

A Revisited of Altman Z- Score Model for Companies Listed in Bursa Malaysia

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Abstract

This study uses Discriminant Analysis as a crucial methodology to predict financial distress of the companies in Malaysia. 30 companies which consist of 15 financial distress company and another 15 non-financial distress company were analyzed. Financial statements of each company is collected five years before the companies are classified as PN17 in Bursa Malaysia. Five financial ratios which exist in the Altman Z-score model are computed and tested with Discriminant Analysis. As a result, working capital to total assets is the most significant variable that discriminates between PN17 and non-PN17 companies. Besides that, MDA has achieved an accuracy rate of 76.7% to predict financial distress companies in Malaysia.

Introduction

Corporate financial distress is one of the critical issues in corporate finance and it refers to the financial health of the companies. The significance of financial distress is extremely felt during financial crises. Bondholders become anxious regarding the reliability of corporations to which they are going to lend their money. So, default and credit rate of corporations are of primary importance to them while trying to invest their money in those companies. Ross, Westerfield, Jaffe and Jordan (2008, p.853) define financial distress as a situation where a firm's operating cash flows are not sufficient to satisfy current obligations and the firm is forced to take corrective actions. As long as solvency remained as an important factor in creditor's point of view, the level of health of a company in repaying its debts timely and in full is very crucial in boosting the credit image of that company.

Predicting financial distress is a very powerful tool which can help both corporations and investors in making wise and prudent decisions. It helps managers to take preventive actions in order to save the firm from falling prey to distress. They can improve the situation and try to find solutions before the condition gets worse. With the ability to predict the probability of the financial distress, investors can improve their investment decisions and the loss by removing their money from distress-prone companies.

One of the models is the Multiple Discriminant Analysis (MDA) model, which will be used in this study. MDA is a technique used to determine significant level on a set of variable provided for a single group. In this research, the Altman Z-score which was developed by Edward I. Altman will be used together with MDA to predict company failure. MDA is practically used by Altman and it is still being used widely nowadays. Financial statement plays a very important role in Altman Z-score. It is used to assess company performances, financial stability, and as an indicator of measuring a company's future performance (Dina Ekasari 2009). It is very useful for managers and investors of the firm.

Measuring the ratio of the company enables managers to take corrective action and precaution so that the firm will not be financially distressed. In this research, companies which are classified as PN17 in Bursa Malaysia will be studied in terms of their probability of bankruptcy. Bursa Malaysia is Malaysia's local stock exchange association where all the financial instruments are traded. Companies that fall in the category of PN17 in Bursa Malaysia are known as companies that are having financial difficulties, or in other words, they are in financial distress (OoiKokHwa 2010).

The purpose of this research is to analyze the companies that are classified as PN17 in Bursa Malaysia with Altman Z-score ratios which will provide the company's probability of bankruptcy. Financial statements five years before those companies were classified as PN17 were investigated in order to obtain hints regarding their poor credit management. In this paper, MDA will be used to identify the ratios that have discriminating power over the classification of PN17 companies.

In this research, we are going to test for the reliability of the ratios that are available in Altman Z-score in discriminating between PN17 and non-PN17 companies. Failing companies are those companies that are classified as PN17 in Bursa Malaysia. On the other hand, we will test the predicting power of Discriminant Analysis in predicting corporate financial distress in PN17 companies. To serve this purpose, 15 companies that are listed as PN17 companies in Bursa Malaysia are chosen. Another 15 companies which are not listed as PN17 companies are selected to match the PN17 companies in terms of industry and size of asset.

Secondary data will be obtained from financial statements from year 2009 -2013 in order to compute the most precise five financial ratios which are working capital to total assets ratio, EBIT to total assets ratio, sales to total assets ratio, market equity value to total liability ratios and retained earnings to total assets ratio. These ratios will be analyzed with Discriminant Analysis, which was proven to be effective pioneers according to previous studies by Altman and Beaver.

The paper is organized as follows. Section 2 is the review of the literature which will discuss corporate financial distress. In this chapter, the studies of corporate financial distress using the Discriminant Analysis model will be discussed. Section 3 introduce and discuss the research design and methodology employed in this study, the data collection and sample of the study. Section 4 presents the results of the finding. Section 5 will summarize the findings of this study.

A Review on Corporate Financial Distress

The early studies on financial distress and bankruptcy predictions can be traced back to the 1960's and the usefulness of accounting information to predict bankruptcy was first studied by Beaver (1966). Beaver defined corporate financial distress as the "inability of a firm to pay its financial obligations as they mature". He highlighted on different forms of financial distress such as bankruptcy, overdrawn bank account, default on bond and default on preferred stock.

Similar interpretation of other researchers (Andrade and Kaplan, 1998; Brown et al. 1993). They contended that the occurrence of corporate financial distress discriminate two time periods of a firm's operations which are financial health and financial illness. Andrade and Kaplan pointed to two forms of financial distress: debt payment failure and debt restructuring. A firm takes debt restructuring into account as the management feels financial adversity is very close. Brown et al. (1993) also classified a firm as distress when the management is thinking about restructuring strategies to prevent current or future default.

Gordon (1971) came up with a fascinating view on corporate financial distress. He stressed that corporate financial distress itself is a part of the process which precedes default and restructuring. He used financial structure and company's stock valuation to define it. According to Gordon, a company experiences this situation when its earnings decline and its debt value exceeds its asset value. In such a situation, the bond yields are lower than risk free rate in the market and the company has difficulty in obtaining external financing.

Denis and Denis (1995) used the term financial distress when a company faces loss for at least 3 consecutive years. According to their research, when a company is in financial distress, its cash flows become negative and it is unable to pay dividend. Therefore, a decline in paying dividend accompanying with negative net income forces the company into financial distress situation. Hendel (1996) considered corporate financial distress as a probable situation of bankruptcy. He referred to two terms of "asset liquidity" and "asset availability" as criteria for corporate financial distress.

The more is asset liquidity and credit availability, the less is likelihood of financial distress. Corporate financial distress is also the consequence of strict and critical losses which result in an increase in liabilities and decrease in asset value (Gestel, Baesens, Suykens, Van den Poel, Baestaens & Willekens, 2006).

Platt and Platt (2002) utilized operational definition to identify corporate financial distress. They emphasized that a company is considered to be in distress when it experiences one of the following events: negative net operating for several years, huge downsizing, pause in dividend payment and financial reorganization. In respect to a company's operational performance, Whitaker (1999) also referred to cash flow and market value of a company to define corporate financial distress. He mentioned that financial distress happens when a company does not have sufficient cash flows to cover its current obligations or it is facing a dramatic decline in its market value of assets. Cash flow problem can be temporary and can be resolved through corrective strategies. Market value decline can be a good indicator as it includes both cash flow and asset value decline.

Purnanandam (2005) discussed corporate financial distress in terms of solvency. He viewed financial distress as a moderate state between solvency and insolvency. A company falls in financial distress when it is unable to pay interest payment or transgresses debt covenants. According to Purnanandam, a company changes from solvent to insolvent when the terminal value of its assets become less than face value of its debt at maturity rate. Thus, in this definition, a company can be distressed while it is still paying its obligations. But, for default or bankruptcy to happen, a company must be in financial distress in the first place. That is, default and bankruptcy are the adverse outcomes of financial distress.

Ling (2007) tried to identify a model which is able to predict bankruptcy in China, one of the fastest developing country in the world. Two groups of companies were tested in this study in 1998 and 1999. A balanced group of financial distressed and non-financial distressed companies were chosen. 15 financial ratios were tested in this study including profitability, solvency and liquidity ratios. Using MDA, a particular model named Z-China Score is valid in examining financial distress. It has also included asset liability, working capital, return on total assets, and retained earnings ratio.

Idris (2008) evaluated the effectiveness of financial ratios to predict company financial status in Malaysia. Data collection began after the year of Asian Financial Crisis which was from 1998 to 2002. Firm which is delisted from that period is considered to be failing company. 66 companies were selected, which consists of 13 failing companies and 53 industrial sector companies to be tested. Liquidity, profitability, cash flow and long term solvency ratio were included to test for their usefulness. As a result, WCTA, cash and liquidity ratios are the main determinant for firm bankruptcy.

Adiana et al. (2008) have compared three methodologies such as MDA, logistic regression and hazard model to identify financially distressed companies in Malaysia. A total of 36 distressed companies were identified from the Bursa Malaysia daily diary. Each distressed company is matched with a non-distressed company during 1990 to 2000. Using sample of 52 distressed and non-distressed companies with a holdout sample of 20 companies, hazard model has correctly predicted 94.9% for financial distress companies. It was more accurate compared to the results generated by the other two methods. However, MDA's accuracy achieved an accuracy rate of 85%. Among the corporate performance ratio examined, the ratio of debt to total assets was a significant predictor of corporate financial distress. In addition, net income growth was also a significant ratio in MDA, whereas logistic regression and hazard model methodologies showed that return on asset ratio is more significant. This study is done due to Western country which emphasized on the drawbacks such as lack of accuracy of MDA and logit model.

Bhumia (2011) built up a model to develop predictive abilities. It is important to run the predictive model in companies that are having different financial structure, business and management in the Indian context. This study was tested on private sector companies which the financial data was taken from 1996 until the end of 2005. Financial reports of the failed companies were obtained for five years before the company goes into bankruptcy. Companies selected are from the manufacturing sector and a total of 32 failed companies are matched with 32 non-failed companies. Peer match samples of failed and non-failed companies are used. A discriminant function model with 7 ratios was tested to be significant in discriminating and the classifying showed 88% and 94% of strong predicting power. This study also proved that even though there are more tools to be used in predicting a company's failure, MDA can still predict bankruptcy with a high accuracy rate.

Data and Research Design

1.1 Sample Selection and Data Sources

The sample of this study includes 15 distressed companies and 15 healthy ones as their counterparts for the time period of 2009-2013. All 30 companies are listed in Bursa Malaysia and have been selected from different industries, including trading and services, industrial products, consumer products and construction. Finance companies are not included due to their high dependence on economic condition (NurAdiana et al., 2008). All distressed companies and their non-distressed matching counterparts have been presented in Table 3.1.

1.2 Selection of Distressed Companies

The criterion for selecting distress companies is Practice Note 17 (PN17) discussed in the previous section of this chapter. There are 28 companies that were identified as PN17 companies by Bursa Malaysia during the time period of 2008-2013. From all the companies identified as PN17 in Bursa Malaysia daily diary, 15 companies were selected to be a part of this research project.

3.2.2 Selection of Non-Distressed Companies

15 healthy companies were also selected as the distressed companies' matching counterparts which are listed in Bursa Malaysia. In order to abate the adverse effect of bias, the following criteria were taken into consideration while identifying and selecting non-distressed companies:

- i) Same size: Healthy companies were chosen on the basis of the same asset size of their distress counterparts.
- ii) Same industry: Healthy companies are in the same industry as their distressed matching companies.
- iii) Same Source: Healthy companies are taken from the same source as their distressed matching companies, which are listed companies from Bursa Malaysia.

Selection of non-distressed companies based on the above mentioned criteria reduces bias and helps the researcher to come out with more reliable and solid results.

Table 3.1: List of PN17 and Pair-matched Companies

No.	Industry	Financial Distressed Companies	Non-financial Distressed Companies
1	Manufacturing	Autoair Holdings Berhad	CybertowersBerhad
2	Construction	Bina Goodyear Berhad	LebtechBerhad
3	Consumer Products	Biosis Group Berhad	EngKah Corporation Berhad
4	Trading/Services	Global Carriers Berhad	Kumpulan JetsonBhd
5	Consumer Products	Hytex Integrated Berhad	Magni-Tech Industries Berhad
6	Manufacturing	Integrated Rubber Corporation Berhad	Goodway Integrated Industries Berhad
7	Trading/Services	IRM Group Berhad	Sws Capital Berhad
8	Manufacturing	Lion Corporation Berhad	Lion Industries Corporation Bhd
9	Manufacturing	Malaysian AE Models Holdings Berhad	Bina DarulamanBhd
10	Manufacturing	Maxtral Industry Berhad	Kym Holdings Bhd
11	Trading/Services	Sumatec Resources Berhad	Nam Fatt Corporation Berhad
12	Industrial Products	VTI Vintage Berhad	Techfast Holdings Berhad
13	Trading/Services	KejuruteraanSamudraTimurBhd	See Hup Consolidated Bhd
14	Manufacturing	Perwaja Holdings Berhad	Lingui Developments Bhd
15	Manufacturing	TPC Plus Berhad	YaHorng Electronic(M) Berhad

The data selection is more likely to be the same as the previous studies that were done by Beaver (1966) and Altman (1968). There are 5 financial ratios that will be computed for each company in the sample. The selected ratios are ratios from the Altman Z-score model, which are working capital to total assets ratio, EBIT to total assets ratio, sales to total assets ratio, market equity value to total liability ratios and retained earnings to total assets ratio. All financial ratios were computed for 1 year up to 5 years before actual distress year for each company. For example, for a company which was announced distressed in 2013, the variables were computed for years 2012(t-1), 2011(t-2), 2010(t-3), 2009 (t-4) and 2008(t-5). Or for a company which was announced as distressed in 2014, variables were computed for 2013,2012,2011,2010 and 2009 as 1 year, 2 years, 3 years, 4 years and 5 years before distress respectively. Data computation for non-distressed companies was the same as their distressed counterparts. That is, for a healthy company whose distressed counterpart was announced as PN17 in 2014, variables were computed for years 2013,2012,2011,2010 and 2009 as 1 year, 2years, 3 years, 4 years and 5 years before distress respectively.

3.3.1 Source of Data

Due to the financial disclosure that is practiced by most of the companies nowadays, financial statements for these 30 companies were obtained from each company's official websites. Five years financial statement for 30 companies was collected from the year before they became distressed. For example, if a company was listed as PN17 in year 2012, then the financial statements from year 2007-2011 will be used. Or, for a company which was announced as distressed in 2014, the financial statements will be taken from year 2009-2013. The main sources of data for financial ratios are EMIS Database (emerging markets information service- www.securities.com) and the companies' annual reports were obtained from Bursa Malaysia website (www.bursamalaysia.com).

3.4 Measurement of Variables

Financial ratio analysis allows us to have better understanding with financial position of a company and develop an effective strategy to deal with company's financial difficulties. Therefore, it is becoming more and more common for analysts to predict bankruptcy and financial distress of a company. In this research, five ratios used in Altman Z-score are studied.

Altman Z-score model:

$$Z\text{-score} = 1.2T1 + 1.4T2 + 3.3T3 + 0.6T4 + 1.0T5$$

T1 = Working Capital /Total Assets

T2 = Retained earnings /Total Assets

T3 = Earnings before Interest and Tax / Total Assets

T4 = Market Value of Equity / Total Liabilities

T5 = Sales/Total Assets

Higher Altman Z-score indicates that the company has a higher chance to avoid bankruptcy. The results will be more reliable if they are being compared against other companies across the same industry. Z-score has four classifications as shown below:

Table 3.2

Indication of Z-score Score

Indication

Less than or equal to 1.80

Between 1.80 and 2.70

Between 2.70 and 2.99

Above 3.0

Very high possibility of financial embarrassment

Good chance of the company going bankrupt within 2 years of operations from the date of financial figures given.

This zone is where extra alert need to be given so that situation will not worsen.

The company is safe from financial distress and bankruptcy.

Working Capital / Total Assets

Working capital is the difference between current assets and current liabilities. It is considered as liquid asset for company to meet their short-term obligation effectively. A company is able to meet its short term obligation when there is positive working capital. When there is insufficient working capital, the company is concerned that they will not be able to pay their short-term debt. Normally, the companies that are facing financial difficulties will have a shrinking asset which will cause them to be non-liquid and fail to pay their creditors.

Earnings before Interest and Tax / Total Assets

This ratio is used to evaluate the company's ability to generate operating profit with existing asset. When the company has high profit with low asset, it has a relatively low chance of getting default. It is due to the dollar of asset that is able to generate a larger amount of operating profit. On the other way, lower income might not be enough to cover company's daily expenses.

Retained Earnings / Total Assets

Retained earnings are the amount of earning that is not paid out as dividend. The purpose of retaining the company's earning is to allow the company to reinvest without adopting external fund with more cost. In another words, retained earnings can be used to measure the extent of a company by using leverage. If this ratio is high, it means that there is sufficient funding for the firm to reinvest. If the ratio is low, the company will borrow instead of retaining earnings to finance their investment. This will increase the company's chance of being default.

Market Value of Equity / Total Liabilities

By referring to this ratio, we are able to measure how fast the company's asset would decline when the company become insolvent – when liability exceed asset of the company. This ratio is not considered based on pure fundamental because it computes with the company's market value. Market capitalization indicates the level of confidence the company gives to the market. A higher level ratio indicates that the company has a higher chance to sustain when there is an economic downturn.

Sales / Total Assets

This ratio is also known as asset turnover. It indicates how effective the company uses a single dollar of asset to generate sales. Sales are the amount earned without considering cost, interest and tax. When this ratio is high, it indicates that with the amount of assets, the company is able to expand their market share. If the company with low asset turnover is not using proper strategy to improve their sales, they may not have a promising future.

3.5 Research Method

Discriminant Analysis used dependent technique to predict the classification of a categorical dependent variable. Discriminant Analysis form varieties which is linear combinations of metric independent variables by following a statistical procedure. In order to optimize between-group variance and minimize the within-group variance, statistical procedure will be deriving discriminant functions, or variation of the predictor variables. When we go enter a deeper analysis, significant level of each variable will be revealed. Hypothesis for Discriminant Analysis are as below:

H₀: Two or more group means are equal on the discriminant function(s)

H_a: The group means are not equal.

To predict a single variable (the outcome or dependent variable) with several independent variables (predictors), MDA will involve a determination of a linear equation as shown below:

Discriminant Function

$$F = a + v_1X_1 + v_2X_2 + v_3X_3 + \dots + v_kX_k + \epsilon$$

Where,

F = Discriminant Function

v = Coefficient for particular independent variables

X = Independent variables

a = Constant of the function

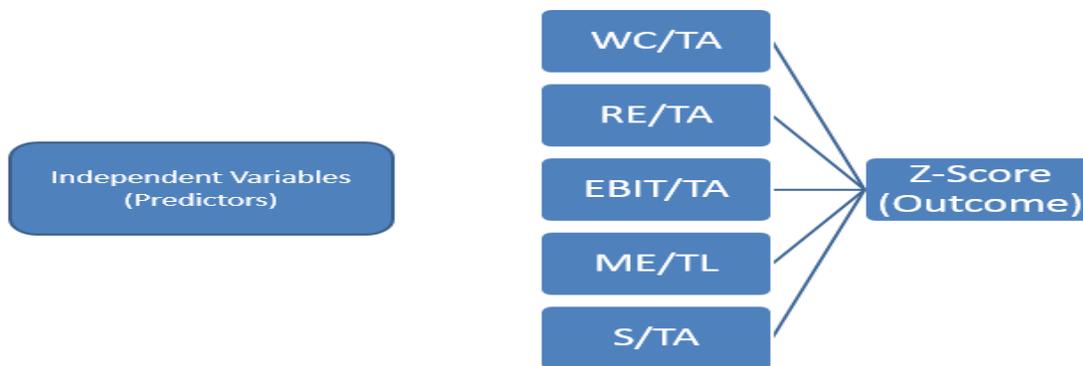
k = numbers of independent variables

Assumption to be applied in MDA:

- The independent variables are metric measurements.
- The maximum number of independent variables, p , is $n-2$, where n is the sample size.
- No independents have a zero standard deviation in one or more of the groups formed by the dependent.
- Group sizes of the dependent are not grossly different.
- Errors (residuals) are randomly distributed.
- Homoscedasticity (Homogeneity of variances): within each group formed by the dependent, the variance of each interval independent should be similar.
- Homogeneity of covariance/correlations: within each group formed by the dependent, the covariance/correlation between any two predictor variables should be similar to the corresponding covariance/correlation in other groups. That is, each group has a similar covariance/correlation matrix.
- Assumes no or low multi- collinearity of the independents
- For purposes of significance testing, variables follow multivariate normal distributions. That is, each variable has a normal distribution about fixed values of all the other independents.
- There must be at least two cases for each category of the dependent.

Discriminant Analysis (DA) is an efficient technique when the dependent variable is categorical (non-metric) and independent variables are in metric form. By using this analysis, we are able to examine multiple independent variables for each dependent variable.

Figure 3.3: Variables to be tested in this Research



2. Data Analysis

Table 4.1 shows the mean and standard deviation of each ratio of the financial distress and non-financial distress companies which are from different industries.

4.2 Discriminant Analysis

Independent variables	Mean		Standard Deviation	
	PN17 Companies	Non-PN17 Companies	PN17 Companies	Non-PN17 Companies
WC/TA	-0.063287606	0.250809485	0.225257227	0.26576069
RE/TA	-0.186503670	0.044463074	0.334979057	0.3027081
EBIT/TA	-0.045155593	0.024529614	0.127538266	0.10688737
ME/TL	0.007192770	0.026829158	0.025424328	0.09251273
S/TA	0.620975392	0.804320990	0.394580132	0.49678182

Based on the results shown in Table 4.1, we can see that the mean for all five of the financial ratios for PN17 companies is lower compared to the mean of non-PN17 companies. The differences between the mean of PN17 companies and the mean of non-PN17 companies is significantly large, which shows that they are good discriminators. When there is no significant difference, it might not be worthwhile to do the analysis. By using ratios from Altman Z-score model, the higher the value of the ratio, it is more preferable. By looking at the table, we can say that non-PN17 companies have proven that they are having greater potential to sustain for a longer period of time.

The mean of working capital to total assets ratio, retained earnings to total asset ratio, and earnings before interest and tax to total assets ratio for PN17 companies are negative, which indicates that they have a weaker ability to survive during a credit crunch.

Table 4.2 Tests of Equality of Group Mean Table

	Wilks' Lambda	F	df1	df2	Sig.
WC/TA	0.708	60.965	1	148	0.000
RE/TA	0.883	19.627	1	148	0.000
EBIT/TA	0.918	13.152	1	148	0.000
ME/TL	0.979	3.142	1	148	0.078
S/TA	0.959	6.264	1	148	0.013

Table 4.2 provides a strong evidence of significant difference between means of PN17 and non-PN17 companies group for all independent variables. Univariate ANOVA's result shows that three financial ratios, which are the working capital to total asset ratio, retained earnings to total assets ratio and earnings before interest and tax to total asset ratio differ significantly between PN17 companies and non-PN17 companies.

Table 4.3 Covariance Matrices

Covariance Matrices^a

PN17		WC/TA	RE/TA	EBIT/TA	ME/TL	S/TA
0	WC/TA	.071	.026	.006	-.003	.036
	RE/TA	.026	.092	.016	.000	.049
	EBIT/TA	.006	.016	.011	.000	.017
	ME/TL	.003	.000	.000	.009	.005
	S/TA	.036	.049	.017	.005	.247
1	WC/TA	.051	.036	.006	-.002	.010
	RE/TA	.036	.112	.023	.000	.034
	EBIT/TA	.006	.023	.016	.000	.012
	ME/TL	-.002	.000	.000	.001	.000
	S/TA	.018	.034	.012	.000	.156
Total	WC/TA	.085	.049	.012	-.001	.041
	RE/TA	.049	.115	.023	.001	.052
	EBIT/TA	.012	.023	.015	.001	.017
	ME/TL	-.001	.001	.001	.005	.003
	S/TA	.041	.052	.017	.003	.208

a. The total covariance matrix has 149 degrees of freedom.

4.3 Box's Test of Equality of Covariance Matrices

Table 4.4 Log Determinants Table

PN 17	Rank	Log Determinant
0	5	-16.280
1	5	-19.355
Pooled within- groups	5	-17.006

The ranks and natural logarithms of determinant printed are those of the group covariance matrices.

Table 4.5 Box's M Test Result Table

Test Results

Box's M		120.088
F	Approx.	7.716
	df1	5
	df2	88192.421
	Sig.	.000

Tests null hypothesis of equal population covariance matrices.

In Discriminant Analysis, the null hypothesis which states that the covariance matrices is the same between groups formed by the dependent is tested by Box's M. Log determinants should be consistent for this hypothesis to hold. Box's M is 120.088 with F equals to 7.716 and the significant value is .000 in Table 4.5. When the p-value is not more than 0.05, equality of variance and covariance matrices cannot be assumed.

4.4 Summary of Canonical Discriminant Functions

Table 4.6 Eigenvalues Table Function Eigenvalue % of Variance

Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	0.493 ^a	100.0	100.0	0.575

a. First 1 canonical discriminant functions were used in the analysis.

Table 4.6 shows a canonical correlation of 0.575 which indicates that the independent variables explains 33% of the variation of dependent variable. A high canonical correlation indicates higher correlation between discriminant scores and the level of dependent variables.

Table 4.7 Wilk's Lambda

Test of Function (s)	Wilks' Lambda	Chi-Square	df	Sig.
1	0.670	58.363	5	0.000

Table 4.7 is stating the proportion of the variance in which the discriminant function is not explained. In this case, we have 67% unexplained. It is the converse of squared value calculated from Eigenvalues table.

Table 4.8 Standardized Canonical Discriminant Function Coefficient Table

	Function
	1
WC/TA	0.898
RE/TA	0.070
EBIT/TA	0.193
ME/TL	0.331
S/TA	-0.026

Table 4.8 has labelled each predictor (independent variables) with an index. This index shows the strong or weak relationship among the five variables which have the same function as beta in regression model. The direction of the sign indicates the relationship. This table shows that working capital to total asset ratio, retained earnings to total assets ratio, earnings before interest and tax to total assets ratio and market equity to total liabilities ratio has positive relationship with financial distress companies. Working capital to total assets ratio is the strongest predictor for predicting PN17 with a value of 0.898. Sales to total assets will be in negative relationships with financial distress company. Retain earnings to total assets ratio and sales to total assets ratio are less important in predicting PN17.

Table 4.9 Structure Matrix

	Function
	1
WC/TA	0.914
RE/TA	0.518
EBIT/TA	0.424
ME/TL	0.293
S/TA	0.207

Table 4.10 Canonical Discriminant Function Coefficient

	Function
	1
WC/TA	3.647
RE/TA	0.221
EBIT/TA	1.636
ME/TL	4.885
S/TA	-0.058
(Constant)	-0.351

Table 4.10 shows the unstandardized coefficient for each predictors to generate a new discriminant function. The predictors used are also the same as Altman Z-Score but with new different coefficients and relationships. By following the table, Discriminant function is shown below:

$$F = -0.351 + 3.647WC/TA + 0.221 RE/TA + 1.636 EBIT/TA + 4.885 ME/TL - 0.058 S/TA$$

The function above indicates that there is a positive relationship between financial distress company with working capital to total assets ratio, retained earnings to total assets ratio, earnings before interest and tax to total assets ratio and market equity to total liabilities ratio. A high value on the mentioned ratios, especially working capital to total assets ratio and market equity to total liabilities ratio will cause a company to be classified as financial distress company. On the other hand, S/TA have negative relationship with financial distress companies.

Table 4.11 Functions at Group Centroids

PN17	Function
	1
0	0.698
1	-0.698

Table 4.11 indicates that PN17 companies have a group mean of -0.698 and non-PN17 companies have a group mean of -0.98. Group mean is also known as centroid. A company scores near to either one of the centroid are predicted as belonging to that group.

4.5 Classification Statistic

Table 4.12 Classification Results

Classification Results^{a,c}

	PN17	Predicted Group Membership		Total
		0	1	
Original	Count	0	1	
		61	14	75
		21	54	75
	%	0	1	
		81.3	18.7	100.0
		28.0	72.0	100.0
Cross-validated ^b	Count	0	1	
		59	16	75
		21	54	75
	%	0	1	
		78.7	21.3	100.0
		28.0	72.0	100.0

a. 76.7% of original grouped cases correctly classified.

b. Cross validation is done only for those cases in the analysis. In cross validation, each case is classified by the functions derived from all cases other than that case.

c. 75.3% of cross-validated grouped cases correctly classified.

Table 4.12 reveals that the original function has correctly classified 81.3% of PN17 and 72% of non-PN17 companies. The original function generates an average prediction power of 76.7%. By using cross validated classification, the more honest classification, PN17 companies and non-PN17 companies are correctly classified into 81.3% and 72% respectively. Cross validation function has achieved 75.3% in overall prediction power.

3. Conclusion

In this study, there are significant difference for most of the ratios among financial distress and non-financial distress companies. Among the five financial ratios (WC/TA, RE/TA, EBIT/TA, MVE/TL and S/TA) which are tested, working capital to total asset is the most significant ratio in classifying Malaysia listed companies into PN17. This ratio indicates how liquid a company is to meet its short terms debt obligation, or in another words, how well it can pay its short term debts.

By using ratios in Altman Z-Score model, Discriminant Analysis has achieved 76.7% of prediction accuracy when it is applied into financial distress prediction. Therefore, this analysis might provide some important information for stakeholders which have interest in dealing with Malaysia listed companies.

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