

# Predicting corporate failure In Emerging Market: Empirical Evidence from Jordan (2001-2008)

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## Abstract

This paper empirically investigates corporate financial distress, for a period up to one year earlier, for public industrial companies in Jordan. For our sample, we select 20 industrial companies listed on Amman Stock Exchange for the period 2001-2008, and evaluate them using 18 financial ratios.

We applied Multiple Discriminative Analysis function (MDA) to predict model assessing the financial distress of public industrial companies in Jordan. This model used mainly to pinpoint the most important financial ratios, which we have to rely on when predicting corporate bankrupts.

Our results indicate that after examining the 18 financial ratios, the following six ratios (debt ratio, debt/owner equity ratio, operating cycle ratio, net working capital, times interest earned, and account receivable turnover) are considered the primary financial ratios that are used in predicting the failure of the Jordanian industrial companies. The study proves that the applied model can predict company failure with 95% accuracy in the Jordanian industrial sector.

**Keywords:** financial ratios, corporate failure, Multiple Discriminative Analysis (MDA), Emerging Market, Jordan

## 1. Introduction

Fundamental analysis is considered one of the two major analysis schools used by investors, traders, financial analysts, financial managers, portfolio managers, auditors, and researchers. Fundamental analysis generally relies on financial analysis (as financial ratio analysis) to predict the financial position among firms and industries.

Fundamental analysis has been always a very popular tool used in predicting the corporation's future stock price using Common size analysis (vertical and horizontal analysis), or financial ratio analysis that measure the financial performance and condition of specific company. In addition to predicting future stock price; many researchers, financial managers, and financial analysts have also depend on fundamental analysis in predicting corporate failure.

Through the years, many researchers have attempt in predicting the failure of corporations using fundamental analysis, mainly financial ratios. Using financial ratios as performance measurement tools can indicate why some corporations might grow, discontinue, fail, or go to bankruptcy in the future.

Beaver (1966) considered to be one of the first to create models designed to predict corporate failure using financial ratios. His approach mainly concentrated on how each ratio alone, separated from other ratios, could be applied in predicting the failure of corporation.<sup>1</sup> In 1968, Altman<sup>2</sup> applied the multivariate linear discriminant analysis (MDA) to improve Beaver study. Although the (MDA) method has specific limitations, many researchers have ignored these limitations and proceeded in extending the model to give them higher accurate results due to its primary advantage. The MDA model has capability to deal with classification problems by examining the whole variable profile of the object at once rather than sequentially analyzing its individual characteristics (Weingartner, 1963).

Attempting to predict the failure of corporation can protect its owners, employees, and managers from financial losses. During the recent financial crisis, many firms around the globe had financially failed and negatively affected various investors, traders, consumers, industries, countries, and global economy as a whole. Predicting the failure of corporations has big influence on the economy mainly because it gives effective early warning signals.

Therefore, various studies have been conducted on predicting the failure of corporations in both developed and developing countries. Many companies in developing countries, as Jordan, have faced financial failure during the recent financial crisis, which have negatively affected their economies.

This study aims to create a statistical failure prediction model, using the financial ratios as analysis tools, to attempt accurately in predicting the failure of corporations in Jordan. The study concentrates mainly in predicting the failure of Jordanian corporations listed in the industrial sector, which considered being the second most important sector in Jordan after the financial sector. Generally corporations listed in the industrial sector have huge influence on Jordanian economy. Thus, attempting to predict corporate distress in the industrial sector can give early warning signals that might prevent financial losses in the sector and in the economy as whole.

This paper is conducted as follows: the first section gives general view about the prediction corporate distress. The second section reviews briefly the previous studies conducted on prediction of corporate failure in developed and emerging markets. The third section outlines the methodology: describe the sample and data selection, and hypothesis. The fourth section analyzes and explains results. Finally, the paper summarizes the study's findings in the final section and gives further research suggestions.

## **2. Previous studies:**

Yuzbasioglu, et al (2011) aimed to create new models to determine whether a particular venture is on the average of financial failure or no. The study analyzed the automotive and spare parts companies listed in Turkey Stock Exchange for the time 2001-2002, using different methods as: Altman Z value, Factor Analysis, Regression Analysis and stepwise regression. The results showed that liquidity, and asset management ratios play a primary role in determining corporate distress.

Yap, et al (2010) developed model to improve the predicative abilities for company failures in Malaysia relying on various financial, business, and operating conditions. For the purpose of the study, the authors used multiple discriminate model to evaluate 64 companies using 16 financial ratios. The result showed a strong discriminate function which constructed with seven ratios out of 16 financial ratios used in the study.

Pranowo, et al(2010) analyzed internal and external factors affecting corporate financial distress in non financial Indonesian companies for the period of 2004-2008. Using panel data regression, they classified financial distress into four steps: good, early impairment, deterioration and cash flow problem companies. The results indicate that current ratio, efficiency, equity, and dummy variable of the status good financial condition have positive and significant influence to Debt Service Coverage as alternatives of financial distress. On the contrary, the results indicate that leverage has a negative and significant relation with Debt Service Coverage. Other variables in the study such as profit, retain earning, good corporate governance and macroeconomic factor have no significant impact on the status of corporate financial distress.

Ab Halim et al(2010) developed model to determine the main factors of highly rate failure of construction companies in Malaysia during the period (2005-2007). The authors applied the secondary data, using 17 financial ratios as measurement performance tool, for evaluating six large- and medium-sized companies. The results showed that most of the construction companies do not have sufficient financial resources, and monitoring system for the cash flow and project costs.

Salehi and Abedini (2009) developed model for predicting financial distress in 60 companies listed in Tehran Stock Exchange (TES) , by using multiple regression models. The statistical results showed the validity of the model and the following selected ratios (liquidity, profitability, managing of debt and managing of property). In addition, the model indicated the reality to predict the distress in companies four years earlier.

Sori and Jalil(2009) developed a failure predication model for 34 Singaporean companies from the year of 1990 to 2000. The result showed a strong discriminate function (more than 80% accuracy) that constructed with two ratios (cash flow to sales and Day sales outstanding) out of 64 financial ratios used in the study.

### 3. Methodology

For the purpose of the study, we use the Multiple Discriminative Analysis function (MDA) to predict a potential financial failure of a company before the event actually happen.

The Multiple Discriminative analysis (MDA) was introduced by Altman in 1968 and then used widely by many academics, researchers, portfolio managers, and financial analysts to predict the financial failure or success of a company. The Multiple Discriminative analysis, a statistical measure, mainly used to eliminate the differences between variables and then classify these variables into groups. This analysis helps in determining which set of variables discriminate between two or more groups on the basis of their observed characteristics where the dependent variable is quantitative variable. Discriminative analysis could then be applied to verify which variables are the best predictors. (Pouslen and French,2009)<sup>3</sup>.

Originally, the MDA function was first applied in the areas of biological and behavior science ( Cochran, 1964) then was used in other areas such as finance. The MDA function is applied successfully in consumer credit evaluation, industry evaluation, company evaluation, stock picking, and asset allocation.

In our study, we depend on the MDA model for analyzing our selected companies. We define failure companies according to (Altman and Marayanan, 1997). Therefore, we listed the companies in the failure group where their net incomes are negative for three years consecutively. The ratios used are as follows:

- 1) Day sales outstanding
- 2) Account Receivable turnover
- 3) Operating cycle
- 4) Net working capital
- 5) Current ratio
- 6) Quick ratio

- 7) Cash ratio
- 8) Sales/working capital
- 9) Times interest earned
- 10) Debt ratio
- 11) Debt/owners equity
- 12) Profit margin
- 13) Total assets turnover
- 14) Return on assets
- 15) EBIT/sales
- 16) Operating assets turnover
- 17) Sales to fixed assets
- 18) Return on equity

### 3.1 Hypothesis

H0: There is no relationship between the financial ratios and the prediction of financial failure of the public industrial companies in Jordan.

### 3.2 The Model

In this paper, we classify the variables in two main groups (failure and not failure) applying the simplest form of Z-score function, which was first introduced by Altman in 1968.

The MDA function we use in our analysis is the following Z-score function:

$$Z = V_0 + V_1 X_1 + V_2 X_2 + \dots + V_n X_n \dots \dots \dots 1$$

Where:-

$V_0, V_1, \dots, V_n$  :-Discriminate coefficients

$X_1, X_2, \dots, X_n$  :-Independent variables

For the purpose of analysis, we depend on fundamental analysis using the financial ratios as performance measurement tools. We choose 18 financial ratios from the major five financial ratio groups (liquidity, asset management, debt management, profitability, and market value ratios) in order to have a clear picture of the company's financial situations.

### 3.3 Data

Regarding the selected companies, we choose twenty public companies from the industrial sector (listed in Amman stock exchange) from 2001-2008. These companies are selected due to their importance and effectiveness on the industrial sector and the Jordanian economy as whole.

### 3.4 Industrial sector in Jordan

The Industrial sector in Jordan is considered the second largest sector after the financial sector. The industrial sector has 11 sub sectors (including chemical, food, mining, pharmaceutical, paper, ceramic, etc) with 73 listed companies. Most of these companies are considered important to the Jordanian economy.

For the purpose of the study, we selected the industrial sector for the following reasons<sup>4</sup>:

1. The industrial sector was 22% of Jordan's GDP during the study period.
2. The volume of the industrial sector ranked the second after the financial sector during the study period.
3. The Industrial sector considered very important sector for the economy because it generally attracts foreign investors especially during the study period.

We choose our selected companies from the following sub industrial sectors (chemical, food, mining, pharmaceutical, paper, ceramic, and textiles) ; and then divide them into two equally groups' (failure and not failure) during 2001-2008

Generally, the definition of failure companies varies from one study to another. For instance, some studies distinguish failure companies when they are unable either to pay the interest at maturity to bondholders, the dividend to preferred stockholders, or repayment of banks' loans, etc.).

## 4. The Results

After analyzing the collected data using SPSS, the results are summarized in the following tables:

Table (1) shows (f) value and Wilks Lambda value for the eighteen variables.

### **Insert here table (1) (f) value and Wilks Lambda value for variables**

Depending on table 1, we select the ratios (variables) used in the analysis , which must have the following two conditions: 1) the variables with the highest (f), where f value is a statistical measure that shows the extent in which a ratio ( variable) makes a unique contribution to the prediction of failure group or non failure group. 2) The variables with the lowest Wilk lambda, which used to measure the differences between the failure and non failure groups (Yap, el at (2010)).

According to the above two conditions, the following ratios are selected in table (2). The ratios are listed according to their level of significant (Note that the level of significant of six financial ratios is less than 0.10).

### **Insert here table (2) selected ratios**

#### 4.1 The Result dissuasion

Based on table two the final discriminative equation is:

$$Z_j = -10.251 + 1.873 X_1 + 0.257 X_2 + 1.58 X_3 + 1.087 X_4 - 0.074 X_5 + 1.572 X_6 \dots \dots \dots 2$$

Where:-

$Z_j$ : Z-score for Jordan

$X_1$ : debt Ratio

$X_2$ : debt/owners equity

$X_3$ : Operating cycle

$X_4$ : Net working capital

$X_5$ : Times interest earned

$X_6$ : Account Receivable turnover

The above discriminative analysis model (using the selected six financial ratios as performance measurement tools), has helped us in predicting the potential failure of a company in the industry sector for one year prior actual failure. In general, the Z-score gives a good indication of the probability of financial problem to the company, at least one year before the failure occurs. (Gerantonis, et al (2009)).

The Z equation can determine the failure of the company, where the lower the Z-score, the greater the potential of firm failure.

According to our results, we can classify our selected companies as follows:

- Z less than -0.14475 (the company face high probability to fail)
- Z greater than 2.066 (the company face high probability not to fail)
- Z greater than -0.14475 and less than 2.066 (we can not decide the probability of company failure (considered in the gray area).
- The cutoff point in our study is when the Z –score is 0.4803125. The cutoff point is used to distinguish between failure and non failure companies

The predictive accuracy rates of the discriminative analysis model used in the study reached 95%, which almost lead to accurate results. The accuracy of the model decreases in the prior years to actual failure. Therefore, the model will give the best results for one year earlier of the actual failure.

According to our results (table 2), the selected six are concerned with the liquidity, asset management, and debt management ratios. Generally, these set of ratios are considered important to the health of company.

X1:- Debt ratio: is the ratio of total debt to total assets that concerned with the financial leverage of the company. It measures the percentage of funds supplied by creditors. Generally, the lower the debt ratio the better it is for the company and the creditors. Lower debt ratio allows company to borrow additional money without rising money from equity. Moreover, lower debt ratio protects creditors from losses in the event of liquidation.

X2:- the debt/owner equity ratio is important to the financial health of a company because it consist of the two primary sources of financing debt and equity. Debt refers to the money borrowed by the company, and equity refers to the money contributed by owners (shareholders). Therefore, this equation is primary indicator of the health of company, especially if it is public.

X3:- Operating cycle ratio is defined as the account receivable turnover in days plus the inventory turnover in days. Generally, it shows how long cash is tied up in account receivables and inventory<sup>5</sup>.

X4:- net working capital ratio, defined as current asset minus current liabilities, measures liquidity and short-term financial health. Positive net working capital indicates the firm ability to pay short term debt.

X5:- Times interest earned (TIE): is the ratio of earnings before interest and taxes to interest charges. The TIE ratio is the primary ratio that measures the firm capability to meet its annual interest payments. Failure to pay interest will probably result in bankruptcy in the future.

X6:- Account Receivable turnover is calculated by dividing the average gross receivables by net sales (360). It measures how effectively the firm managing its account receivable. Generally low cash, low inventory, and high account receivable turnover indicates high probability of failure.

## 5. Conclusion:

This paper aims to evaluate the importance and the effectiveness of the financial ratios in predicting the failure of companies within one year. We used 18 financial ratios to asses the failure of twenty industrial public companies listed in Amman stock exchange. Our results generally indicate that ratios measuring liquidity, asset management, and debt management ratios are considered the most essential indicators for predicting financial distress.

The followings six ratios (debt ratio, debt/owner equity ratio, operating ratio, net working capital, times interest earned, and account receivable turnover) are the primary financial ratios that asses in predicting the failure of the Jordanian industrial companies. This model is only valid to test the failure of companies in the industry sector in Jordan. For further study, we recommend to test other sectors in Jordan by applying the same methodology used in this paper to determine the discriminative equation for a specific sector.

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Table (1) (f) value and Wilks Lambda value for variables

Financial ratio	Wilk lambda	F	sig	coefficient
Day sales outstanding	0.964	2.055	0.157	0.830
Account Receivable turnover	0.947	3.100	0.084	1.572
Operating cycle	0.943	3.296	0.075	1.58
Net working capital	0.945	3.210	0.079	1.087
Current ratio	0.957	2.482	0.121	1.516
Quick ratio	0.989	0.638	0.428	-1.170
Cash ratio	0.981	1.055	0.309	0.336
Sales/working capital	0.982	1.006	0.320	-0.109
Times interest earned	0.945	3.171	0.080	-0.074
Debt ratio	0.906	5.675	0.021	1.873
Dept/owners equity	0.926	4.414	0.040	0.257
Profit margin	1.000	0.00	0.986	2.306
Total assets turnover	0.974	1.478	0.229	1.972
Return on assets	0.967	1.851	0.179	-2.273
EBIT/sales	0.963	2.115	0.152	-0.154
Operating assets turnover	0.998	0.116	0.734	-0.376
Sales to fixed assets	0.977	1.286	0.262	-0.235
return on equity	0.961	2.256	0.139	0.356
constant				-10.251

Table (2) selected ratios

Financial ratio	Sig	Coefficient
Debt ratio	0.021	1.873
Debt/OE	0.040	0.257
Operating cycle	0.075	1.58
Net working capital	0.079	1.087
Times interest earned	0.080	-0.074
Account Receivable turnover	0.084	1.572
constant		-10.251

### Notes

1. <http://wenku.baidu.com/view/3f3779c589eb172ded63b725.html?from=related>
2. [www.JSTOR.org](http://www.JSTOR.org)
3. <http://userwww.sfsu.edu/~efc/classes/biol710/discrim/discrim.pdf>
4. <http://www.mit.gov.jo/Default.aspx?tabid=354>
5. [http://www.bizwiz.ca/efficiency\\_ratio\\_calculation\\_formulas/operating\\_cycle.html](http://www.bizwiz.ca/efficiency_ratio_calculation_formulas/operating_cycle.html)