Predicting Corporate Bankruptcy of Jordanian Listed Companies: Using Altman and Kida Models

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Abstract

The purpose of this study is to report the effect of financial ratios in bankruptcy prediction in Jordanian listed companies through the use of Altman and Kida models. The study sample includes non-financial service and industrial companies for the years 1990-2006. The banking, insurance, and finance sectors were excluded from the study since they apply certain disclosure requirements. To achieve the objectives of the study, Altman and Kida models were applied on the sample companies in both service and industrial sectors. After the exclusion of companies from the financial sectors 16 companies were eligible for the analyses that have been bankrupt during the period mentioned and compared with 16 successful companies every year of the five years preceding the` incident liquidation. The results of the two models were then compared to recognize which one is most favorable to give an early warning about the possibility of bankruptcy for each of those years. Of the two models Altman's model has an advantage in company bankruptcy prediction, with a 93.8% average predictive ability of the five years prior to the liquidation incident, while the average for Kida's model is 69%. The outcome of the analyses shows that Jordanian listed companies may not be using such models in their financial and credit analyses. Consequently, it is best that they should at least apply one of these models with high credibility for predicting corporate bankruptcy.

Keywords: Jordanian, Financial ratios, Prediction, Bankruptcy, Altman model, Kida model

1. Introduction

As a result of the bankruptcy, companies in general and public shareholding, in particular, will suffer financial distress. Not only owners are affected, but also other financial statements users, such as investors, creditors, and the economy in general will also be affected. Consequently, an early warning of bankruptcy could be taken as a precaution to be established to lower the risk and danger levels of company bankruptcy or distress. The motivation for this study arises from the arguments made by several authors who identified financial ratios and financial indicators that are used as a yardstick for bankruptcy prediction. It is based on Beaver (1966), where he compared a number of financial ratios of group of companies for the five years prior to bankruptcy period with another group of companies that are not bankrupt. Then Altman (1968), (1983) developed a model (Altman z-score) which was the most renowned model in predicting company bankruptcy using financial ratios. The aim of this model is to arrive to the most useful financial ratios to predict bankruptcy. Then in 1981 Kida developed another model (Kida z-score) where he also used financial ratios to predict bankruptcy with slight differences in ratios applied.

Looking at the above situation, it is important to identify the reasons behind the bankruptcy of Jordanian listed companies by using Altman and Kida models, and to answer the following research questions:

1) To what extent is the Altman model able to predict bankruptcy and in which year of the five years prior to bankruptcy.

2) To what extent is the Kida model able to predict bankruptcy and in which year of the five years prior to bankruptcy.

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2. Study Objectives

The aim of the study is to identify the predictive ability of both Altman and Kida models in giving an early sign of company bankruptcy, and also to find out which of the two models is most appropriate in predicting bankruptcy of a sample of Jordanian listed companies for the period between 1990 to 2006 for each year of the five years prior to liquidation.

3. Literature Review

Literature on bankruptcy had identified many ratios that were important in predicting bankruptcy. There are no certain rations used to predict company failure (Barnes, 1987; Altman, 1993; Mohamed, Li and Sanda, 2001). Most researchers have selected financial ratios based on their popularity and predictive ability in the previous bankruptcy research studies (Beaver, 1966; Altman, 1968; Ohlson, 1980; Altman and Kao, 1985; Casey and Bartczak, 1985; Shumway, 2001;Beaver et al., 2005; Nur Adiana et.al.; 2008, Lifschuts and Jacobi, 2010; Y. Wu et.al 2010).

The most commonly used financial ratios by researchers were net income to total assets (Beaver, 1966; Deakin, 1972; Libby, 1975; Ohlson, 1980; Lennox, 1999), total liabilities to total assets (Beaver, 1966; Deakin, 1972; Ohlson, 1980; Zmijewski, 1984) and size (Ohlson, 1980; Lennox, 1999; Shumway, 2001; Halim et al, 2008). Net income ration was used by Ohlson (1980) to represents growth. To explain bankruptcy in the UK, Lennox (1999) used cash to current liabilities, debtor turnover ratio and gross cash flow ratio to from the cash flow. To explain bankruptcy in Korea, the result of Nam and Jinn (2000) was that financial expenses to sales, debt coverage and receivables turnover were important. The study of Nam and Jinn (2001) was consistent with Lennox (1999). Zulkarnain et al. (2001) used the MDA model, which showed that total liabilities to total assets, sales to current assets, cash to current liabilities, and market value to debt were significant in explaining financial failure in Malaysian companies between 1980 and 1996.

Altman (1968) established a model (Altman Z Score) that consists of a set of financial ratios which are then analyzed using Multiple Discriminate Analysis (MDA), based on the assumption of a relationship between financial ratios in previous years and the time of bankruptcy for the following years.

3.1 Altman's Z score Model

As mentioned above, this model was developed in 1968 and was the first in predicting corporate bankruptcy by using financial ratios. The Z score for a company is the weighted average of five separate financial ratios; these are represented in the following formula:

$$\mathbf{Z = 1.2X1 + 1.4X2 + 3.3X3 + 0.6X4 + 1.0X5}$$

Where:

Z = weighted average of five separate ratios

X1 = working capital / total assets

X2 = retained earnings / total assets

X3 = profit before interest and tax / total assets

X4 = market capitalization / book value of debts

X 5 = Revenue / total assets

Altman's model shows companies that have a Z-score of > 2.7 are considered as a good sign for being successful compared to those which have a Z-score of < 1.8 had potential serious problems and may not be able to continue. However, for a company who's Z-score falls between 2.7 and 1.8, it is difficult to determine its status.

3.2 Kida's Z score Model

This model also represents five separate financial ratios for predicting bankruptcy; these are represented in the following formula:

$$\mathbf{Z = 1.042X1 + 0.42X2 + 0.461X3 + 0.463X4 + 0.271X5}$$

Where:

Z = weighted average of five separate ratios

X1 = net profit after tax / the total assets

X2 = Interest and expenses discounted for short-term and long-term obligations

X3 = (Accounts and Notes Payable / total sales)*12

X4 =Sales / total assets

X5 =Cash / total assets

Kida's model shows companies that have a Z-score of > 0.38 are considered as a good sign for being successful compared to those which have a Z-score of < 0.38 had potential serious problems and may not be able to continue.

4. Research design and methodology

The study included sample companies listed on the Jordanian Stock Exchange that were liquidated during the period 1990 - 2006. Only companies from services and industrial sectors were eligible for the study. Banking and insurance sectors were excluded from the study because they apply different financial ratios. The final sample consists of thirty two companies eligible for the study, sixteen bankrupt companies and sixteen successful companies.

In order to calculate Altman Z-Score and Kida Z-Score, financial ratios data were then extracted from the annual reports of Jordanian public shareholding companies that were liquidated for the period 1990-2006 and the annual reports of the successful firms were also obtained from the Ministry of Trade and Industry.

In order to achieve the objectives of the study, and to be able to compare the results, descriptive statistical analysis was applied to analyze the contents of both successful and bankrupt companies' financial statements' by applying Altman and Kida Z-Score models.

4.1 Hypotheses development

Based on the findings of the literature review, the following hypotheses were developed to answer the research questions and to achieve the study objectives. The hypotheses are listed below:

Hypotheses 1: Altman model is unable to predict bankruptcy of companies during the five years prior to liquidation.

Hypotheses 2: Kida model is unable to predict bankruptcy of companies during the five years prior to liquidation.

Hypotheses 3: There are no statistically significant differences between the Altman and Kida Models for predicting corporate bankruptcy during the five years prior to liquidation.

5. Analysis and discussion of results

The analysis results for each company was extracted through excel spreadsheets and the results of the overall analysis of all the sample companies using the frequencies and percentages.

Tables 5-1 and 5-2 show the results of the Z Value of both bankrupted and successful listed companies according to Altman and Kida models, respectively, and are summarized in table 5-3 which shows the aggregate results of bankrupted companies, the percentage of failure rate or the incapability of companies to continue for each of the five years prior to bankruptcy.

As Table 5-3 shows that Altman's model was able to predict companies' bankruptcy in the fifth year prior to the bankruptcy by 75%, while Kida's model was able to predict bankruptcy by 69% for the same year. The results of the fourth year that preceded the bankruptcy, an improvement is noted in the predictive ability of Altman's model where the rate reached 94%, compared to predictive ability of Kida's model having remained at the rate of 69%. These results support the rejection of the first hypothesis which stated that Altman model is unable to predict companies' bankruptcy during the five years prior to liquidation and the second hypotheses which stated that the Kida model is unable to predict companies' bankruptcy during the five years prior to liquidation.

It is also noted from table 5-3 that the Altman models' predictive ability has significantly improved in the third, second and first years prior to bankruptcy where the rate has reached 100% for each of the three years. While the predictive ability of Kida's model was constant over the first four years that preceded the bankruptcy, having reached 69% each year, while in the last year before the bankruptcy incident there has been a significant improvement that has reached 75%. It is also noted that Altman's model was comparatively the better model in bankruptcy prediction of Jordanian listed companies, where the average bankruptcy prediction rate in the past five years was 93.8%, compared to that of Kida's model where the average bankruptcy prediction rate in the past five years was 70.2%. These results support the acceptance of the third hypothesis that states that there are no statistically significant differences between the Altman and Kida Models for predicting companies' bankruptcy during the five years prior to liquidation. Moreover, the study found that profitability and liquidity ratios were

able to predict bankruptcy of companies in Jordan.

Through the collection of the primary data, the findings also show that some Jordanian listed companies have a problem with the financial disclosure available in the annual report. This may be due to various reasons such as tax evasion, aversion to disclosing net income, and protecting companies' financial and competitive positions in the local and regional markets. Consequently, this may hinder the process of privatization program and make the investment environment less attractive for foreign investments in Jordan.

6. Summary and Conclusion

The purpose of this study was to investigate predictability of corporate bankruptcy of Jordanian listed companies using Altman and Kida Models. The study included sample companies listed on the Jordanian Stock Exchange that were liquidated during the period 1990 - 2006. It also set out to find which model is favorable in predicting bankruptcy. The study showed the ability of the Altman Z-Score model to predict the bankruptcy of Jordanian companies during the five years preceding the bankruptcy incident high rates of 75% for the fifth year, 94% for the fourth year and 100% for each of the third, the second and the first as shown in table 5-3. It also found that percentage rates and prediction frequencies for Altman Z-Score are better than those of Kida's Z-Score. Furthermore, the study showed that Kida's Z-Score of 70.2% failed to reach the degree of accuracy in predicting bankruptcy. This may be due to the inexperience of credit and financial analysts and the lack of knowledge in financial management of Jordanian companies compared with those of developed countries. Although the Jordanian government has made attempts to open its market to attract foreign investors by establishing industrial estates areas and applying the international accounting standards, they still fall short of their objectives.

The unstable Jordanian economy forced the Jordanian government to operate an economic reform program jointly with the International Monetary Fund and the World Bank to improve its economy. This should have permitted Jordanian listed companies to demonstrate an improved performance to go international, but failed to participate or make its name in the international markets in areas of sales, and financing their assets, in the sense that its market value does not reflect its real value. The study also showed a shortfall of financial disclosure in the annual reports available for some companies in order to attract regional and foreign investments.

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Appendix

Table 5-1. The Z Value of the bankrupt listed companies according to Altman and Kida models

Company's name	Five years prior to bankruptcy					
	Z Score	Year 1	Year 2	Year 3	Year 4	Year 5
National Textile and Plastic Industries	**Altman**	0.393	-0.147	0.121	0.067	-0.910
	Kida	-0.065	-0.151	-0.085	-0.359	-0.303
Modern Food and Vegetable Oils Industries	**Altman**	-0.213	-1.024	-0.419	-0.580	-1.274
	Kida	-0.269	-0.063	0.084	0.007	0.012
Arabia for Investment and International Trade	**Altman**	0.640	-0.231	-0.642	-0.772	-2.360
	Kida	-0.270	-0.228	0.372	0.368	0.480
Delta Food Industries	**Altman**	1.268	0.763	0.071	-0.692	-1.158
	Kida	0.366	0.428	0.175	-0.014	-0.031
National Industries	**Altman**	0.631	-0.111	-0.201	-0.655	-0.677
	Kida	-0.247	-0.469	-0.361	-0.486	-0.744
International for fabrics production	**Altman**	-0.890	-0.416	-0.668	1.033	1.286
	Kida	-0.346	-0.141	-0.437	-0.223	-0.311
Nayzak for the manufacture of molds and equipment	**Altman**	-0.824	-1.044	-2.119	-0.296	-0.373
	Kida	0.165	0.149	-0.440	-0.335	-0.435
Jordan Safi Salt	**Altman**	-0.483	-0.277	-0.940	-1.545	-2.245
	Kida	0.013	-0.160	-0.389	-0.417	-0.529
Jordan Kuwait for agricultural products	**Altman**	-0.323	0.945	0.897	0.301	-1.715
	Kida	-0.148	0.027	0.293	0.321	-0.166
Al Kawthar Investment	**Altman**	1.402	0.818	0.882	0.954	0.262
	Kida	-0.338	-0.388	-0.314	-0.356	-0.065
Glucose and Food Manufacturing	**Altman**	3.169	1.091	0.473	0.166	-0.776
	Kida	1.060	0.422	0.379	0.077	0.116
Al Mafraq Food Industries	**Altman**	4.637	1.614	1.633	0.441	-1.148
	Kida	2.057	0.794	0.856	0.622	0.139
Arabia for media investment	**Altman**	2.862	-1.916	-3.977	-4.735	-5.708
	Kida	-6.583	-0.884	-1.836	-1.696	-1.557
Jordan for concrete manufacturing	**Altman**	-1.063	-1.722	-1.362	-2.402	-3.283
	Kida	-0.103	-0.276	-0.306	-0.185	-0.134
Jordan Spinning and Weaving	**Altman**	0.894	0.619	1.404	1.318	1.703
	Kida	-0.239	-0.251	-0.526	-0.639	-3.419
Arab Contractors / Akron	**Altman**	10.543	3.644	0.849	0.723	0.204
	Kida	-3.655	-0.442	-0.236	-0.154	-0.158

Table 5-2. The Z Value of the successful listed companies according to Altman and Kida models

Company's name	Five years prior to bankruptcy					
	Z Score	Year 1	Year 2	Year 3	Year 4	Year 5
Ready mix concrete and construction supplies	**Altman**	3.146	2.981	2.842	3.674	5.124
	Kida	-0.857	-1.233	-0.885	-0.857	-0.499
Jordan Steel	**Altman**	2.840	2.383	2.936	3.811	2.414
	Kida	0.054	-0.030	0.247	0.217	-0.456
Union for tobacco & cigarette production	**Altman**	6.293	4.627	5.191	4.944	5.627
	Kida	-0.591	-0.613	-0.328	-0.444	-0.276
International Ceramic Industries	**Altman**	1.817	2.002	2.381	1.887	2.916
	Kida	-0.642	-0.780	-0.704	-0.770	-1.033
Pearl for sanitary papers production	**Altman**	7.338	7.957	5.664	3.183	4.170
	Kida	2.056	1.886	-0.100	-0.538	-0.496
National Aluminum	**Altman**	4.308	4.919	4.481	4.659	3.657
	Kida	1.823	1.572	0.484	0.209	-0.029
Arab international factories for food and investments	**Altman**	27.497	26.984	31.091	52.507	51.586
	Kida	21.530	17.295	23.784	46.554	52.547
Al iqbal for printing and packaging	**Altman**	3.026	6.882	5.865	13.412	9.665
	Kida	0.111	1.193	1.066	2.365	1.907
The Public Mining	**Altman**	5.766	8.206	11.041	15.389	19.874
	Kida	-1.903	-2.561	-1.419	-1.932	-1.741
Jordan Dairy	**Altman**	5.076	5.654	5.294	5.494	6.079
	Kida	0.028	0.293	0.041	0.006	0.026
Arab Chemical Detergents Factories	**Altman**	6.050	6.294	6.496	4.897	4.970
	Kida	-0.090	-0.176	0.268	0.440	0.360
National Steel Industry	**Altman**	5.178	5.702	8.483	14.714	3.736
	Kida	0.147	0.372	0.507	0.913	-0.676
Jordan for pipes manufacturing	**Altman**	1.882	2.882	3.259	5.251	2.581
	Kida	-0.397	-0.189	-0.382	-0.384	-0.616
Jordan tanning	**Altman**	6.948	6.504	7.201	6.033	6.155
	Kida	-0.341	-0.273	-0.291	-0.102	-0.173
Jordan Center for International Trade	**Altman**	1.891	2.143	3.471	5.016	4.720
	Kida	-0.338	-0.354	0.084	0.385	-0.065
Zarqa for education and investment	**Altman**	6.860	5.300	4.379	3.915	6.258
	Kida	2.337	0.173	0.404	0.639	1.001

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Table 5-3. Comparative results of Altman and Kida models in terms of bankruptcy predictive ability five years prior to the bankruptcy incident

Statement	**Altman Z-Score**		**Kida Z-Score**	
	Number of prediction times (frequency)	Percentage Rate	Number of prediction times (frequency)	Percentage Rate
Predictive ability of business discontinuation five years prior to bankruptcy	12	75%	11	69%
Predictive ability of business discontinuation four years prior to bankruptcy	15	94%	11	69%
Predictive ability of business discontinuation three years prior to bankruptcy	16	100%	11	68%
Predictive ability of business discontinuation two years prior to bankruptcy	16	100%	11	69%
Predictive ability of business discontinuation one year prior to bankruptcy	16	100%	12	75%
Average predictive ability of business discontinuation five years prior to bankruptcy	-	93.8%	-	70.2%