THE DEGREE OF COMPANY VULNERABILITY USING ALTMAN MODEL: A SURVEY OF PUBLIC LISTED COMPANIES IN INDONESIA

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ABSTRACT

This research is purposed to analyze the degree of vulnerability of a company's performance. From the financial report produced, investor will analyze the level of its performance. There are several variables of defining the performances, in which they are used to distinguish the degree of vulnerability. This level of degree affects investor's decision on company's performance.

The object of this research, after taking relevant data from years 2006-2008 published annual financial reports, there are 184 public companies listed in Indonesian Stock Exchange that are qualified in the analysis procedure. The Altman (1993) model of Z-score formula is used to define variables reflecting in a company performance, in which is classified into three-zone index (safe zone, grey zone and distress zone).

This research has found that more companies lie in the grey and distress zone. Amongst the safe zone companies are Mining Industry and the lowest degree is the Infrastructure Industry. Also, a trend of decreasing performance occurred during 2008. There are possible reasons that might result in the performance of the industries. This result of research will benefit for investors in considering investing in Indonesian companies.

Keywords: altman, z-score test, coefficient of variation, financial distress.

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INTRODUCTION

The economic world has become a huge connection between countries and has led a volatile condition. Some of the facts where developing countries like Thailand, Korea, Malaysia and Indonesia, have experienced economic problem, particularly in credit market back in 1997-1998 (Caouette, Altman, Narayanan, Nimmo, 2008). This has resulted a huge downturn in country's economy affected by the collapse of major industries. Altman, Baidya & Dias (1979) also argue that particularly in developing countries, an epidemic of business failures could have drastic on the strength of the private sector and on the economy as a whole. Thus, a prudent and precaution measurement needs to take place in order to predict the economic condition, as well as a company's performance.

There are numerous reasons why company performs in a not-so-good performance. Altman and Hotchkiss (2006) describe some of the reason occur due to corporate failures are deregulation of key industries, international competition, and most of all, inadequacy in management performance. A poor decision from the management, combined with unfavorable event will also lead to financial distress (Opler and Titman, 1994). The effect of distress is harmful and costly to shareholders. At the extreme, a firm's financial difficulties may lead to bankruptcy and result either in the liquidation of its assets or in reorganization (Altman, et al, 1979). As a result, this problem will likely affect investment decision, where investors are seeking for any opportunity for shifting their preferences.

Uncertainty in financial performance conducts investors to be more prudent in choosing a prospective company, thus they require alternative tools to predict any volatility of a company's performance. Kahl (2002) argues that investment decisions are affected by the degree of uncertainty on a firm's prospects. He mentioned that stakeholders, such as creditors may postpone their decision to learn more about the distressed firm's on better information. Thus, a natural proxy for firm distress is bankruptcy risk (Dichev, 1998)

In the case of Indonesian public listed companies, previous studies have acknowledged the use of Altman Z-score to prove the company's vulnerability, yet expected bankruptcy in certain industries. Permatasari

(2006) has observed in telecommunication industry represented by PT. Telekomunikasi Indonesia Tbk (Telkom), where she concluded that the financial performance is not in an healthy condition. Ambarsari (2009) has also investigated pharmaceutical industry, and Muhammad (2008) has made a research on bankruptcy prediction in wood industries from public listing, where he found that the industry are in distress financial situation. Both research have proven that Altman model of Z-score were accurate. The aim of this research is to evaluate the industry vulnerability using the model and to to help investors overseeing the degree of vulnerability, in the sense that it would help to aid and minimize risky companies. Also, the main result will be confirmed by other measure of risk.

METHODOLOGY

The research will be a descriptive study, where factors in the designated variables under the Multivariate Discriminant Analysis (MDA) introduced by Altman, will be described in the financial variables on formula. Altman's study of bankruptcy prediction (1968) has been an effective indicator to state the list of companies that has gone bankrupt by analyzing its financial performance. The table shows the original Z-Score Model's Variables and Coefficients.

Table 1. Variable Definition Weighting Factor

Variable	Definition	Coefficient Factor
X_1	(Current Assets-Current Liabilities)/ Total Assets	1.2
X_2	Retained Earnings/ Total Asset	1.4
X_3	EBIT/ Total Asset	3.3
X_4	Market Value of Equity / Total liabilities	0.6
X_5	Sales / Total assets	0.999

Source: Altman & Hotchkiss (2006)

$$\textbf{Z-score}=1.2\ X_1+1.4\ X_2+3.3\ X_3+0.6\ X_4+0.999\ X_5 \quad \textbf{(1)}$$

The original Z-score model was introduced by Altman in 1968, and has been widely used in most countries. Altman's study on private company's bankruptcy in Brazil (Altman et al, 1979) has proven to be 87% accuracy 1 year prior to problem's Company and also proven 94% prediction In Indonesia, Agustine and Chrestinawati (2003) has concluded that Altman Z-score can be applied as accurate as 80% to determine the three zones expressed on the next discussion.

Altman (2006) describes that the coefficients embedded in each variables are objectively determined by the computer algorithm and thus remain fixes. The Z-score consisted of 5 variables to do the best overall job together in prediction of corporate vulnerability (Altman, 1968 & Altman, 2006). The contribution of the entire profile is evaluated and this process is essentially iterative toward dicriminant function.

X_1, Working Capital/ Total Assets

This ratio is a measure of the net liquid assets of the firm relative to the total capitalization. Working capital is defined as the difference between current assets and current liabilities. Liquidity and size characteristics are explicitly considered. Previous research by Kahl (2002) depict that if a firm has a high pre-distress leverage ratio, it can enter financial distress if cash flows cannot make sufficient high debt and thus liquidity makes an important factor.

X_2, Retained Earnings/ Total Assets

Retained earnings is the total amount of reinvested earnings and or losses of a firm over its entire life, which is also known as earned surplus (Altman, 2006). It is a measure of cumulative profitability over the life of the company. The age of a firm is implicitly considered in this ratio. Caouette et al (2008) argue that bias would be created by a substantial reorganization or stock dividend and appropriate readjustments should in the event of this happening be made to the accounts.

The ratio measures the leverage of a firm. Those with high RE relative to total assets have financed their assets through retention of profits and have not utilized as much debt. This ratio highlights the use of either internally

generated funds for growth or other people's money which is considered higher risk of capital.

X_3, Earning before Interest and Taxes/ Total Assets
This is a measure of the productivity of the firm's assets, independent of any tax or leverage factors. Since it is based on the earning power of assets this ratio appears to be particularly appropriate for studies dealing with corporate failure (Caouette, et al, 2008).

X_4, Market Value of Equity/ book value of Total Liabilities
This is a measure where it combined market value of all shares of stocks, preferred and common, while liabilities include all the liabilities and obligations. The measure, would assist in acknowledge the movement of the stock before the report of which liabilities exceed the assets and the firm become insolvent.

X_5, Sales/ Total Assets
It is the measurement of capital turnover ratio as a standard financial ratio. The variable contributes less than other variables, on which under univariate statistical significance test basis, it would not be selected. However, Opler and Titman (1994) argue that Sales decrease will affect financial distress in the first place, which then can be an important role to the model.

From all the component in the Z-score model, X_3: Earning before Interest and Taxes/ Total Assets is the most important variables, as it weighs 3.3. It indicates the important role of the company's operation is to be able to pay the interest expense from day to day operations.

Using Caouette, et al (2008) grouping, the measurement will be stated under three zones as follow:

$Z > 2.99$: Safe Zone
$1.81 < Z < 2.99$: Grey Zone
$Z' < 1.81$: Distress Zone

Safe zone meaning that the company debt is in the safe zone whereby the company is operating on a good corporate planning, in which bankruptcy

will be less likely. As for the second zone, which is the grey zone, means that the company is in the medium term, where by indicating that the company will go bankrupt in three to five years. As for the Distress Zone, the company is operating in the red zone, whereby the company is operating with large debt, hence the chances of going bankrupt is very high.

Other method used in this research is Coefficient of Variation (CV). The purpose is to state the degree of risk of which z-score is placed in all industries. As explained by Keller (2005), coefficient of variation is the standard deviation of the observations divided by its mean. Moreover, Brigham & Houston (2007) explain that in order to standardize investing preference, one must provide a meaningful risk measure when the expected returns on choices are not the same. The number is also capture the effects of both risk and return, and is better measurement for investment that has different expected return

A standard deviation formula will be used to enhance the finding:

$$\sigma = \sqrt{\sum_{i=1}^{N} (ri - r)^2 Pi} \quad \textbf{(2)}$$

where r is the expected rate of return with a probability of P_i. The tighter the probability distribution of expected future returns, the smaller the risk of a given investment (Brigham & Houston, 2007).

After calculating all industry standard deviation, as well as their mean, the coefficient of variation can then met:

$$CV = \frac{\sigma}{\overline{r}} \quad \textbf{(3)}$$

Where:
σ : Standard Deviation
r : Mean of Population

Later, the formula will describe the degree of risk associated in each industry.

DATA SELECTION

The data is gathered from the Binus Library whereby it has coordinate together with the Indonesian Stock Exchange (IDX) in collecting the data in the personal or called Binus own cyber collection. The data collected will be all the financial report of the companies listed from 2006 to 2008.

The data being sort into various classifications, however, in this research, due to limitation and unavailability of information on several financial reports, the samples are filterized. There are nine sectors in the ISX, namely, Basic Industry, Miscellaneous Industry, Finance Industry, Trade Industry, Mining Industry, Agriculture Industry, Consumer Industry, Manufacturer Industry and Property Industry. And due to different nature of sales, this research has eliminated both finance and property industries.

To ensure Altman's requirements of quality and the availability of adequate data (Altman et al, 1979), and by Ohlson (1980), the samples are sorted as follow. As for basic industry, there are 44 companies being selected, without elimination, whereas for miscellaneous industry, there are 42 companies that accepted, with 5 companies eliminated due to less than three year operation. On consumer industry, 33 were selected with 1 company being eliminated, 22 companies on Manufacturer Company and 24 from infrastructure industry. Under the mining industry there are 24 companies that operate in this sector, however; there are 9 companies that listed less than three years. Hence is being deducted resulting in 15 companies being conducted in the research. The last industry is Agriculture, where 11 companies being conducted in the research. In conclusion, a total of 184 companies included in the sample.

FINDINGS AND DISCUSSION

The first empirical testing is to examine the average ratios for all industries. Using Altman original Z-score, the table below describe the placement of all industries in 3 main zones.

Table 2. Industry Classification by Zone

No	Industry	Safe	Grey	Distress	Total
1	BASIC INDUSTRY	10.37%	20.74%	68.89%	100.00%
2	MISC-INDUSTRY	13.51%	13.51%	72.97%	100.00%
3	CONSUMER INDUSTRY	34.34%	27.27%	38.38%	100.00%
4	MANUFACTURE INDUSTRY	33.33%	22.73%	43.94%	100.00%
5	INFRASTRUCTURE INDUSTRY	4.17%	9.72%	86.11%	100.00%
6	MINING INDUSTRY	40.00%	22.22%	37.78%	100.00%
7	AGRICULTURE INDUSTRY	21.21%	30.30%	48.48%	100.00%
	Average per Zone	22.42%	20.93%	56.65%	**100.00%**

The above table shows that most of the companies are in the distress zone, with 56,65% over total sample, followed by safe zone and grey zone with 22.42% and 20,93%, respectively. This shows a proportion of low performance of the industries. Specifically, infrastructure has 86,11% of its companies under distress zone, followed by miscellaneous by 72.97%. This findings support previous research done by Muhammad (2008).

On the other hand, under the safe zone, mining industry place the most companies by 40% overall, followed by consumer (34.34%) and manufacture (33.33%). Those industries are all above the average of the total safe zone. In addition, the mentioned industries have the percentage of distress zone under the average of 56.65%.

Observing the findings by of Z-score on each industry, Table 3 shows the illustration of the above Z-score for each industry for 3 years period. On average, it shows that Mining and Agriculture have the highest Z-scores with an average of 3.46 (safe zone), whereas the lowest average of Z-score are Miscellaneous and Infrastructure Industries, with 0.80 and 048, respectively. Interestingly, the trend of the score on most of the industries tend to decrease in 2008, namely Mining, Agriculture, Miscellaneous and Infrastructure. This is most likely due to the economic downturn affected by America's subprime mortgage problem.

Table 3. Average Industry's Z-score

Industry	Average z-score				Rank
	2006	2007	2008	Average	
Mining	2.97	4.22	3.20	3.464	1
Agriculture	2.16	4.66	3.55	3.455	2
Consumer	2.69	2.25	2.55	2.495	3
Manufacture	1.81	1.64	1.97	1.808	4
Basic	1.46	1.19	1.22	1.292	5
Misc	0.84	0.85	0.69	0.795	6
Infrastructure	0.77	0.54	0.12	0.477	7

In terms of risk comparison amongst industries, the value of Coefficient of Variation (CV) each industry are shown the following table. CV derives from the z-score's standard deviation, divided by their means. The expected result of the ratio will create a range of scale used to compare industry on each zones. The interpretation of this formula is that the lesser ratio presented, the lesser risky is the industry.

Table 4. Industry's Coefficient of Variation

Industry	Mean	Std Dev	Coef of Var	Rank
Consumer	2.4955	0.2251	0.0902	1
Manufacture	1.8075	0.1633	0.0903	2
Misc	0.7952	0.0892	0.1122	3
Basic	1.2919	0.1484	0.1149	4
Mining	3.4640	0.6674	0.1927	5
Agriculture	3.4553	1.2524	0.3625	6
Infrastructure	0.4766	0.3276	0.6874	7

The table above shows a different result from the Z-score model. Consumer and Manufacture industries have to lowest risk compare to others, although the means are not as big as Mining. The two higher risk industries, after Mining, are Agriculture and Infrastructure.

CONCLUSION, LIMITATION AND RECOMMENDATION

From the seven sectors presented in this research, it shows that most of the companies are mostly situated in the distress zone. Retrieving all tables shown in findings, there are 3 best performers for comparison, describe in the following table:

Table 5. Summary of Industry comparison

Industry	Safe zone (avg 22.42%)	Distress zone (avg 56.65%)	Avg Z-score	Coef of Variation
Mining	0.4000	0.3778	3.4640	0.1927
Consumer	0.3434	0.3838	2.4955	0.0902
Manufacture	0.3333	0.4394	1.8075	0.0903

All industries appear to have favorable zone (exceeds the average), with an adequate Z-score and coefficient of variation. The proportion of zone allocation, are approximately one third on each zone, which give a view of wide variance. In regard to z-score and CV analysis, the three industries present a combination of safe, yet less risk. In the mining industry, although the Z-score is high, but the risk is also high. On the other hand, the other two industries describe the opposite. This supports the theory of investor behavior by Fabozzi and Modigliani (2009) and Hull (2010), where investors are seeking a higher return to compensate greater risk.

After a complete finding from various data presented above, there are several interest things for further discussion. Based on Altman's Z-score model, mining industry is the safest industry compare to other sectors, with the first rank in Z-score and proportion on the safe zone above average. Hence, although Mining has more risk in investing, but a safe zone will likely to assist investment decision.

The recommendations would state deeper investigations on other proxy of model, as Z-score has been existed many years, with similar condition of assumption. A suggestion from Suk (2007) that argues the independent variables in the original Z-score have a weight of assumption, that most of

the financial ratios are likely to comply. Further research suggestion implies on the Zeta Model by Altman, Haldeman and Nayanan (Caoutte, et al, 2008) and Logit Analysis by Ohlson (1980).

This research was very much constrained by limited sample which is less able to represent all industry in Indonesia Stock Exchange, whereby sometimes there are not enough samples in the industry. Hence resulting might be less accurate.

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