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THE ROLE OF FINANCIAL RATIOS IN PREDICTING FINANCIAL DISTRESS TWO YEARS BEFORE ITS OCCURRENCE IN FINANCIAL SERVICES COMPANIES LISTED ON THE AMMAN STOCK EXCHANGE (A PROPOSED MODEL)

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Abstract

This research aims to identify the optimal set of financial ratios that can be used to predict financial distress for financial services companies listed on the Amman Stock Exchange. The early identification of potential financial distress allows relevant stakeholders and regulatory bodies to intervene with appropriate corrective measures in a timely manner. The statistical technique of multivariate linear discriminant analysis was employed to determine the best set of financial indicators for building the prediction model. This model enables differentiation between distressed and healthy companies two years before the occurrence of distress. Financial ratios were calculated for a sample of 18 companies, half of which were distressed and the other half non-distressed, covering the period from 2014 to 2021. The resulting model is as follows:

$$Z = -0.61X\_1 + 2.96X\_2 - 245.17X\_3 + 1.33X\_4 + 18.75X\_5 - 49.83$$

The model, upon testing, demonstrated its ability to distinguish between distressed and non-distressed companies with a prediction accuracy of 72%.

Keywords:
Financial distress, financial ratios, financial distress prediction models, multivariate discriminant analysis.

Biographical Notes

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1. INTRODUCTION

Financial distress is one of the most critical risks facing the investment environment and organizations alike, as it indicates a company's inability to meet its debt obligations. It is of great importance to all users of financial data, including owners, investors, managers, and creditors (Pamungkas, 2023). Among the main causes of financial distress are weak financial performance, particularly in profitability and debt management, poor governance, financial mismanagement, inadequate financial controls, poor working capital management, and inappropriate financial policies, in addition to rising costs and insufficient marketing efforts (Michalkova et al., 2018).

Financial ratios are used to establish quantitative relationships based on the data available in a company's financial statements, such as profitability and leverage ratios, to determine the trend of these relationships over a specific period. This allows for the prediction of financial continuity or potential distress in the future. Stakeholders, including management, owners, and lenders, often analyze profitability using financial ratios, given that achieving profit is the primary reason for the establishment and continuity of enterprises, thus avoiding future financial distress (Khanfar et al., 2011). Debt ratios are also employed to assess a company's ability to meet its long-term obligations and pay interest when due, with any failure to do so serving as an indicator of future financial distress (Zahwani, 2022).

The first financial distress prediction model was developed by Fitzpatrick in 1932. Subsequent pioneering studies have since developed statistical prediction models using financial ratios derived from corporate financial statements. Notable models include Beaver's (1966), Altman's (1968, updated in 1977, 1993, and 2010), Kida's (1980), Laitinen's (1993), and Shirata's (1998). These models aimed to enhance the accuracy of financial distress predictions due to the economic importance of such accuracy. Financially distressed companies generate substantial losses not only for shareholders and creditors but also impose enormous economic and social costs on nations (Laitinen et al., 2023).

Recent years have witnessed numerous cases of corporate financial distress globally, as seen in the United States, Europe, and Asia, leading to significant national economic losses. Jordan was not immune to this crisis, as many public companies, including financial services firms, faced multiple instances of financial distress. More than 50% of these companies experienced financial distress (defined as two or more consecutive years of losses) during the period from 2014 to 2021, according to the financial data available on the official website of the *Amman Stock Exchange*.

This research aims to develop a model for predicting financial distress based on financial ratios from financial services companies listed on the Amman Stock Exchange. It involves conducting appropriate statistical tests, such as multivariate discriminant analysis, to evaluate the effectiveness of the proposed model in distinguishing between distressed and healthy companies in the future.

2. LITERATURE REVIEW AND DEVELOPMENT OF RESEARCH HYPOTHESIS

2.1 Financial Distress

Financial distress is a situation where companies encounter specific financial difficulties that render them unable to meet their financial obligations. It is crucial for companies to take the necessary measures promptly, as

prolonged financial distress may lead to bankruptcy (Aker & Karavardar, 2023). Zhang defines financial distress as a common issue faced by companies, referring to a state where a company's earnings are insufficient to cover its liabilities at their due date (Zhang et al., 2024). Bae describes financial distress as a term used in corporate finance to denote a failure in timely repayment to the company's creditors, potentially leading to a decrease in the company's market value (Bae, 2012).

Financial distress is generally associated with one of the following scenarios (Corbett et al., 1991):

- Continuous financial losses, regardless of their magnitude.
- Losses amounting to half of the company's capital.
- Insufficient or complete lack of liquidity, hindering the ability to settle debts on time.

In summary, financial distress represents a financial imbalance faced by a company due to a severe liquidity shortage, causing it to lose control over its debt payments, which in turn hampers its regular operations.

For the purposes of this study, financial distress is defined as a situation where a company records losses for two consecutive years (Zebda, 2021), specifically for the years 2020 and 2021. The year 2021 is considered the year of distress, thus classifying companies that meet this condition as distressed.

2.2 Concept and Importance of Predicting Financial Distress

The process of predicting corporate financial distress is a critical aspect of managerial decision-making, applicable to both financial and non-financial firms. Financial distress can be identified through a series of warning signals of varying severity. Recognizing, analyzing, and accurately interpreting these signals can help managers and analysts take appropriate measures to mitigate the negative impacts of distress (Citterio, 2024). Financial distress prediction is defined as the use of tools by financial managers and decision-makers to anticipate the future financial position of the company (Mebrouki, 2021).

Financial distress reflects challenges faced by companies due to structural financial issues. These problems can affect the majority of the company's operations and may lead to bankruptcy, causing negative repercussions for the industry and the national economy. Thus, predicting financial distress is highly important in determining the likelihood of companies becoming distressed, enabling the implementation of preventive and corrective measures, and identifying low-performing companies while uncovering the root causes of their distress (Say, 2024).

2.3 Financial Distress Prediction Models

Financial distress prediction models are advanced forecasting tools primarily based on financial indicators. Credit managers, financial analysts, and creditors utilize these models to evaluate a company's future capability to meet its financial obligations (Rezende & Montezano, 2017). Such models act as early warning systems that, based on observed financial behavior, indicate potential threats to the company's financial health. These models are particularly important for creditors who need to assess whether a company can meet its financial commitments (Pech et al., 2020).

Numerous researchers have focused on financial distress prediction, resulting in several models still in use today. Below is an overview of some key studies:

1. **Beaver's Study (1966)**: This study aimed to develop a financial distress model using financial ratios. It included a sample of 79 healthy American industrial companies and 79 distressed ones. The researcher found the following ratios to be the most significant predictors: current assets to short-term debt, net profit to total assets, working capital to total assets, total debt to total assets, and self-financing to total debt.
2. **Altman's Study (1968)**: This study analyzed financial ratios to predict corporate distress, using a sample of 33 distressed and 33 healthy companies from the American industrial sector. Altman developed a model consisting of five financial ratios: working capital to total assets, retained earnings to total assets, earnings before interest and taxes to total assets, market value of equity to total assets,

and sales to total assets. The model achieved a prediction accuracy of 95% in the first year before distress, 72% in the second year, 48% in the third year, 29% in the fourth year, and 36% in the fifth year.

3. **Zavgren's Study (1985)**: This study aimed to evaluate the exposure of American industrial companies to distress using logistic regression analysis. The sample included 45 successful and 45 distressed companies from 1972-1978. The model predicted distress up to five years in advance using the following ratios: inventory to sales, receivables to inventory, cash to assets, quick assets to current assets, profit to total capital, debt to total capital, and sales to total capital.
4. **Chieng's Study (2013)**: This study examined the applicability of Altman's model in predicting distress for eight banks in the Eurozone, including four distressed and four non-distressed banks. The study concluded that Altman's model had a predictive capability of up to five years prior to distress for these banks.
5. **Kozarevic & Piric's Study (2022)**: This study evaluated the revised Z-Score model as a predictor of financial distress for 50 major industrial companies in the Federation of Bosnia and Herzegovina. The results indicated the effectiveness of the model, classifying 30 companies as stable, 10 as distressed, and 10 within the grey area.
6. **Pamungkas's Study (2023)**: This study analyzed financial distress using the Olson model in non-financial state-owned enterprises in Indonesia. It found a high default rate across all state-owned enterprises from 2017 to 2020, with the highest increase in defaults occurring in 2020 compared to 2019. The tourism sector experienced the most significant distress in 2020, while the agriculture and forestry sector had the least distress.
7. **Elsayid et al.'s Study (2023)**: This study applied the Kida model to predict financial distress in Egyptian companies, focusing on nine distressed firms. The findings confirmed the model's applicability, with seven companies showing distress in all years studied. It also highlighted that some management teams had concealed financial realities to mislead investors for personal gain.

The researcher observes a consensus among previous studies in addressing several financial indicators and utilizing pre-established models for predicting financial distress and failure. The following section details studies that have agreed on specific financial ratios and indicators. Both Pamungkas (2023) and Elsayid et al. (2023) have used the ratio of current liabilities to current assets as an independent variable. Additionally, both Elsayid et al. (2023) and Pamungkas (2023) employed the ratio of total liabilities to equity as an independent indicator. The Altman model for predicting financial distress was applied in the studies by Chieng (2013) and Kozarevic and Piric (2022). Furthermore, both Elsayid et al. (2023) and Pamungkas (2023) used the return on assets ratio as an independent variable.

Previous studies have covered a wide range of economic sectors across different regions of the world. However, most of these studies focused on the banking sector. The variations in results among these studies are attributed to differences in time, location, and the specific sector studied.

The current study stands out as the first of its kind in the financial services sector of the Amman Stock Exchange, to the best of the researcher's knowledge. It aims to develop a model for predicting financial distress based on financial ratios and indicators as independent variables (e.g., return on investment, dividend yield, financial independence, debt coverage ratio, and solvency ratio). The current study emphasizes 15 financial ratios selected based on the study environment, providing comprehensive, detailed, and accurate results. In contrast, most previous studies focused on testing the validity and effectiveness of pre-existing predictive models, with few attempts to build new models across different sectors.

2.4 Research Problem

The issue of financial distress represents a phenomenon that threatens the continuity of many institutions and companies, posing a risk during their operations, particularly for those that do not pay adequate attention to their financial status, potentially leading to bankruptcy. Financial distress has become a focal point for numerous studies aimed at preventing or at least reducing its occurrence by identifying indicators that can detect and predict it in advance.

According to the official website of the Amman Stock Exchange, the financial statements of companies in the financial services sector revealed that:

- Over 50% of financial services companies listed on the Amman Stock Exchange experienced financial distress between 2014 and 2021.
- Some companies in the financial services sector, such as Al-Amal Financial Consulting, Sabaek Investment, and the Jordan Mortgage Refinance Company, reported financial losses for two consecutive years during the period from 2014 to 2021.
- Other companies, such as the Jordanian Holding Company and the Jordanian Expatriates Holding Company, reported negative cash flows for several years during the period from 2014 to 2021. http://www.exchange.jo

Therefore, it is essential to find a solution to the issue of financial distress that companies may face in the future, aiming for early detection before it occurs, to enable necessary corrective measures.

Based on the above, the research problem is formulated through the following questions:
To what extent can the proposed model predict financial distress in financial services companies listed on the Amman Stock Exchange* two years before the distress occurs*?

2.5 Research Objectives and Hypothesis

The research aims to achieve the following objectives:

1. **Assess** the predictive ability of financial ratios derived from published financial statements in identifying financial distress among the studied companies by distinguishing between distressed and non-distressed firms.
2. **Develop** a proposed model consisting of a set of financial ratios capable of distinguishing between distressed and non-distressed companies.
3. **Test** the ability of the proposed model to differentiate between financially distressed and non-distressed companies two years before the occurrence of distress.

The research also seeks to verify the feasibility of using a model based on profitability and debt ratios, structured as follows:

$$Z = B\_1 * X\_1 + B\_2 * X\_2 + B\_3 * X\_3 + ... + B\_n * X\_n + \{Constant\}$$

Where:

- (Z) is the discriminant equation score.
- (B) represents the unstandardized discriminant coefficients.
- (X) denotes the actual values of the discriminant variables.
- (n) is the number of discriminant variables.
- Constant is the intercept of the equation.

The model relies on multivariate discriminant analysis to predict financial distress, aiming to achieve the proposed model, with the hypothesis stating that:
(The model can distinguish between distressed and non-distressed companies two years before the distress occurs).

3. RESEARCH METHODOLOGY

This research adopts a descriptive approach to describe, present, and analyze financial distress, along with an inferential approach for predicting distress among companies listed on the Amman Stock Exchange. The theoretical framework was established through a review of previous studies, books, research papers, and scientific articles. For the practical and applied aspect, data related to predicting financial distress risks among companies were collected and analyzed.

3.1 Analytical Methods Used

To test the research hypotheses, the following statistical methods were employed:

- Multivariate linear discriminant analysis to construct the model based on financial ratios of the financial services companies.
- Chi-square test to evaluate the model's validity in predicting its ability to distinguish between distressed and non-distressed companies.
- Wilks' Lambda and F-test to determine the discriminative power of the financial ratios in identifying distressed companies.

3.2 Research Population and Sample

The research population consists of 18 financial services companies listed on the Amman Stock Exchange (as per the website of the Amman Stock Exchange) that have complete financial data necessary for the research. A comprehensive survey approach was adopted, including all companies within the study population.

The study was applied to financial services companies listed on the Amman Stock Exchange, where more than 50% of these companies experienced distress and reported losses for two consecutive years. The study covered published financial data from 2014 to 2021, using the distress criterion established in the research (losses in 2020 and 2021 for distressed companies and profits for non-distressed companies).

The population was divided into two groups:

- The first group consists of companies classified as financially distressed, having incurred losses for two consecutive years (2020 and 2021), and totaling 9 companies.
- The second group comprises non-distressed companies, also totaling 9 companies. The selection aimed to match a distressed company with a non-distressed counterpart in terms of business nature and approximately equal paid-in capital.

The following table presents the names of these companies and their business activities:

Table No. (1) Research Population Companies

No	Distressed Companies	No	Non-distressed Companies
1	Tehama for Financial Investments	1	Jordanian Mortgage Refinance
2	Dar Al-Aman for Islamic Finance	2	Hope Financial Consulting
3	Jordanian for Development and Financial Investment	3	National Portfolio for Securities
4	Al-Daman for Investment	4	Jordanian Expatriates Investment Holding
5	United for Financial Consulting	5	Jordanian Management and Consulting
6	Al-Bilad for Securities and Investment	6	Hanging Gardens of Babylon Consulting
7	Al-Kafa'ah for Financial Investments	7	Jordan and Emirates Dimensions for Commercial Investment
8	Jordanian for Investment Fund Management	8	Jordanian Holdings Departments
9	Al-Sanabel International for Islamic Consulting	9	Saba'ek for Investment

Source: http://www.exchange.jo\ar

3.3 Research Variables

Financial distress represents the dependent variable, while the financial ratios in this study constitute the independent variables. These ratios are used to differentiate between distressed and healthy companies, serving as distinctive features for each group involved in the analysis. They were selected based on their ability to differentiate between the groups and to form a model that can later be employed to predict financial distress. The analysis uses 15 financial ratios, categorized into two groups: (7) profitability ratios and (8) leverage ratios. Below is a description of these ratios and their role in predicting financial distress:

A. Profitability Ratios:

1. **Return on Investment (Net Profit / Total Investment)**: This ratio indicates the company's efficiency in using and managing all available funds, including shareholders' equity and borrowed funds. A

significant decline in this ratio suggests a failure in managing the company's assets, threatening its continuity. (Ismail, 2014)

2. **Return on Equity (Net Profit / Equity)**: This ratio reflects the return generated for shareholders from their investment in the company. A decrease in this return might prompt shareholders to reallocate their funds to other investments, posing a risk to the company's future sustainability. (Ismail, 2014)
3. **Earnings per Share (Net Profit / Number of Shares)**: This ratio measures the company's financial performance, benefiting both shareholders and management. A decline in this ratio is a negative indicator for the company's future prospects and continuity. (Wahba et al., 2021)
4. **Dividend Yield (Cash Dividends per Share / Market Price per Share)**: This ratio estimates shareholder returns relative to the market price of the stock. A high dividend yield suggests that investors expect slow growth in dividends. (Khanfar, 2011)
5. **Book Value per Share (Equity / Number of Common Shares)**: A decrease in the book value per share below its nominal value indicates that the company has incurred losses that have eroded part of its capital. (Al-Maghribi, 2022)
6. **Dividend Payout Ratio**: This ratio represents the proportion of net profits distributed as dividends. A lower ratio is a negative indicator of the company's performance, increasing the likelihood of future financial distress. (Az-Zahwani, 2022)
7. **Market-to-Book Ratio (Market Value per Share / Book Value per Share)**: This ratio reflects the company's future financial performance. A decline in this ratio indicates lower return rates achieved by the company. (Wahba, 2021)

B. Leverage Ratios:

1. **Financial Independence (Equity / Total Liabilities)**: This ratio measures the extent to which the company relies on its own funds and its financial independence from creditors. A lower ratio indicates a higher reliance on debt. (Sabrina, 2021)
2. **Debt Servicing Ratio (Fixed Assets / Total Debt)**: This ratio assesses the company's ability to repay its debts using its fixed assets. A lower ratio indicates reduced financial solvency. (Sabrina, 2021)
3. **Debt Ratio (Total Liabilities - Shareholders' Equity / Total Assets)**: This ratio reflects the contribution of creditors to financing the company's assets. A higher ratio indicates increased company debt and a higher risk of default. (Az-Zahwani, 2022)
4. **Long-Term Debt to Working Capital Ratio**: This ratio measures the capacity to cover long-term debt using working capital. A higher ratio indicates a higher probability of financial distress. (Ismail, 2014)
5. **Current Liabilities to Equity Ratio**: This ratio shows the contribution of current liabilities in financing assets compared to equity. An increase in this ratio is a factor contributing to financial distress, while a decrease reduces debt-related risks. (Wahba, 2021)
6. **Long-Term Debt to Equity Ratio**: This ratio measures the relationship between long-term debt and shareholders' equity. A higher ratio suggests a greater reliance on borrowed funds, increasing the risk of financial distress. (Al-Sayah et al., 2019)
7. **Debt Coverage Ratio (Cash Flow from Operations / Total Debt)**: This ratio evaluates the company's ability to generate annual cash flows from operations to service both short-term and long-term debt. A lower ratio suggests a reduced capacity to meet debt obligations. (Al-Sheikh, 2008)
8. **Debt to Fixed Assets Ratio**: This ratio indicates the extent of debt contribution to acquiring fixed assets. A high ratio suggests a significant reliance on debt, which is a negative indicator for the company's future sustainability. (Khanfar, 2011)

4. DISCUSSION AND RESULTS

In an effort to develop a model for predicting financial distress among financial service companies listed on the Amman Stock Exchange, the financial ratios comprising the model were identified, along with the criteria for their selection. Additionally, information on standardized and non-standardized discriminant coefficients was presented according to the following steps:

4.1 Ratios Comprising the Discriminant Equation:

To select the most distinguishing ratios for differentiating between distressed and non-distressed companies, the aforementioned 15 ratios were input into SPSS software. Multivariate linear discriminant analysis was employed to construct the proposed model and derive the discriminant equation for predicting company distress.

The following table shows tests for equality of group means and the significance level for all variables (the studied ratios):

Tests of Equality of Group Means					
Variable	**Wilks' Lambda**	**F**	**df1**	**df2**	**Sig.**
Return on Investment	**.484**	**17.044**	**1**	**16**	**.001**
Return on Equity	**.489**	**16.751**	**1**	**16**	**.001**
Earnings per Share	**.647**	**8.734**	**1**	**16**	**.009**
Earnings per Share	**.701**	**6.838**	**1**	**16**	**.019**
Book Value of Common Stock	**.662**	**8.187**	**1**	**16**	**.011**
Dividend Payout Ratio	**.914**	**1.513**	**1**	**16**	**.236**
Market Value per Share to Book Value Ratio	**.904**	**1.689**	**1**	**16**	**.212**
Financial Independence	**.855**	**2.712**	**1**	**16**	**.119**
Liability Ratio	**.945**	**.929**	**1**	**16**	**.350**
Leverage Ratio	**.979**	**.350**	**1**	**16**	**.562**
Long-Term Loans to Working Capital Ratio	**.937**	**1.069**	**1**	**16**	**.317**
Current Liabilities to Equity Ratio	**.988**	**.187**	**1**	**16**	**.672**
Long-Term Debt to Equity Ratio	**.942**	**.978**	**1**	**16**	**.337**
Debt Coverage Ratio	**.995**	**.085**	**1**	**16**	**.775**
Debt to Fixed Assets Ratio	**.941**	**1.005**	**1**	**16**	**.331**

Table No. (2) Tests of the equality of group averages

The table indicates that the significance level (Sig) for (Return on Investment, Return on Equity, Earnings per Share, Dividend Yield, and Book Value per Share) is less than 0.05, which is statistically significant. This implies statistically significant differences between distressed and non-distressed companies for these five ratios. For the remaining ratios, the Sig value was greater than 0.05, indicating no statistically significant differences between distressed and non-distressed companies. Thus, the best ratios for distinguishing between distressed and non-distressed companies are the five financial ratios: (Return on Investment, Return on Equity, Earnings per Share, Dividend Yield, Book Value per Share). These ratios were selected based on their F-value and Wilks Lambda, as they exhibited the highest F-values and lowest Wilks Lambda among the variables included in the analysis.

4.2 Model Development Using Standardized and Unstandardized Discriminant Coefficients

The table below presents the standardized and unstandardized discriminant coefficients for the five previously mentioned financial ratios, reflecting their relative importance in constructing the model. For the purpose of developing the model necessary to calculate the discriminant score for predicting financial distress, it is crucial to include the unstandardized discriminant coefficients in the proposed model. This is done statistically by multiplying the unstandardized coefficients by the actual values of the associated financial ratios and then adding or subtracting the accompanying constant to obtain a value equivalent to the standardized score. The table also displays the unstandardized discriminant coefficient corresponding to each financial ratio previously identified as the most effective for predicting financial distress among financial service companies listed on the Amman Stock Exchange. The results obtained are as follows:

Ratio	Symbol	Kind	Non-standard discriminatory transactions	Standard discriminatory transactions
Earnings per Share	X1	Profitability	-0.61	-24.812
Return on Equity	X2	Profitability	2.957	15.896
Book Value per Share	X3	Profitability	-245.167	8.922
Earnings per Share	X4	Profitability	1.334	3.508
Return on Investment	X5	Profitability	18.749	-2.239
Constant			-49.833	

Table No. (3) Standard & Non-standard discriminatory coefficients

The absolute values of the standardized discriminant coefficients (regardless of their sign) indicate the importance of the independent variable in distinguishing between groups. A variable with a higher absolute value is considered more significant among the variables. From the previous table, it is evident that Earnings Per Share (EPS) is the most important financial ratio contributing to the differentiation between distressed and non-distressed companies, as its discriminant coefficient has the highest absolute value (24.812). It is followed by the Return on Equity (ROE) ratio with an absolute value of (15.896), then the Book Value per Share (BVS) with a discriminant coefficient of (8.922). The Dividend Yield (DY) ratio has a discriminant coefficient of (3.508), while the Return on Investment (ROI) ratio has the lowest discriminant power among the previous ratios, with an absolute value of (2.239).

The representation of the unstandardized discriminant coefficients for the financial ratios used in forming the discriminant equation (proposed model) follows the mathematical formula:

$$Z = -0.61X_1 + 2.96X_2 - 245.17X_3 + 1.33X_4 + 18.75X_5 - 49.83$$

Where:

- (Z): Represents the final value of the discriminant equation.
- (X_1): Return on Investment (ROI).
- (X_2): Return on Equity (ROE).
- (X_3): Earnings Per Share (EPS).
- (X_4): Dividend Yield (DY).
- (X_5): Book Value per Share (BVS).

To test the statistical significance of the proposed model, the Chi-Square and Wilks' Lambda values were determined as shown in the following table:

Model	Wilks Lambda	Chi - Square	DF	Sig
Profitability	0.018	38.431	5	0.000

Table No. (4) Values of Chi-Square

From the above table, it can be observed that the calculated Chi-Square value (38.431) is greater than the critical value (11.345) at a significance level of (0.01) and 5 degrees of freedom (equal to the number of variables in the discriminant equation). Furthermore, the significance level (Sig) of 0.000 is less than the significance level of (0.01), indicating that the combined financial ratios (the model) have the capacity to distinguish between distressed and non-distressed companies.

4.3 Hypothesis Testing

To test the research hypothesis, it is necessary to determine the cut-off point between the discriminant scores of the distressed and non-distressed companies. This is based on the mean centroids of each group, with the cut-off point being the midpoint between these centroids. The mean centroid for distressed companies was -7.064, while for non-distressed companies it was 7.064, resulting in a cut-off point of zero. According to the results of the derived discriminant equation, which consists of the five financial ratios mentioned in the model, the prediction of company distress or non-distress is as follows: if the discriminant score is positive, the company is classified as distressed; if the score is negative, it is classified as non-distressed.

The research hypothesis states: "***The proposed model differentiates between distressed and healthy companies two years prior to distress***."

To validate this hypothesis, the ability of the model to distinguish between distressed and non-distressed companies two years before distress (in 2019) was tested. The proposed model was applied to the financial data of the sample companies for the year 2019, and the results are presented in the following table:

No	Companies Research Sample	Discriminant Mark	Sign	Classification status according to the proposed model
1	Tehama for Financial Investments	-4.715	Negative	Distressed
2	Dar Al-Aman for Islamic Finance	35.729	Positive	Non-Distressed
3	Jordanian for Development and Financial Investment	-14.117	Negative	Distressed
4	Al-Daman for Investment	-7.407	Negative	Distressed
5	United for Financial Consulting	-2.972	Negative	Distressed
6	Al-Bilad for Securities and Investment	-6.116	Negative	Distressed
7	Al-Kafa'ah for Financial Investments	-5.775	Negative	Distressed
8	Jordanian for Investment Fund Management	0.372	Positive	Non-Distressed
9	Al-Sanabel International for Islamic Consulting	-9.423	Negative	Distressed
10	Jordanian for Mortgage Refinancing	-23.084	Negative	Distressed
11	Al-Amal for Financial Consulting	3.767	Positive	Non-distressed
12	National Portfolio for Securities	1.802	Positive	Non-distressed
13	Jordanian Expatriates Investment Holding	9.489	Positive	Non-distressed
14	Jordanian for Management and Consulting	2.563	Positive	Non-distressed
15	Hanging Gardens of Babylon for Consulting	26.365	Positive	Non-distressed

16	Jordan and Emirates Dimensions for Commercial Investment	-39.852	Negative	Distressed
17	Jordanian Holding Houses	74.124	Positive	Non-distressed
18	Saba'ek for Investment	-1.921	Negative	Distressed

Table No. (5) Distinguishing mark of the companies and their classification according to the proposed model two years before the distress

By calculating the Z-score discriminant value for the sample companies in 2019 (two years prior to financial distress), it was found that 10 companies had negative Z-scores. According to the proposed model, these companies are considered distressed. The remaining companies showed positive Z-scores, indicating that they are sound and not distressed. To evaluate the proposed model and test its predictive accuracy one year before distress, a comparison was made between the actual classification of the sample companies and the classification based on the proposed model for the year 2019. The results are shown in the following table:

No	Companies Research Sample	Actual Classification	Classification status according to the proposed model	Prediction Correct
1	Tehama for Financial Investments	Distressed	Distressed	True
2	Dar Al-Aman for Islamic Finance	Distressed	Non-distressed	False
3	Jordanian for Development and Financial Investment	Distressed	Distressed	True
4	Al-Daman for Investment	Distressed	Distressed	True
5	United for Financial Consulting	Distressed	Distressed	True
6	Al-Bilad for Securities and Investment	Distressed	Distressed	True
7	Al-Kafa'ah for Financial Investments	Distressed	Distressed	True
8	Jordanian for Investment Fund Management	Distressed	Distressed	True
9	Al-Sanabel International for Islamic Consulting	Distressed	Non-distressed	False
10	Jordanian for Mortgage Refinancing	Non-distressed	Distressed	False
11	Al-Amal for Financial Consulting	Non-distressed	Non-distressed	True
12	National Portfolio for Securities	Non-distressed	Non-distressed	True
13	Jordanian Expatriates Investment Holding	Non-distressed	Non-distressed	True
14	Jordanian for Management and Consulting	Non-distressed	Non-distressed	True
15	Hanging Gardens of Babylon for Consulting	Non-distressed	Non-distressed	True
16	Jordan and Emirates Dimensions for Commercial Investment	Non-distressed	Distressed	False
17	Jordanian Holding Houses	Non-distressed	Non-distressed	True
18	Saba'ek for Investment	Non-distressed	Distressed	False

Table No. (6) Actual classification of the companies and their classification according to the proposed model and the validity of the prediction during the year 2019

The predictive accuracy of the proposed model was also tested, with the classification of each group of companies and its percentage for 2019 shown in the table below:

Actual Group	Count	Classification according to the proposed model	
		Distressed Companies	Non-distressed Companies
Distressed Companies	9	7	2
Non-distressed Companies	9	3	6
Distressed Companies (%)	100%	77.8%	22.2%
Non-distressed Companies (%)	100%	33.3%	66.7%
The overall prediction accuracy rate was 88%, which is (7+6) / (9+9)			

Table No. (7) Accuracy of the prediction of the proposed model before the default in the year 2019

The previous table shows that the predictive accuracy for distressed companies was 77.8% (7/9), while the accuracy for sound companies was 66.7% (6/9). The overall predictive accuracy for the sample companies was 72%.

Based on the above, it is evident that this model successfully distinguished between distressed and sound companies two years before financial distress (in 2019) with an accuracy of 72%. Hence, the success of this model in differentiating between distressed and sound companies before financial distress refutes the research hypothesis, which stated: "The proposed model does not differentiate between distressed and sound companies two years before financial distress."

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The researcher, through discussing the results of the empirical study, reached several conclusions related to the research variables as follows:

- A proposed model was developed to predict financial distress for financial service companies listed on the Amman Stock Exchange. The non-standardized discriminant coefficients for financial ratios were used to construct the discriminant equation (proposed model) as per the following formula:

$$Z = -0.61X\_1 + 2.96X\_2 - 245.17X\_3 + 1.33X\_4 + 18.75X\_5 - 49.83$$

- The proposed model effectively distinguishes between distressed and sound companies two years prior to financial distress, i.e., in 2019, with an overall predictive accuracy of 72%. The predictive accuracy for distressed companies was 77.8% (7/9), while it was 66.7% (6/9) for sound companies, resulting in an overall predictive accuracy of 72%.
- This model successfully differentiated between distressed and sound companies two years before the financial distress, thereby confirming the validity of the stated hypothesis.

5.2 Recommendations

In light of the theoretical study and the empirical findings, the researcher formulated the following recommendations:

- Applying the proposed model to predict financial distress in financial service companies listed on the Amman Stock Exchange, as it demonstrated high predictive accuracy two years before distress.
- Encouraging investors in the Amman Stock Exchange to utilize financial distress prediction models to make informed investment decisions.
- Enhancing financial oversight by the Jordan Securities Commission on companies listed on the Amman Stock Exchange, particularly financial service companies, by ensuring transparency and publishing accurate financial data.
- Raising awareness among company managements regarding the importance of analyzing financial ratios, especially profitability ratios such as return on investment (ROI), return on equity (ROE), and earnings per share (EPS), which could help management in making appropriate decisions to avoid future financial distress.

5.3 Recommendations for Future Studies

The researcher suggests the following topics as potential future research projects:

- Developing a model to predict financial distress for small, medium, and large enterprises: A comparative study.
- Utilizing artificial intelligence techniques and neural networks for predicting financial distress in organizations.
- The role of machine learning algorithms in detecting financial distress in banks: A theoretical and empirical analysis.
- The impact of financial leverage and industry type on the degree of financial distress.
- The role of cash flow statement-derived financial ratios in predicting financial distress for companies.

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