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Predicting Corporate Failures Using Multi Discriminant Analysis and Current Ratio: An Empirical Application to Philippines Stock Exchange

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Abstract: ***Corporate failure models can be broadly classified into two groups: quantitative models, which are mainly based on published financial information and qualitative models, which are based on an internal assessment of the company concerned. Both types attempt to determine characteristics, whether financial or non-financial, which can then be used to distinguish between surviving and failing companies. This study sought to predict companies that are potential to corporate financial distress utilizing the Altman Z-Score model and current ratio. Forty-five companies currently listed on the Philippine Stock Exchange were randomly selected, and their corresponding audited financial statements published online were downloaded and assessed using the financial ratios. Findings of the study revealed, 35 companies have been chosen potential for becoming financially distressed when subjected to the Altman Z-score model. On the other hand, 12 companies were also found experiencing financial difficulties based on current ratio analysis. Accordingly, these companies have classified either failure or non-failure based on Altman and current ratio. The study concluded both the Altman Z-Score Model and current ratio are financial analytical tools investors and financial analysts can use in assessing the financial health of the company before investing or buying the stock. For businesses having low or declining Z-index, requires an in-depth analysis of the accounts in the financial statements to verify the cause of the problem or potential risk.***

Keywords: financial distress, Altman Z-Score Model, Current Ratio, failure companies, non-failure companies

1. Introduction

The use of financial statements and reports in predicting corporate failure has been a topic of much interest in accounting and finance researchers since the mid 1960's (Poston, et.al. 2011) with the goal of assessing the usefulness of selected accounting variables in identifying between failed and non-failed firms with failures most often defined as the inability of firms to pay its obligations as they mature (Beaver, 1966). The study of Beaver was considered one of the classic works in the area of financial ratios analysis and established the standards for other researchers on bankruptcy predictors (Altman, 2000). Operationally, firms have failed when any of the following conditions have occurred: bankruptcy, going-concern, financially distress, bonds default, non-payment of preference shares dividends, insolvency or overdrawn bank accounts (Poston, et.al. 2011, Shumway, 2001, Hambrick, et.al., 1988, Beaver, 1966 and Altman, 1968).

Predicting bankruptcy is one of the leading decision criteria problems since it affects the entire lifespan of the business (Mohammed et al., 2012). Subsequently, failure results in excessive costs to firms, organizations, the society, and the economy in general (Ahn and Kim, 2000). The emergence of assessing corporate failures especially that of domestic companies and trans-national corporations attracted a significant number of academics and professionals of developing optimal financial accounting prediction models in meeting their specific interest and growing needs of businesses (Mohammed et al. 2012). Studies conducted by Altman (2000) as cited by Mohammed et al. (2012) using financial ratios to forecast the occurrence of business failure predicted 94% accuracy one year before bankruptcy occurred and 72% two years before the actual incident.

In predicting failure Altman (1968) developed the Z-Score Model applying multi-discriminant analysis (MDA) which is based on the sample of the dataset of publicly held U.S. manufacturing companies in 1968 but has since been re-estimated to make the model applicable to all types of businesses. Subsequently, this model became widely utilized in actual practice. Altman used five financial ratios considered significant in predicting business failure consisting of working capital over assets, retained earnings over total assets, earnings before interest and taxes over the total assets, a market value of equity over the total value of liabilities, and sales over total assets. These ratios represented the independent variables and assigned a relative weight of each variable. Altman constructed the model using the following equation:

$$Z= 0.012X_1 + 0.014X_2 + 0.033X_3 + 0.006X_4 + 0.999X_5$$

where-
X_1 = Working Capital/Total Assets
X_2 = Retained Earnings/Total Assets
X_3 = Earnings Before Interest and Taxes/Total Assets
X_4 = Market Value Equity/Book Value of Total Liabilities
X_5 = Sales/Total Assets
Z = Overall index

Each ratio captures a different dimension of profitability or risk as follows (Wahlen, et al. 2011, Weygandt, et al., 2012, Brigham and Houston, 2014, Ross, et al., 2010):

1) Networking capital/Total assets: The proportion of total assets comprising relatively liquid of net current assets

(current assets-current liabilities). This ratio measures the firm's short-term liquidity risk.
2) Retained earnings/Total assets: This represents the accumulated profitability and relative age of firms.
3) Earnings before interest and taxes (EBIT)/Total assets: This ratio represents a variant of return on assets (ROA) and also measures current profitability.
4) The market value of equity/Book value of total debt: This represents a form of the debt-to-equity ratio but incorporates the market's assessment of the value of the firm's shareholders' equity. It measures long-term solvency risk and the overall market assessment of the profitability and uncertainty of the firm.
5) Sales/total assets: This is similar to total assets turnover and indicates the ability of a firm to use assets to generate revenues.

In applying this model, Altman found that Z-scores of less than 1.81 indicated a probability of bankruptcy, while Z-scores of higher than 3.0 signified a low chance of bankruptcy. Scores between 1.81 and 3.0 denote a gray area.

Meanwhile, the current ratio (current assets/current liabilities) is used to evaluate the liquidity and capital of the current critical period(Greminger et al., 1996, Agarwal, et al., 2008, Nam, et al., 2008, Belovary, et al., 2007). The current ratio is a financial indicator that measures whether or not a firm has the available resources to pay its debt in one year or less (Wahlen et al. 2011, Warren, et al., 2009, Ross, et al. 2010, Mohammed, et al. 2012). The current ratio is the prime essential liquidity test. A current ratio of greater than or equal tone one, indicates the current assets are meeting short-term obligations while a ratio of lesser than one signifies liquidity issues (Tirapat, 1999, Cowen and Hoffer, 1982, Mohammed, et al., 2012). For instance, businesses in cyclical industries may maintain a higher current ratio to remain solvent (Ali, 2008, Jones, 1987) but shareholders, on the other hand, prefer a lower current ratio so that more assets are utilized for the growth of the business (Ali, 2008, Mohammed, et al., 2012).

Overall, these financial ratios provide meaningful indicators of the performance and health condition of firms. These set of coefficients have been used for many years by investors, creditors, shareholders, auditors, suppliers, lenders, employees, and stakeholders who may have incurred substantial losses resulting from business failure (Mohammed et al. 2012, Chava and Jarrow, 2004, Platt, et al. 2002). These financial ratios are divided into five components comprising of profitability ratios, liquidity ratios, activity ratios, financial leverage ratios, and capital market ratios.

It has been widely claimed the use of Altman, and current ratio models were found useful in predicting corporate bankruptcy when applied to several corporations in the past(Nam et al., 2008, Bellovary, et al., 2007, Zeytinoglu, E., &Akarim, Y. D., 2013). The uses of these models, however, have not been studied at length for Philippine companies due to the shortage of analytical studies and scientific researchers. Thus, this paper investigated the validity of the two widely financial tools in assessing the potential risks of companies involved in this study. In this paper, thresholds for the financial failure of selected companies were utilized to distinguish between failure and non-failure companies when assessed using the Altman-Z Score and current ratio respectively.

2. Theoretical and Conceptual Framework

This study is anchored on the theory of ratio analysis by Beaver (1966). Applying the cash flow framework, Beaver posited the assumptions the more substantial the reservoir and the net liquid asset flow, the smaller the probability of failure. On the contrary, the enormous amount of debt held and more massive expenditures for operations, the higher the likelihood of failure. It investigated the predictive ability of financial ratios and able to distinguish between failure and non-failure firms. Also used in the study is the Altman Z Score Model a linear equation developed by Edward Altman (1968) for predicting bankruptcy utilizing a multi-discriminant analysis. Firms can be distinguished either potential or non-potential for bankruptcy when assessed using the financial ratios.

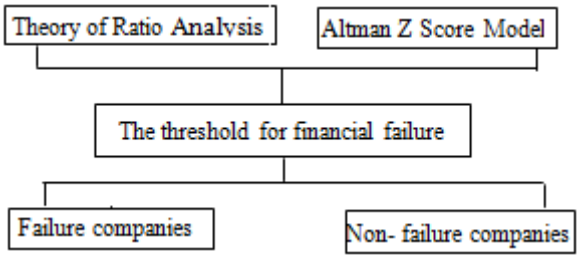

Figure 1: The theoretical and conceptual framework of the study

3. Methods

This study used a descriptive analysis design. An analysis is a careful examination to determine new information as well as significant relationship and at the same time expand or substantiate existing knowledge. The investigation conducted was based on the financial statements of 45 companies downloaded from the Philippine Stock Exchange Electronic Disclosure Generation Technology or PSE EDGE. EDGE is a state-of-the-art, fully automated system that facilitates the efficient processing, validation, submission, distribution, and analysis of time-sensitive disclosure reports submitted to the Philippine Stock Exchange. In calculating the current ratio and Altman Z-Scores, the study used the following accounts: Current Assets, Current Liabilities, Total Assets, Retained Earnings, Stockholders' Equity, Gross Revenue and Income from operations, and Total Liabilities. These financial reports are fully disclosed in PSE EDGE and dated 31 December 2015.

4. Results and Discussion

Table 1: Profiles of industries and number of companies studied

Industries	Number of companies
Food, beverage, tobacco	12
Holding firms	7
Electricity, energy, power, and water	5

Media	4
Hotel, resorts, and leisure	3
Transportation services	3
Banks	2
Mining and oil	2
Telecommunications	2
Education	2
Casinos and gambling	1
Small, medium, and emerging board	1
Property	1
Total	45

The food, beverage, and tobacco sector represent 27% of the total number of companies studied. Holding firms represent 15% of the sample. Meanwhile, the electricity, energy, power, and water and media sectors account for 11% and 9% respectively.

Table 2: Threshold of Altman Z Score and Current Liquidity Ratio

Financial situation	Altman Z score value	Current ratio value
Failure company	<1.81	<1.1
Non-failure company	>2.99	=>1.1

In applying this model, Altman found that Z-scores of less than 1.81 indicated a probability of bankruptcy, while Z-scores of higher than 3.0 signified a low possibility of bankruptcy. Scores between 1.81 and 3.0 denote a gray area. Similarly, a current ratio of less than 1.0 means helplessness of the firm to pay its short-term creditors on time.

Table 3: Results of current ratio and Altman Z-Score tests of companies studied

Company	Company	Current Ratio	Altman Z- Score
1	Media	1.9	1.55
2	Media	1.8	2.20
3	Transportation Services	1.2	1.71
4	Food, Beverage, Tobacco	1.3	3.09
5	Media	1.2	3.26
6	Media	1.3	5.08
7	Electricity, Energy, Power, and Water	1.3	1.92
8	Electricity, Energy, Power and Water	3.4	1.60
9	Education	2.5	3.04
10	Transportation Services	5.6	1.46
11	Holding firm	1.5	1.35
12	Food, Beverage, Tobacco	1.6	3.04
13	Food, Beverage, Tobacco	2.3	2.68
14	Holding firm	2.8	3.06
15	Banks	0.6	0.44
16	Holding firm	1.5	1.06
17	Electricity, Energy, Power and Water	1.1	1.88
18	Banks	0.8	0.11
19	Food, Beverage, Tobacco	4.3	2.93
20	Property	3.1	2.26
21	Food, Beverage, Tobacco	1.0	-1.98
22	Telecommunications	0.8	1.19
23	Food, Beverage, Tobacco	0.7	0.98
24	Education	1.1	2.29
25	Electricity, Energy, Power and Water	1.2	1.29
26	Holding firm	2.1	1.25
27	Holding firm	1.1	1.18
28	Telecommunications	0.5	0.87
29	Food, Beverage, Tobacco	1.5	3.35
30	Electricity, Energy, Power and Water	1.4	1.09
31	Mining and Oil	0.3	-0.15
32	Small Medium and Emerging Board	3.5	3.32
33	Mining and Oil	0.8	1.36
34	Casinos and Gambling	2.4	1.36
35	Food, Beverage, Tobacco	2.1	4.08
36	Hotel and Leisure	0.6	1.00
37	Holding firm	3.0	0.58
38	Hotel and Leisure	1.7	2.01
39	Food, Beverage, Tobacco	0.5	0.71
40	Food, Beverage, Tobacco	0.8	2.16
41	Food, Beverage, Tobacco	0.6	-44.21
42	Hotel and Leisure	1.2	0.59
43	Food, Beverage, Tobacco	1.4	1.15
44	Transportation Services	0.9	1.73
45	Holding firm	1.2	1.21

Results of the current ratio analysis revealed 12 companies experienced ratios below 1.0 times. It means that for every 1 peso of current liabilities the 12 companies have less than a peso to cover their short-term obligations. Meanwhile, the current ratio of 33 companies appeared to be in better shape as their ratios were higher than one peso. It relatively shows these companies have sufficient current assets relative to their current liabilities, a good sign of sound financial health status. In practice, the current ratio is one of the liquidity measures popularly utilized and considered a more dependable indicator of being liquid than working capital (Weygandt et al., 2012). For instance, two or three companies having a similar amount of working capital may significantly differ in their actual current ratios. (Ross, et al. 2010, Brigham and Houston, 2014) suggested several short-term creditors preferred to provide credit to companies with higher current ratios.

According to the Altman Z Score, 35 companies have scores between -44.21 and 2.99. Companies were obtaining these scores either experiencing deteriorating financial future or high probability of bankruptcy shortly. Under Altman, is deemed to be a classified failure if its Z index is below 3.0. Additionally, companies with negative scores indicated below mean score. The Z index is more than an assessment of bankruptcy and insolvency. Decomposing the component ratios, it reveals critical issues and risks faced by companies assessed by traditional ratio analysis: liquidity concerns are measured in X_1; shareholders claims against resources are measured in X_2; profitability is measured in X_3; long term solvency risk is measured in X_4; asset utilization is measured in X_5. The following table summarizes the results of the test.

Table 4: Financial Status of Companies Studied

Measurements	Number of Companies	
	Failure	Non-Failure
Altman Z- Score	35	10
Current ratio	12	33

The analysis in this paper was restricted to the sample companies selected from the Philippine Stock Exchange using the Altman Z-Score Model and current ratio. Thresholds were used in identifying between failure and non-failure company listed in Table Number 3. Under Altman, a company is deemed to be the classified failure if its Z index is below 3.0. For the current ratio, a company is categorized as the failure if the ratio is below 1. For a simple analysis, a current ratio of .80 reads as .80:1 meaning for every P1.00 debt, the company is capable of paying off up to P0.80 centavos. Thus, this particular company needs to look for additional sources to cover the balance. In real practice, some of the companies identified as failure usually run some advertisements in Philippine television during prime time; however, nobody noticed the predicament since a majority of the failure companies reported income from operations. By merely reading the financial information published in PSE EDGE it appeared these companies are in good financial condition, but the careful analysis should be carried out using the model to assess the potential danger the company is facing. The findings of this study provided credence to the degree of financial analysis results (Mohammed and Soon, 2012, Brigham and Houston, 2014). Over the years, some researchers suggested the use of financial ratios and Altman model in assessing potential risk for bankruptcy were deemed useful (Altman, 2002, Chava and Jarrow, 2004, Nissim and Penman, 2001, Wahlen, et al., 2011).

Whenever financial ratios are utilized to analyze a company, it is important to note that no economic analysis technique is perfect (Gerantonis et al., 2009, Summers and Sweeney, 1998, Karamzadeh, 2013). For instance, the Z-Score is merely reliant on the underlying financial data reported by the company. If the company is window-dressing the presentation of the financial statements in cohorts with the external auditors, then the financial statements will not reflect a fair representation of the financial statements published. The Enron scandal (Petrick, and Scherer, 2003) in 2001 was a celebrated case in fraudulent reporting of the financial statements (Li, 2010, Grey, 2003, Nelson, et al., 2008). The collapse, unfortunately, led to the demise of the world's most prominent accounting firm, Arthur Andersen.

5. Conclusion

At a minimum, the Z- Score model and current ratio are among the analytical tools investors can use in monitoring the safety of their investments. Potential investors, on the other hand, will be benefited if they are going to assess the historical financial data of the particular company using the tool before making their investments. A low or declining Z – Score index, definitely requires in-depth analysis to determine the cause of the potential risk. Note that financial accounting information is significantly affected by policies, estimates, and assumptions. Accounting standards permit different accounting policies which prevent comparability; thus there is the tendency the use of ratio analysis is somehow less useful in such conditions. One potential issue is an application of depreciation. Different depreciation methods used by companies affect the financial statements differently and difficult to compare. There are times that companies may engage in window dressing of the financial statements enticing prospective investors to invest in a particular business. In general, false financial accounting data provide an incorrect ratio. Hence, investors should be conscious enough before buying those shares traded on the market.

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