptcy model. For the analysis were used three variants of Altman Zscore - Altman Z-score by Neumaier (Z1), Altman Z- score for non-productive and start-ups businesses (Z2) and Altman Z- score for other businesses (Z3). For the results' verifying of the analysis through Altman Z-score for other businesses are recommended to carry out further analysis of the construction industry.
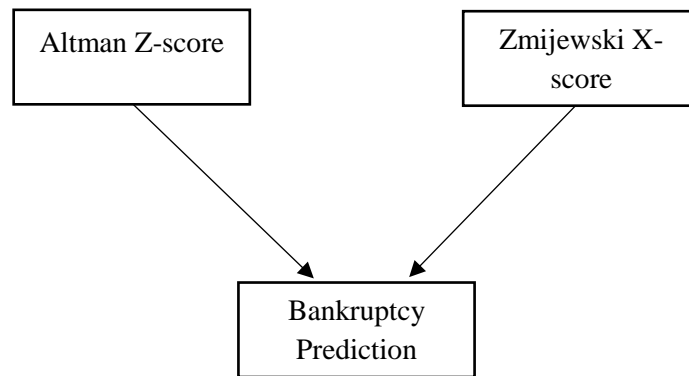
Conceptual Framework

Figure 1. Conceptual Framework

RESEARCH METHOD

Research Approach

This is a quantitative research and data are analyzed by descriptive analysis. This study uses analytical and quantitative data types about a number of chemical sub-sector companies listed on the Indonesia Stock Exchange (BEI) during the 2013-1017 period.

Population, Sample and Sampling Technique

The population of this research is chemical sub-sector manufacturing companies listed on the Indonesia Stock Exchange (BEI). Chemical sub-sector manufacturing company that publishes financial statements for five years namely 2012, 2013, 2014, 2015, 2016, and 2017. Has a calculation indicator component needed in this study, namely the Z-Score and cash flow ratio.

The sampling technique is Judgment Sampling Technique which is determining the sample based on the criteria. The criteria are:
1. The company is a manufacturing company.
2. The company has annual report from 2013 until 2017.
3. Has a calculation indicator component needed in this study, namely the Z-Score and X-score.

Data Collection Method

The data used in this study is secondary data (documentary) annual report of chemical sub-sector manufacturing companies listed on the Indonesia Stock Exchange (BEI). The study period was for five years using the latest data, from 2013 to 2017.

Data Analysis Method

This research will be using Altman Z-score and Zmijewski as the tool for data analysis.

Altman Z-score

Predict the level of corporate bankruptcy with using Altman Z-Score variables. Formula as a basis benchmark in the Z-Score analysis, which is:

$Z = 1,2X1 + 1,4X2 + 3,3X3 + 0,6X4 + 1,0X5$

Cut-off value:

$Z < 1,81$ potential bankrupt

$1,81 < Z < 2,99$ gray area

$Z > 2.99$ is not bankrupt

Zmijewski X-score

The Zmijewski model was introduced in 1984. This model uses ratio analysis that measures the performance, leverage, and liquidity of a company. Zmijewski used probit analysis which was applied to 40 bankrupt companies and 800 companies that were still surviving at that time. The equation of this model is:

X = -4,3 - 4,5 X1 +5,7 X2 - 0,004X3

The assessment criteria for X in this model equation is the greater the value of X, the more likely / probability the company will go bankrupt. The purpose of the evaluation of the Zmijewski model is that the greater the value of X, the greater the probability / probability of the company going bankrupt, so that in the analysis of this method if it is negative then the company is not potentially bankrupt.

Table 1. Z-score and X-score for Bankruptcy Prediction of PT. Barito Pasific Tbk

Year	Z-score	Prediction	X-score	Prediction
2013	1,77	Bankrupt	-6,1	Health
2014	1,77	Bankrupt	-6,0	Health
2015	1,32	Bankrupt	-4,4	Health
2016	26,60	Not Bankrupt	-5,3	Health
2017	41,33	Not Bankrupt	-4,8	Health

Source: Data Processed (2018)

From the table 1, in year from 2013 until 2015 PT. Barito Pasific enter the category of bankrupt and in the year of 2016 and 2017 enter the category not bankrupt with using the Altman Z-score, when using the Zmijewski X-score PT. Barito Pasific still in the health category because Zmijewski different with the Almant Z-score. Zmijewski has only two categories which is Health Company and Not Health Company. And PT. Barito Pasific in the health category for the last five years because the value is lower than 1. In year 2015 PT. Barito has decreasing from -6.0 become -4.4 it means the X-score in 2015 closed to 1 and closed to the not health company.

Table 2. Z-score and X-score for Bankruptcy Prediction of PT. Budi Starch & Sweetener

Year	Z-score	Prediction	X-score	Prediction
2013	2,06	Gray Area	-5,6	Health
2014	1,86	Gray area	-4,9	Health
2015	1,56	Bankrupt	-3,8	Health
2016	1,77	Bankrupt	-4,7	Health
2017	1,81	Gray Area	-4,8	Health

Source: Data Processed (2018)

From the table 2 in 2015 and 2016 PT. Budi Starch & sweetener enter the bankrupt category according to Altman model and in 2013, 2014 and 2016 enter the gray area category. While according to Zmijewski for the last five years PT. Budi Starch & Sweetener still in the health category.

Table 3. Z-score and X-score for Bankruptcy Prediction PT. Duta Pertiwi Nusantara

Year	Z-score	Prediction	X-score	Prediction
2013	3,58	Not Bankrupt	-5,9	Health
2014	2,68	Gray Area	-5,9	Health
2015	2,59	Gray Area	-5,6	Health
2016	2,45	Gray Area	-5,5	Health
2017	2,33	Gray Area	-5,2	Health

Source: Data Processed (2018)

Based on the results in table 3, PT. Duta Pertiwi Nusantara is decreasing for the last five years. Even though experienced decrease the company still in the safe area which is in the gray area and not enter the bankrupt category according to Altman's model. While according to Zmijewski PT. Duta pertiwi Nusantara still in the health category.

Table 4. Z-score and X-score for Bankruptcy Prediction PT Ekadharma International

Year	Z-score	Prediction	X-score	Prediction
2013	3,39	Not Bankrupt	-8,0	Health
2014	3,48	Not Bankrupt	-8,2	Health
2015	3,95	Not Bankrupt	-9,0	Health
2016	3,05	Not Bankrupt	-7,1	Health
2017	3,00	Not Bankrupt	-7,0	Health

Source: Data Processed (2018)

PT. Ekadharma International still in the health company according to Zmijewski because the value of X-score is small and below zero, and in the not bankrupt category according to Altman model.

Table 5. Z-score and X-score for Bankruptcy Prediction PT Eterindo Wahanatama

Year	Z-score	Prediction	X-score	Prediction
2013	1,89	Gray Area	-4,8	Health
2014	0,70	Bankrupt	-3,3	Health
2015	0,22	Bankrupt	-0,3	Health
2016	-0,05	Bankrupt	0,4	Not Health
2017	-0,28	Bankrupt	1,8	Not Health

Source: Data Processed (2018)

Based on the table 5 PT. Eterindo Wahnatama is decreasing every year. And the company from 2014 until 2017 enter in the Bankrupt category based on the Altman model and in 2016 and 2017 enter the not health category according to Zmijewski model.

Table 6. Z-score and X-score for Bankruptcy Prediction PT. Intan Wijaya International

Year	Z-score	Prediction	X-score	Prediction
2013	2,51	Gray Area	-6,6	Health
2014	2,68	Gray Area	-7,3	Health
2015	2,97	Gray Area	-7,4	Health
2016	2,21	Gray Area	-6,7	Health
2017	2,59	Gray Area	-7,7	Health

Source: Data Processed (2018)

Based on the table 6 PT. Intan Wijaya for the last five years still in the gray area category according to Altman model while according to Zmijewski model enter the health category. The value of Z-score and X-score for PT. Intan Wijaya had increased and decreased every year.

Table 7. Z-score and X-score for Bankruptcy Prediction PT. Indo Acitama

Year	Z-score	Prediction	X-score	Prediction
2013	2,32	Gray Area	-7,1	Health
2014	2,39	Gray area	-7,2	Health
2015	2,16	Gray Area	-6,2	Health
2016	1,69	Bankrupt	-4,9	Health
2017	1,98	Gray Area	-5,8	Health

Source: Data Processed (2018)

In 2016 PT. Indo Acitama enter the bankrupt category but in 2017 the company's is increasing and enter the gray area based on the Altman model while based on the Zmijewski Model still in the health category.

Table 8. Z-score and X-score for Bankruptcy Prediction PT. Chandra Asri Petrocchemical

Year	Z-score	Prediction	X-score	Prediction
2013	2,49	Gray area	-7,1	Health
2014	2,36	Gray area	-6,9	Health
2015	1,77	Bankrupt	-4,6	Health
2016	42,33	Not Bankrupt	-5,7	Health
2017	30,19	Not Bankrupt	-5,4	Health

Source: Data Processed (2018)

PT. Chandra Asri Petrocchemical is decreasing from 2013 until 2015, and in 2015 enter the bankrupt category. But in 2016 and 2017 is entering the not bankrupt category based on the Altman model. While based on the Zmijewski model still in the health category for the last five years.

Table 9. Z-score and X-score for Bankruptcy Prediction PT. Unggul Indah Cahaya

Year	Z-score	Prediction	X-score	Prediction
2013	3,19	Not Bankrupt	-9,0	Health
2014	3,17	Not Bankrupt	-9,7	Health
2015	2,81	Not Bankrupt	-8,0	Health
2016	3,07	Not Bankrupt	-8,1	Health
2017	10,81	Not Bankrupt	-9,2	Health

Source: Data Processed (2018)

PT. Unggul Indah Cahaya for the last five years enter the Health category based on the Altman and Zmijewski models. Even though the company has decreased and increased every year but still in the health category or in the safe zone.

Discussion

PT. Barito Pasific since 2013 until 2015 included in the category of bankrupt but in the year of 2016 and 2017 included in the category health or not bankrupt based on the Altman Model. Because from 2013 until 2015 the company get loss, it can be seen from the Retained Earnings year 2013 until 2015 PT. Barito Pasific has negative ratio of retained earnings to total asset it means, during that time the company never records retained earnings or always accumulated losses. While in the year of 2016 and 2017 PT. Barito Pasific is increasing and enter the not bankrupt category. It is because of the company already get profit from the capital that company get from the Stock.

PT. Chandra Asri Petrocchemical in 2013 and 2014 in the gray area category and in 2015 in the bankrupt category while in 2016 and 2017 increase in the health category or health category. It is because the sales in 2015 decrease 0,54% from 2014 it causes the company get in the bankrupt category, but in 2016 and 2017 the company increase the market value of equity 39,63% in 2016 and 27,58% in 2017.

PT. Eterindo Wahanatama is decreasing from 2013 until 2017. In 2013 the company enter in the gray area category but in 2014 unntil 2017 in the bankrupt category. Because the working capital to total asset in 2014 until 2017 is negative it means the company cannot fulfill their short term obligations with their asset. The retained earnings to total assets since 2014 until 2017 is negative it means that the company always accumulated losses that is why the company use their asset to cover theirs loses in the previous year.

PT. Budi Starch & Sweetener in 2013 and 2014 enter the Gray area category while in 2015 is decreasing and become bankrupt category while in 2017 increase 0,1% and enter the gray area category based on the Altman model. In 2015 the sales to total asset decrease 0,19% from 2014 that affect the retained earnings to total asset decrease 0,02% from 2014. But in year 2016 sales of the PT. Budi Starch & Sweetener increase 0,11% from 2015. That is why the company in 2015 enter the gray area category again. Even though the company still in the safe zone but company must take attention of that because if the company decrease 0,1% will be entered the bankrupt category. The company should take attention about the market value of equity ratio because since 2013 until 2017 the value of market value equity is lower that other company. The company can increase the value of the stock the the amount of the stock with low price so from that the company can use it for the capital of the company itself. It is support by Triharyanti (2008) that market value of equity to total liabilities has partial affect the bankruptcy prediction.

PT. Duta Pertiwi Nusantara is decreasing every year. Its cause in 2013 the company in the not bankrupt category but in 2014 until 2017 in the gray area category. Even though the company experienced decrease but the value of the Z-score still in the safe zone. The company must take care of it so their company will not decrease and enter the bankrupt category. Same with PT. Intan Wijaya in the last five years the company experienced the increased and decreased every year but still in the gray area category never decrease in the bankrupt category and never increase the health category.

PT. Indo Acitama from 2013 until 2015 in the gray area category but in 2016 decrease in the bankrupt category but in 2017 increase in the gray area category. In the 2016 PT. Indo Acitama experienced decrease 0.23% from their sales that is why the company decrease in the bankrupt category. But in 2017 the company

increase 0,29% its Z-score and also the sales increase 0,1%. It can cause the company enter the gray area category again. It is support by Indriyati (2010) that sales had partially affect the bankruptcy.

In the last five years from 2013 until 2017 PT. Ekadharma International and PT. Unggul Indah Cahaya in the not bankrupt category or health category. Because the ratio of sales to total asset is high it means the company can get profit from their sales the then keep it and record in the retained earnings to use as a capital or to pay their debt in the future that is why the ratio of retained earnings to total assets is high.

Different from the Altman Model, the Zmijewski model did not divide into three part like the Altman model but Zmijewski only divided into two part which is health company and not health company. The company that get in the not health company is only PT. Eterindp Wahanatama because the X-score that they get is above zero it means the company in the not health company. Because since 2013 until 2017 the value of debt ratio PT. Eterindo Wahanatama is higher than the other company. It means than the company use high debt in their company. When the debt ratio gets higher while the proportion of total asset does not change, the debt held by the company is greater. The greater total debt means the financial ratio or the ratio of the company's failure to repay the loan is higher. It is support by Rohmadidi, Saifi, and Darmawan (2018) that debt ratio partially influenced bankruptcy or financial distress.

CONSLUSION AND RECOMMENDATION

Conclusion

From the data analysis that has been carried out, it can be drawn several conclusions, as follows:

A. Altman Model
1. PT. Barito Pasific
   Based on the Altman Model since 2013 until 2015 PT. Barito Pasific in the bankrupt category while in 2016 and 2017 enter the not bankrupt category. Based on the Zmijewski PT. Barito Pasific in the health category for the last five years.
2. PT. Budi Starch & Sweetener
   Based on the Altman model in 2013,2014 and 2017 PT Budi Starch & Sweetener in the gray area category but in 2015 and 2016 the company get in the bankrupt category. While based on the Zmijewski the company in the health category.
3. PT. Duta Pertiwi Nusantara
   In 2013 the company get in the not bankrupt category but in last four years since 2014 until 2017 get in the gray area category. While based on the Zmijewski the company in the health category.
4. PT. Intan Wijaya International for the last five years get in the gray area category same with PT. Indo Acitama but in 2016 PT. Indo Acitama get in the bankrupt category.
5. PT. Chandra Asri Petrocchemical
   In 2013 and 2014 the company get in the gray area but in the 2015 decrease in the bankrupt category and then in 2016 and 2017 successful get in the not bankrupt category.
6. PT. Eterindo Wahanatama
   In 2013 the company get in the gray are but since 2014 until 2017 is decreasing and enter in the bankrupt category.
7. PT. Ekadharma International and PT. Unggul Indah cahaya in the last five years they are in the Not bankrupt category or health category.

B. Zmijewski Model
   Different with the Altman Model, this model just uses two categories which is health category and not health category, if the X-score is high it means the company potential bankrupt. And the company that get in the bankrupt category is PT. Eterindo Wahanatama.

Recommendation

1. For investors and creditors, before making an investment decision or in distribute loans, it is expected to apply the z-score and x-score calculation as a basis for consideration to make a decision whether to be used as an investment land. While the creditor can make a decision whether the company is worthy of a loan.
2. For further research can increase the number of sample companies and other ratios so that it can multiply research samples and add other factors that are thought to have an influence on bankruptcy rate.

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