Predicting Financial Bankruptcy by Using Altman-Z Score in Financial Companies:The Case of Amman Stock Exchange

Mansour Alkhazaleh
Al al-Bayt University
Assistant professor
Department of Finance and Banking Jordan

Amjad Ghazi AL Habashneh
Al al-Bayt University
Assistant professor
Department of Finance and Banking Jordan

Hussein Al-zeaud
Al al-Bayt University
Professor
Department of Finance and Banking Jordan

Omar Amjad Al-Habashneh
Accounting Department
PUTRA Business School University Putra Malaysia (UPM)
Saa'eda Abu O'laim
saadaabuolem@gmail.com

Abstract:

This study aims to predict the financial bankruptcy of a sample of 19 financial companies listed in the Amman Stock Exchange (ASE) in the period 2010-2021 using the 1983 Altman Z-Score model. It was found through the analysis that five companies taken in the study sample were completely safe from the possibility of exposure to the risks of bankruptcy, while three companies were financially failed and suffering from great financial distress, and therefore there is a high probability of them being exposed to bankruptcy. On the other hand, eleven companies fluctuated towards the possibility of bankruptcy and falling into gray areas that couldn't be judged on the possibility of bankruptcy or not. Accordingly, the study model is reliable and valid for predicting the financial bankruptcy for the financial companies listed in Amman Stock Exchange.

Key words: Z-Altman Score, Bankruptcy, Financial Sector, Amman Stock Exchange

1. Introduction

The primary goal of any corporation is to increase its value. This goal is reflected by increasing the wealth of the owners. As a result, achieving the goals of shareholders and all stakeholders too in the corporation. The parties in this equation includes; banks, and undoubtedly, financial institutions, business organizations, the government, suppliers, and customers. If these parties do their missions efficiently and effectively, and then they will avoid reaching what is called financial failure or bankruptcy. Therefore, the prudent management of the company in general seeks to achieve the maximum possible profits and maximize the company's profitability as much as possible. To achieve this goal, it is necessary for the managers to get a support from internal or external sources.

There is no doubt that, the financial failure is considered as one of the most important challenges that companies of all types face. The reason is that if the company's financial performance is sound, it will prevent the future dilemmas of the company. The main targets of any corporation are considered as; survival, growth and continuity (Al-Hamdani and Al-Qattan, 2013). At this stage, the role of the financial department as the most important one in the company comes, because it is the department which responsible about the financial analysis, measurement of the financial ratios and the selection of appropriate policies to deal with the necessary procedures with all parties, shareholders, investors, creditors and regulatory bodies as well (Gitman, 2015).

Bankruptcy can be defined as the situation in which the company's liabilities exceed its total assets (Sassi and Qureshi, 2011). In other words, the real net worth of the company becomes negative, which inevitably leads to a decrease in sales and an increase in both costs and losses and with the passage of with time, the company loses its competitive advantage with its counterpart companies. This situation leads to what is called financial distress because of the difficult conditions that this company is experiencing.

Many researchers who have dealt with the area of financial failure in many studies. Those studies have confirmed that financial failure, in reality, is the first step towards bankruptcy. This means that financial failure is the stage prior to entering bankruptcy, and they attributed this to the fact that financial failure occurs when a loss occurs to creditors or the inability to recover the mortgaged properties and seize the properties or withdraw and leave unpaid obligations on the institution (Altman, 2006).

It should be noted that, the role of financial analysts and managers has gone beyond the traditional role. They practice on assessing financial situation and monitoring the company's performance. It is very necessary instead to be able to predict the risk before it occurs. By doing such role, it will be a serious attempt to control risk. However, researchers develop appropriate policies to deal with risk if it occurs in the company. The analysis of relevant financial ratios play a prominent role in predicting financial failure before it occurs, among the methods that have been employed for this purpose are the Altman (1968) model, the Springate (1978) model, the Zmijewski(1984) model, and finally the Grover (2001) model. Previous models have been used in many studies and in various sectors. The opinions have varied regarding their ability to predict financial failure and the extent to which their results can be trusted (Zeytinoglu, 2013).

There is a large literature that dealt with the Altman model to predict financial failure (Yasser & Almamun, 2015), (Chieng, 2013), (Salimi, 2015), and (Meeampol et al., 2014). The Altman model is considered a pioneer of models that deal with the context of predicting financial failure efficiently and competently due to its extreme ease of use, modifications that have been made on it, in order to adapt to economic changes compared to other models that have become obsolete and have not been made appropriate modifications to keep pace with contemporary economies, especially with regard to the reluctance of researchers to use them in their studies compared to the modified Altman model.

Based on the above, this study seeks to shed light on the ability of the Altman Z-Score model to predict the financial failure of financial services companies listed in the Amman Stock Exchange.To the best of our knowledge, there is a noticeable lackof the studies that have dealt with this area, especially companies concerned with by providing financial services listed in Amman Stock Exchange. We determine the ability of this model to provide us with a forecast of the future for these companies and address potential risks posed by these companies. Finally, we have addressed the period of the study so that it is as recent as possible.

2. Literature Review

The first appearance of studies related to financial failure was attributed to (Beaver, 1966).He proposed a mathematical model that used as an early warning to predict financial failure before it occurs with a good period. In the meanwhile, a number of other studies concerned and dealt with this matter were unveiled in both the United Kingdom and Canada. The researchers derived the probability of financial failure based on appropriate mathematical models (Amendola et al., 2011). In addition to the above, some researchers have concluded that analyzing financial ratios alone is not sufficient as an appropriate tool for predicting financial failure. The reason is that, as it explicitly contradicts the principle of the company's continuity of activity, as the company in this case will stop continuing the activity because of achieving dependent profits on its current assets when it is liquidated for example (Ahmed, Al-Kassar, 2009).

In another study of 17 industrial stock companies affiliated with the Iraqi Stock Exchange in 2006, this study aimed to investigate the possibility of accepting the Altman model as a tool for judging the ability of this model to predict financial failure. The result was the acceptance of this model as a valid tool for predicting financial failure,by reducing the potential risks to the Iraqi economy so that it does not reach the stage of bankruptcy (Ramo and Al-Wattar, 2010).

Later on, the models (Altman, Kida, Springate, Sherrod) were used in theperiod2007- 2011 for seven financial investment companies listed in Iraqi Stock Exchange.The study concluded that the first three models are considered appropriate as a reference for predicting future financial failure. On the contrary,the latter model was completely inappropriate to achieve this goal (Al-Moussawi, 2014). Moreover, Al-Azzam (2020) used the Springate model to predict the financial failure of ten commercial service companies in the period from 2012 to 2018. He concluded that this model considered asa reference for evaluating future performance within a few years, and that companies in general pass. It goes through stages of financial hardship until it reaches what considered as a financial failure. In any case, the study of Matar and Obaidat (2007), aimed to explore the possibility of improving the predictive ability of classical models, based on the accrual system to discover an appropriate tool that warns early of the possibility of financial failure of companies and reduces the risks associated with. A sample of 36 public joint-stock industrial companies was checked, half of this number of companies had been subjected to liquidation, compared to the other half that continued to operate in the period from 1989 to 2001. The result drawn by the study was that traditional models are powerless in front of derivative models based on calculations related to financial ratios and with a prediction accuracy of 11%.

The Altman model was evaluated in 1983, which was intended for industrial companies. It was considered a developer of the model proposed in 1968, especially since many modifications were added to the model so that it became suitable for all types of companies in different countries. It was proven beyond a doubt that it is suitable for different types of companies in the majority of countries in which it was applied on its companies. Altman et al (2014)among many studies in which the Altman model was applied is the study (Coelho, 2012), which studied all companies listed on the Johannesburg Stock Exchange in the period between 2008 and 2012.
This study proved that the Altman model could be considered appropriate for predicting the financial distress of companies listed on this stock exchange.

In a related context, the Altman model was used to predict financial failure in some companies listed in the Bahrain and New York stock exchanges and for several sectors, in the period 2011-2015, the study concluded that the Altman model is appropriate for predicting financial failure, and accordingly, some companies fell into the risk zone and therefore there is a high probability of being exposed to financial failure in the near future. In contrast, some of the other sample companies fell into the safe zone and do not suffer from the possibility of being exposed to financial failure (Sajjan, 2016). Moreover, Chieng (2013) explored the extent of the ability of the Altman model for predicting financial failure to predict banking failure in banks in the United States of America, and the result of the study indicated that the Altman model can be relied upon in predicting financial failure for a maximum period of 5 years.

Niresh & Pratheepan (2015) dealt with 7 companies belonging to the commercial sector in Sri Lanka, by applying the Altman model (1968). According to the results reached by this study, this model was appropriate and efficient for predicting financial failure, and accordingly, the majority of Sri Lankan businesses 71% are located within the risk zone, which means a rapid intervention is necessary to save them. Finally, Al-Janabi (2018) used the Sherrod model to predict financial failure, as this model was applied to Iraqi commercial banks for several years. The attempt was done, to reach expectations through which future financial failure could be avoided because of the economic conditions at the time.He concluded that commercial banks in Iraq has the ability to withstand and there is no reason to worry about the possibility of it being exposed to financial failure. Hence, there is an ability of these banks to develop financial plans and structures for their capital well and are able to attract foreign investments.

3. Importance and Problem of the Study

Financial safety is a major concern for financial and commercial companies, financial institutions, government, suppliers and customers. To achieve this goal, all of these parties should work effectively and efficiently to prevent being pushed to the brink of financial failure and pushed to bankruptcy. Bankruptcy is the situation in which a company's total liabilities exceed its total assets, and therefore the net worth of the company is negative.
There is no doubt that investors in the Amman Stock Exchange are thinking carefully about the investment risks they face in the future. None of the companies is isolated from facing the problem of financial failure, this, as a result, affects the entire Jordanian economy, and therefore this calls for asking the following two questions:

1. Do investors in the Amman Stock Exchange have the ability to predict the financial failure of financial services companies listed in Amman Stock Exchange?
2. Does the Altman Z-Score model have the ability to predict the financial failure of a sector of financial services companies listed in Amman Stock Exchange?

The highest priority for this study is to know the size of the losses associated with the default of financial services companies listed in Amman Stock Exchange and the consequences of affecting investors' funds and the national economy in general. Therefore, there was a requirement for a mathematical model capable of predicting the financial failure of companies. A main priority needed to an innovative tool that indicates the possibility of its occurrence. Hence, companies can confront potential risks; address their effects as much as possible. This will gain the confidence of investors, and enhance this confidence in the companies in which they own shares.

This study aims to investigate the ability of the modified Altman Z-Score model to detect the probability of financial services companies listed in Amman Stock Exchange being exposed to financial failure and the suitability of this model to the Jordanian economic environment. Furthermore, the data gathered manually, and the E-views software is employed to analyze the data.

4. Methodology

4.1 Data

The study population consists of companies that provide financial services listed in the Amman Stock Exchange for the period 2010-2021.The number of all companies is 138 companies, 19 of which were selected in a random manner that provided the information needed by the study. These companies are as the following: Darcom Investment, Tihama Financial Investments, and Sabayek Investments. Sanabel International for Islamic Investments, First Finance, Sherco Securities, Selectivity for Investment and Real Estate Development, Dimensions of Jordan and the Emirates for Commercial Investment, Jordanian Real Estate for Development, Al-Mawarid for

Development and Investment, Al-Daman Investment, Jordanian Loan Guarantee, Al-Ittihad for Land Development, Al-Bilad Securities and Investment, Integrated Development Real Estate and Investment, Hanging Gardens of Babylon Real Estate Coordinates Investments, Mithaq Real Estate Investments, and Al-Mustaqbal Arab Investments.

4.2 Method

The 1983 Altman Z-Score model was used to predict the financial failure of a sample of financial sector companies listed in Amman Stock Exchange. The modified model is used as an extension for his industrial model (1968). The modified model was proposed in light of the changes occurring, as numerous studies have proven that it is suitable for forecasting financial failure, regardless of the sector to which companies belong.
Accordingly, this study will employ the Altman Z-Score model according to the following formula:

$$Z = 3.25 + 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4$$

Where the variables in the equation refer:

X_1 : The total capital is divided by the total assets

X_2 : Retained earnings are divided by total assets

X_3 : Earnings before interest and taxes are divided by total assets

X_4 : The book value of shareholders' equity is divided by total liabilities

The value of the constant is 3.25, where Z represents the total value of the index

Based on this equation, Z will be located in one of the following ranges:
When the value of $Z \geq 2.9$ either this situation reflects the company's ability to continue and move forward in practicing its activities and investments. As a result there is no evidence of the possibility of the company failing and being exposed to financial distress.The second outcome falls within the range $1.23 < Z < 2.9$, which means a grey area and it is not possible to judge from this value a decisive decision to make the company fail financially. Finally,when $Z < 1.23$, this situation indicates that the company is threatened by the risk of financial failure and that it is likely to go bankrupt.

5. Results and Discussion

Table No. (1) Shows the results of the study analysis, covering the years from 2010 to 2021, and for 19 companies providing financial services, where the model proposed by Altman Z-Score (1983) was used as shown in Equation No. (1), which determines the relationship between the dependent variable Z-Altman score and the independent factors X_1, X_2, X_3, X_4 .

The increase in the values of the dependent variable at times and its decrease at other times is due to the rise and fall in the values of the independent variables. On the other hand, the increase in the coefficients of the independent factors in the equation may cause these results. The increase in the values of total capital, retained earnings, earnings before interest and taxes, and the book value of shareholders' equity compared to the decrease in the values of the total Assets and total liabilities might cause these results as well. This, of course, enables us to obtain the final value of the dependent variable, which in turn leads us to judge the company's failure or success. Alternatively, it is under the threat of financial failure and bankruptcy.

Returning to Table No. (1), Darcom Investment Company failed financially and faced financial distress in nine years, compared to one year, which it was safe. As for Tihama Investment Company, it was not better off than its predecessor, as it failed financially and throughout the entire years of study. This situation also applies to real estate investment and selective investment company.

On the other hand, the companies Sabayek Investment, Arab Future, Al-Mawarid Investment, Al-Oula Investment, and Al-Daman Investment never suffered financial failure or fell into the gray zone throughout the years of study in the period 2010-2021.The reason for this is due to the good performance of these companies. In addition to that, the effectiveness of its management in making appropriate financial decisions that are in the interest of the company and achieving its desired goals in the best possible way, and thus continuing to perform its effective role in achieving financial stability.

As for the other companies, they fluctuated over the years of the study of the random sample between the three cases (failure (distress), safe, and threat). This indicates the failure to make appropriate financial decisions from the managers of these companies, which calls on the financial decision makers in these companies to take more precaution and carefully study the decisions. In this way, they can paint appropriate future policies and plans for these companies. However, any success could be reflected on the financial sector as a whole in particular and on the national economy as a whole.

Table 1: Z-Score values for financial services companies in the period 2010-2021

year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Z-Darcom Investment	-73.4	-581	-1609	-1697	-1715	-1710	-1113	728.3	-685	-719	-824	-921
result	fail	fail	fail	fail	fail	fail	fail	safe	fail	fail	fail	fail
Z-Tihama Investment	-4.72	-2.37	-1.80	-0.3	-0.02	-0.2	-0.7	-0.99	0.642	0.752	0.86	0.934
result	fail	fail	fail	fail	fail	fail	fail	fail	fail	fail	fail	fail
Z-scoreSabaek Investment	4512	4403	4526	4620	3785	4380	4683	4840	4970	4353	6585	4959
result	safe	safe	safe	safe	safe	safe	safe	safe	safe	safe	safe	safe
Z-Sanabel International for Islamic Investments	2.00	2.05	1.32	0.45	0.44	0.09	0.18	-0.03	-0.57	-0.22	-0.18	-0.01
result	grey	grey	grey	fail	fail	fail	fail	fail	fail	fail	fail	fail
Z-Al-Oula Investment	2546.3	2514.6	2494.4	2310	2328	2381	2576	2132	2088	2008	1990	1844
result	safe	safe	safe	safe	safe	safe	safe	safe	safe	safe	safe	safe
Z-Sherco Securities	2.648	1.44	1.454	1.60	-0.55	-0.9	-2.2	-6.58	-1.73	-1.52	-1.59	-1.645
result	grey	grey	grey	grey	fail	fail	fail	fail	fail	fail	fail	fail
Z-Selectivity for Investment and Real Estate Development	-0.17	-0.24	-0.12	-0.2	-0.88	-0.1	-0.08	-0.03	0.201	-0.86	0.129	-1.33
result	fail	fail	fail	fail	fail	fail	fail	fail	fail	fail	fail	fail
Z-Dimensions of Jordan and the Emirates for Commercial Investment	0.297	1.366	1.126	1.115	5.781	5.649	5.717	5.594	4.672	4.823	4.775	4.8191
result	fail	grey	grey	fail	safe	safe	safe	safe	safe	safe	safe	safe
Z-Jordanian Real Estate Development	-102	-637	-831	-466	-523	-588	-1322	-1259	-1381	-1429	-1483	-1475
result	fail	fail	fail	fail	fail	fail	fail	fail	fail	fail	fail	fail
Z-Al-Mawarid In	1040	1205	1347	1518	1535	1799	1733	1674	1641	150.7	1553	1634

vestment												
result	safe	safe	safe	safe	safe	safe	safe	safe	safe	safe	safe	safe
Z-Al-Daman Investment	3341	3691	2743	2718	2908	4561	4478	1923	729	379	6.4	6.4
result	safe	safe	safe	safe	safe	safe	safe	safe	safe	safe	safe	safe
Z-Jordanian Loan Guarantee	-229	-56	-457	-3.8	91.7	-147	-679	-198	1423	1158	1037	716
result	fail	fail	fail	fail	safe	fail	fail	fail	safe	safe	safe	safe
Z-Al-Ittihad for Land Development	9.503	9.103	10.2	10.3	1.133	2.23	2.17	0.97	1.114	1.7	1.02	0.618
result	safe	safe	safe	safe	fail	grey	grey	fail	fail	grey	fail	fail
Z-Al-Bilad Securities and Investment	10.58	1.9	0.25	-1.1	1.3	1.24	0.81	1.08	3.11	2.5	4	3.306
result	safe	grey	fail	fail	grey	grey	fail	fail	safe	grey	safe	safe
Z-Integrated Development Real Estate and Investment	39.6	41.5	40.4	19.7	3.07	3.4	3.6	3.35	8.05	3.57	3.98	3.03
result	safe	safe	fail	fail	grey	grey	fail	fail	safe	grey	safe	safe
Z-Hanging Gardens of Babylon Real Estate	76.29	169.7	922.6	864	618	-422	-21	-120	-113	-187	-209	-247.5
result	safe	safe	safe	safe	safe	fail	fail	fail	fail	fail	fail	fail
Z-Coordinates Investments	1604	-267	163	-24	-116	50.7	-1.3	-216	-402	-669	1702	1246.1
result	safe	fail	safe	fail	fail	safe	fail	fail	fail	fail	safe	safe
Z-Mithaq Real Estate Investments	3.1	1.7	2.7	-0.3	3.3	2.8	2.9	1.8	-0.02	1.35	0.8	0.97
result	safe	grey	grey	fail	safe	grey	safe	grey	fail	grey	fail	fail
Z-Future Arabia	478.8	72.9	323	680	443	607	763	758	173	169.5	174.9	169.6
result	safe	safe	safe	safe	safe	safe	safe	safe	safe	safe	safe	safe

Table 2: Summary of the status of financial services companies in the period 2010-2021

year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
safe	11	8	8	7	9	8	7	7	9	7	10	10
grey	2	5	4	1	2	4	1	1	0	4	0	0
fail	6	6	7	11	8	7	11	11	10	8	9	9

Referring to Table No. (2), five companies among the study sample companies were completely safe from the possibility of exposure to the risks of failure and financial distressing the period of the study. These companies are (Sabaek Investment, Future Arabia, Al-Mawarid Investment, Al-Oula Investment, and Al-Daman Investment). While three of the companies in the sample were financially failed and suffering from great financial distress. Accordingly, there is a high probability of them being exposed to bankruptcy in the near future. Those companies are (Jordanian Real Estate Development, Selective Investment, and Tihama Investment). On the other hand, eleven companies among the sample fluctuated. The companies subject to the study indicate the possibility of bankruptcy and falling into grey areas, which cannot be judged on the possibility of bankruptcy or not, over the period of the study. In other words, we find that they are financially unsuccessful in one year, then in a subsequent year they become threatened and perhaps they become safe at other times.

However, the number of cases in which companies were financially unsuccessful over the years of the study was equal to one hundred and one, while the number of cases in which companies fluctuated between failures and safety was equal to twenty-four. Finally, there were a number of companies in some years between failure and success, meaning that they are located within the grey zone equal to zero, and this became clear in the years 2018, 2020, and 2021.

6. Conclusions

The Z-Altman Score (1983) model showed its ability to predict the financial failure of financial sector companies listed in the Amman Stock Exchange in the period 2010-2021. Accordingly, it can be used in the future to predict the financial failure of these companies. In light of this, the extent of the ability of these companies can be judged. Companies will be able to continue in the future to carry out their strategic roles to achieve their desired goals. This will contribute to provide the owners of these companies with the profits they are looking for achieve.The national economy will be provided with the requirements of success through financial stability. As a result, steadfastness in the face of various challenges will be exist, especially in the ability to achieve sustainable development for the financial environment as a whole.

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