MANUFACTURING COMPANY BANKRUPTCY PREDICTION IN INDONESIA WITH ALTMAN Z-SCORE MODEL

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Abstract: Model Altman is one of the models used to predict financial distress. Some of the results of research that conducted in Indonesia showed that Altman model is completely accurate in predicting financial distress but the other found the opposite results. This inconsistency indicates the need to adapt the model by checking whether variables affect Altman model in financial distress companies in Indonesia and the adjustment coefficients Altman to be able to better predict about financial distress. The results showed that the partial test working capital/total assets, retained earnings to total assets, and earning before interest and tax to total assets were able to classify the company’s financial distress. However, the model that formed by five variables were able to classify financial distress well with an accuracy of 87.8%.

Keywords: altman z-score, financial distress, bankruptcy, prediction

Bankruptcy is an issue that really needs to be watched by the company. Corporate bankruptcies will certainly have a negative impact on the company’s stakeholders. Before bankruptcy, the company experienced a condition financial distress or financial condition of the company in a bad state that a preliminary indicator bankruptcy (Corina and Chrissa, 2013). At companies that go public, the impact of a company experiencing financial difficulties is the removal of the company’s shares from the stock exchange. It can be seen from 20 companies were delisted in 2011 until 2015 in the activity of listing of shares on the Indonesia Stock Exchange.

Prediction of financial distress is very important as a step in early detection so that both companies and investors can find out a possibility of bankruptcy will happen to the company in the future. Early detection can be beneficial for the company to evaluate and perform the actions need to be done to avoid bankruptcy. This may be one reason for the importance of a tool that can predict the condition of financial difficulties (financial distress).

Bankruptcy prediction can be measured through the financial statements of a company by analyzing the ratio of the financial statements of the company (Adnan and Kurniasih 2000). Results of research conducted by Beaver (1966) found that the financial ratios were able to predict the bankruptcy of the
company. Beaver research was the beginning of the development of research on the analysis of financial statements that correlate financial ratios, for example, the model of the Altman Z-Score. Z-Score model was created in 1968 by Edward I. Altman.

Altman Z-Score Model can be used to predict the chances of a company that can bankrupt within a period of 2 years (Altman 1968). This model features up to 72% accuracy in predicting a bankruptcy within two years before the bankruptcy occurred and have accuracy up to 80%-90% in predicting bankruptcy one year before the bankruptcy that occurred (Altman 2000). The accuracy in predicting corporate bankruptcies making models Altman Z-Score is a reference for each investor and investment managers in the United States as a tool to assist their investment decisions (Eidleman, 1995).

The accuracy of the model Altman Z-Score has been widely proven in many studies that test the accuracy of these models. The high level of accuracy Altman is supported by research conducted by Prihanthini and Sari (2013) who found that the model of the Altman Z-Score has an 80% accuracy rate on food and beverage company on the Indonesian Stock Exchange. Research on cigarette sub-sector companies in the Indonesia Stock Exchange by Tambunan, et al. (2015) also found that the model of Altman’s Z-Score have a high degree of accuracy based on the analysis performed in two periods before the bankruptcy occurred. Research conducted by Rim and Roy (2013) found that in addition to being able to predict well about potential bankruptcy, Altman model is able to classify the company in the category of small, medium, and large. Additionally, Nugroho and Mawardi (2012) examine the model Altman Z-Score is at 88 manufacturing companies that go public in Indonesia and found that the level of accuracy of Altman model has reached 79.75%. The interesting thing was found by Kusdiana (2014), which conducts research on commercial bank listed on the Indonesia Stock Exchange found that the level of accuracy of the model Altman Z-Score has reached 100%.

However, Altman model does not always show the highest level of accuracy when applied. Research conducted by Marcelinda, et al. (2014) in the manufacturing companies listed in Indonesia Stock Exchange found that the prediction model Altman Z-Score have a low accuracy rate is only 27.96%. The same was found by Nikmah and Sulestari (2014). They found that accuracy rate of Altman Z-Score models is less efficient in predicting bankruptcy, only about 40% of 120 companies listed in Indonesia Stock Exchange. Research Yi Wang (2012) concluded that Altman model suitable for use in the United States but not very suitable for use in China.

The inconsistency regarding the accuracy of Altman model indicates that the need for testing in advance about the effect of the ratios on the model of the Altman Z-Score to financial distress companies in Indonesia and adjust coefficients Altman model that is able to predict financial distress companies in Indonesia.

RESEARCH METHODS

Altman Z-Score Model consists of five ratios that have proven able to better predict a bankruptcy. However, the application of Altman model has an accuracy rate that contradicted so that the necessary checks fifth relationships ratio in financial distress companies and the adjustment coefficients in the Altman Z-Score model before being applied to the company in Indonesia. The dependent variable in this research is financial distress and the independent variable is working capital to total assets, retained earnings to total assets, earnings before interest and tax to total assets, a market value of equity to total liabilities, and sales to total assets.

Operational Definition of Variables

Operational definitions of variables used in this study as follows:
1. Net working capital to total assets is score ratio that shows the company’s ability to generate working capital of the total assets owned by the company obtained from the division of working capital and total assets.
2. Retained earnings to total assets is score ratio which indicates the company’s ability to benefit obtained from the distribution of retained earnings and total assets.
3. Earnings before interest and tax to total assets is score ratio which indicates the company’s ability to generate profits from the assets of the
company itself, before interest payments and
taxes generated from the distribution of earn-
ings before interest and tax and total assets.
4. The market value of equity to total liabilities is
score ratio that measures the extent to which
the company’s assets are financed from loans
obtained from the result of the division of the
market value of equity and total liabilities.
5. Sales to total assets is score ratio that indicates
the extent to which the company is using its as-
sets effectively to increase sales obtained from
the division of sales and total assets.
6. Financial distress is dummy variable, 1 if the
company has negative earnings per share for two
years in a row, and 0 for the others.

Population and Sample

The population in this study are all manufacturing
companies listed in Indonesia Stock Exchange in 2014
to 2015 consisting of three sectors, namely industry
and the chemical sector, various industrial and consu-
mer goods industry.

The sampling technique used purposive sampling
method with the criteria of the companies listed on
the Indonesia Stock Exchange in 2014-2015 did not
include companies that relisting nor delisting and
issued annual financial statements from 2014 to 2015.
In this study, the number of companies surveyed was
131 companies.

Data Analysis Technique

Data analysis techniques used in this research is
discriminant analysis. According to Ghozali (2011),
discriminant analysis is a form of regression with the
dependent variable is a non-metric or category.

RESULTS AND DISCUSSION

Condition Companies That Are Experiencing
Financial Distress in The Stock Exchange
Indonesia

This study found that there are 21 companies
listed on the Indonesia Stock Exchange is experiencing
financial distress, while 110 companies are not expe-
riencing financial distress. it means that companies
that are listed on the Indonesia Stock Exchange are
not necessarily free from financial distress.
Companies experiencing financial distress can be seen from its financial statements. In this study, the company at least has a negative figure in working capital, earnings before interest and taxes, or profit holding from the financial statements of the companies.

The working capital will negatively affect the growth and profitability of the company. If this continues, it will initiate financial distress and could eventually lead to bankruptcy for the company itself (Delavar, et al., 2015). The research conducted by Caballero, et al., (2008) found that companies experiencing financial distress have a lower working capital.

If earnings before interest and tax were negative, that indicated the company had a problem on the company’s ability to generate an operating profit. This obviously makes the company vulnerable to financial distress. John, et al. (1992) described the company’s financial distress can be seen from the negative value of the earnings before interest and tax firm.

Negative retained earnings show that the company is not able to generate profits and to finance the company’s assets. In addition, the negative retained earnings also showed that the inefficient management in managing the company’s activities. If this condition continues, the company is vulnerable to financial distress, although it has a small debt (Byoun, 2007).

In the graph above shows that more companies are not experiencing financial distress than those experiencing financial distress. Seen from the sector, the companies experiencing financial distress condition occurs in every sector.

All the graph above shows all of the companies in the subsectors of cement, wood and its management, machinery and heavy equipment, footwear, cables, electronics, pharmaceuticals, cosmetics and household goods, and housewares are not experiencing financial distress while other sub sectors at least there one company experiencing financial distress.

Companies in the textile and garment sector are the most experienced financial distress as many as seven companies. This condition is caused by competition with imported goods are cheaper in price and the weakening rupiah against the US dollar led to rising raw material prices that make weak growth in

![Figure 3](image-url)

**Figure 3.** Comparison of the number of companies experiencing and not experiencing financial distress in the sector and chemical industry.
this sector. This has led to layoffs of employees is approximately 30,000 employees (Ministry of Industry, 2015).

**Discriminant Result**

The results showed that when tested by partial, there are 3 variables were able to classify the financial distress of the company, namely the working capital to total assets (X1), retained earnings to total assets (X2), and earnings before interest and tax (X3) with significant value below 0.05 while the variable market value of equity to total liabilities (X4) and sales to
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total assets (X5) that did not able to classify the company’s financial distress.

**Table 1. Partial Assay Results Significance**

| Source: Results of the research data processing (2016) |
|-------------------------------------------------------|
| Significance                                          |
| X1  0,000                                              |
| X2  0,000                                              |
| X3  0,000                                              |
| X4  0,071                                              |
| X5  0,082                                              |

CONCLUSIONS AND SUGGESTIONS

**Conclusion**

Companies experiencing financial distress occurs in almost every sub-sector with a total of 21 companies from a total of 131 companies or 16% of all manufacturing companies. Companies experiencing financial distress have negative numbers in working capital, earnings before interest and tax, or on retained earnings. The results showed that the partial test working capital to total assets, retained earnings to total assets, and earnings before interest and tax to total assets were able to classify financial distress while variable market value of equity to total liabilities and sales to total assets was not able to clarify financial distress. However, formed the model of these five variables were able to classify financial distress. The variables in the Altman model able to predict the financial distress of the company amounted to 87.8%. These results were obtained after adjustment coefficient with the condition of manufacturing companies in Indonesia.

**Suggestions**

In accordance with the data obtained from this research, if you want to get a more accurate discriminant model it is necessary to do the adjustment coefficients for each variable Altman model. This is done because of the condition of the company different in each country. Advisable to add the range in order to obtain more accurate results in future studies. Using others indicators of financial distress. The research object other than a manufacturing company should be considered in order to be confirmed that the model Altman applies not only to manufacturing companies. Advisable to using other financial ratios to be able to obtain a more accurate model.

| Source: Results of the research data processing (2016) |
|-------------------------------------------------------|
| Table 2. The Results of Simultaneous Test              |
| Test of Function(s) Significance                       |
| 1  0,000                                              |

**Discriminant model formed**

\[ Z = -0.958 + 1.354 X_1 - 0.118 X_2 + 12.454 X_3 - 0.114 X_4 + 0.191 X_5 \]

The results of discriminant analysis shows how well the models created in predicting the company’s financial distress.

**Table 3. The Results of The Model's Accuracy Rate**

| Source: Results of the research data processing (2016) |
|-------------------------------------------------------|
| Y Predicted Group Membership Total                     |
| Original Financial Distress Non Financial             |
| Count 18 3 21                                       |
| % Financial Distress Distress                          |
| Financial Distress 85,7 14,3 100,0                     |
| Non Financial Distress 11,8 88,2 100,0                 |

The result showed that the accuracy of the discriminant model predict financial distress manufacturing company in Indonesia Stock Exchange amounted to 115/131 or 87.8% discriminant model is able to correctly predict the company’s financial distress or discriminant model can be said is good.
REFERENCES

Adnan, M.A., Kurniasih. 2000. Analisis tingkat kesehatan perusahaan untuk memprediksi potensi kebangkrutan dengan pendekatan Altman. Jurnal Akuntansi dan Auditing Indonesia. 4(2):131-151.

Altman, E.I. 1968. Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. Journal of The American Finance Association. 23(4):589-605.

Altman, E.I. 2000. predicting financial distress of companies: revisiting the z score and zeta models. Journal of Banking & Finance. 1:15-22.

Beaver, W.H. 1966. Financial Ratios as Prediction of Failure. Journal of Accounting Research. 4:71-111.

Byoun, S. 2007. Financial Flexibility, Laverage, and Firm Size. Hankamer School of Business: Baylor University.

Caballero, S.B., Teruel, Garcia, P.J., Solano, P.M. 2008. Working capital management, corporate performance, and financial constraints. ScienceDirect. 67(3).

Corina, W., Chrissa. 2013. Analisis Rasio Keuangan untuk Memprediksi Financial Distress pada Perusahaan Sektor Keuangan yang Terdaftar di Bursa Efek Indonesia. Jurnal Akuntansi IBBI. 19(2):1.

Delavar, A., Kangarluei, S.J., Motavassel, M. 2015. Working capital, firm performance, and financial distress in firms listed in Tehran Stock Exchange. Indian Journal of Fundamental and Applied Live Science. 5:2086-2093.

Eidleman, G.J. 1995. Z scores-A Guide to failure prediction. The CPA Journal. 65(2):52-53.

Ghozali, I. 2011. Aplikasi Analisis Multivariate Dengan Program IBM SPSS 19. Semarang: Badan Penerbit Universitas Diponegoro.

John, K.L., Lang, H.P., Netter, J. 1992. The Voluntary Re-structuring of Large Firms in Response to Performance Decline. Journal of Finance. 47(3):891-917.

Kementrian Perindustrian. 2015. Industri Tekstil Harus Meningkatkan Daya Saing. tersedia pada: http://www.kemenperin.go.id/artikel/9346/Industri-Tekstil-Harus-Tingkatkan-Daya-Saing. [Diakses tanggal 31 Desember 2016].

Kusdiana, Y. 2014. Analisis Model Camel dan Altman Z Score dalam Memprediksi Kebangkrutan Bank Umum di Indonesia. Jurnal Tepak Manajemen Bisnis. 6(1):85-94.

Marcelinda, S.O., Paramu, H., Puspitasari, N. 2014. Analisis Akurasi Prediksi Kebangkrutan Model Altman Z score pada Perusahaan Manufaktur yang terdapat di Bursa Efek Indonesia. E-Journal Ekonomi Bisnis dan Akuntansi. 1(1):1-3.

Nikmah, Sulestari, D.D. 2014. Prediksi Financial Distress Untuk Perusahaan Besar dan Kecil di Indonesia Perbandingan Ohlson dan Altman. Jurnal Fairness. 4(1):36-58.

Nugroho, M.I., Mawardi, W. 2012. Analisis Prediksi Financial Distress dengan Menggunakan Model Altman Z score modifikasi 1995. Dipenogoro Journal of Management. 1(1):1.

Prihanthini, E.D., Sari, M.M. 2013. Prediksi kebangkrutan dengan model Grover, Altman Z.score, Springate, dan Zmijewski pada perusahaan food and beverage di Bursa Efek Indonesia. E-Jurnal Akuntansi Universitas Udayana. 5(2):417-435.

Rim, E.K., Roy, A.B. 2014. Classifying manufacturing firm in Lebanon: an application of Altman’s Model. ScienceDirect. 109:11-18. doi: 10.1016/j.sbspro.2013.12.413.

Tambunan, R.W., Dwiatmanto, Endang, W.N. 2015. Analisis Prediksi Kebangkrutan Perusahaan Menggunakan Metode Altman Z score. Jurnal Administrasi Bisnis. 2(1):1.

Yi Wang. 2012. Z Score Model On Financial Crisis Early-Warning of Listed Real Estate Companies in China:a Financial Engineering Perspective. ScienceDirect. 3:153-157. doi:10.1016/j.sbspro.2011.11.021.