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Prediction of Financial Failure Using the Altman and Sherrod Model Study of Saidal Institution of Medea Province between 2017 - 2020

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Abstract:

This study aims to highlight the importance and effectiveness of using the Altman and Sherrod models in predicting the financial failure of Saidal institution during the period 2017-2020 to give early warning in disclosing the likelihood of bankruptcy.
In order to achieve the objectives of the study, the two models were applied based on the institution's financial statements and the most important financial indicators. Thus, the study found that the two models are effective in predicting the future financial failure of Saidal institution during the period studied, 100% is needed.

Key words: Altman Model, Sherrod Model, Financial Failure Prediction, Saidal Institution.
JEL Classification Codes: G17, G32 , M4 .

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Introduction :

Predicting the failure of economic institutions is an important topic that has occupied many international bodies and accessions; has negative effects at the institution, investor and economic levels as a whole. It is mainly important for debtor creditors who may lose money in the event of financial failure. It is also important for auditors, management, employees and other relevant parties of the institution, whether internal or external, and has appeared to be interested in this subject since the 1930s. Researchers have used some financial indicators individually to predict the financial corruptions of institutions. Interest in this subject increased in the United States of America since the beginning of the sixties, in the wake of the major bankruptcy crisis that swept it after the Second World War. Major companies around the world, such as ENRON, collapsed in which the global credit crisis to a global recession in 2009. Researchers conducting studies aimed at identifying indicators that can inform the prediction of financial failure, since then several studies emerged that developed highly predictable models based on financial indicators and use besides modern methods of financial analysis. From this logic, we will try to apply Altman and Sherrod Model to predict financial failure and judge the financial position of Saidal institution in Medea province through strengths and weaknesses and detect distractions to help it grow and achieve its objectives according to its system.

Study Problem:

Based on the above and given the importance of the content, the following main question can be asked as follow:

How effective are the Altman and Sherrod models in predicting the financial failure of Saidal institution of Medea province?

The main problem can be divided into sub-questions as follows:

- What is meant by financial faltering and predicting it?
- How effective is the Altman model in predicting the financial failure of Saidal?

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- How effective is Sherrod's model in predicting the financial failure of Saidal?

Study hypotheses:

Based on the foregoing and as provisional answers to the sub-study questions, the following hypotheses can be formulated:

- Financial faltering means
- Altman's Model helps Saidal's financial failure prediction.
- Sherrod's model helps Saidal's financial failure prediction.

Significance of the study:

The importance of research derives from the importance of evaluating institutions' financial performance using modern indicators to evaluate performance; and forecasting the financial failure, the use of financial failure prediction models can give warning signals both for the institution and for stakeholders to find out the flaw to take the necessary measures that would avoid the institution falling into bankruptcy and then liquidate.

Aims of the study:

This study aims to:

- Demonstrate the concept, types and stages of financial failure.
- Recognize the financial failure prediction models Altman and Sherrod.
- Knowledge of the ability of the prediction models used in the study to identify the financial failure of Saidal.

Method:

The researcher used the analytical descriptive approach based on analysis of phenomena where some of the financial failure prediction models (Altman and Sherrod) were used based on the financial statements of Saidal institution for the period (2017-2020).

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Literature Review

Many studies that deal with the topic of statistical models to predict financial failure and the extreme importance of its application are explained in the following:

1. The study of Altman « Financial Ratios Discriminant Analysis and the Predication of Corporate Bankruptcy » (1968). The study aimed to determine the extent to which financial indicators can predict the financial faltering of a sample of 22 industrial institutions, 11 of which are faltered and 22 financial ratios were used as separate variables. The method of discriminant linear analysis was used to build a z- score function. Finally, it found the proportions that can predict bankruptcy:

- Sales to total assets.
- Retained earnings to total assets.
- Working capital to total assets.

The model was able to accurately predict corporate failure 83%.

2. The study of Al-Morchidi (2018): "The Use of the Sherrod Model to Predict the Financial Failure of Commercial Banks in Iraq." The study aims to apply the Sherrod Model in order to predict the financial failure of banks with a view to achieving preliminary results that help bank management diagnose the strengths and weaknesses of performance and take the necessary corrective action. The sample included 11 Iraqi commercial banks during the period 2013-2014. The study found that only two banks are not exposed to bankruptcy. Three banks have little likelihood of being exposed to bankruptcy risks. Other banks have results obtained through the model that the risks of bankruptcy are difficult to predict.

3. The study of Razak Salem (2020). This study aims to highlight the importance of the process of predicting financial failure using the Sherrod & kida model as a step to avoid bankruptcy in order to allow the institution to take the necessary procedures that would avoid bankruptcy and liquidation. The kida model shows that the complex under study is in a good financial position, far from financial failure, while the results of the Sherrod

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model analysis showed that it is difficult to predict the financial failure of the Saidal complex for the 2011-2018 period.

All of these studies relied on identifying procedures for predicting financial failure in banks and comparing Sherrod and Kida's model while our study focused on Altman and Sherrod's model at Saidal institution to detect the risk before it occurred.

1. Theoretical Frame work of the Study

1.1. Definition of Financial Failure:

The first definition: Beaver defined financial crises as when a company is considered failed practically when it experiences bankruptcy or fails to repay its debts, interest, or outstanding stock dividends. (WILLIAM, 1966)

The second definition: Altman defines financial distress as situations where companies have legally declared bankruptcy, placed under judicial supervision, or granted the right to reorganize under bankruptcy laws. (EDWARD, 1968)

The third definition: Deakin defines financial failure as the state of companies that have gone bankrupt, become insolvent, or have been liquidated for the benefit of creditors. (Abdelhamid, 1998)

Based on these definitions, a comprehensive definition of financial failure can be provided as an imprecise term to describe the financial state of a company as it becomes considered failed. Some use financial failure to refer to the moment of bankruptcy and the termination of a company through bankruptcy proceedings.

1.2. Types of financial failure:

- **Creeping Financial Failure:** This type of failure often results from various internal factors, such as ineffective management, excessive reliance on debt, unwise expansion, wasteful resource utilization, and relative cost inflation. It ultimately affects key aspects of a company, including financial structure and management efficiency.

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- **Sudden Financial Failure:** This type of failure occurs unexpectedly due to external factors like political, legal, economic, technological, social, or natural changes over which the company has little control.
- Economic Failure: Economic failure happens when a company's returns are insufficient to cover all costs, including the cost of capital. In other words, economic failure occurs when a company cannot achieve an adequate return on invested capital relative to expected risks.
- **Business Failure:** Business failure is associated with any business entity that ends its relationship with creditors with a loss, as defined by the financial analysis company Dun & Bradstreet.
- **Technical Insolvency:** Technical insolvency refers to a situation in which a company's management is unable to meet its due obligations even though it has more current assets than current liabilities. This type is often associated with a liquidity crisis within the company.
- **Liquidation Insolvency:** Also known as actual insolvency, this type of failure occurs when a company is unable to meet its due obligations even with sufficient time granted. It typically results from the company's total liabilities exceeding the market value of its total assets. This type of insolvency is more common compared to technical insolvency.

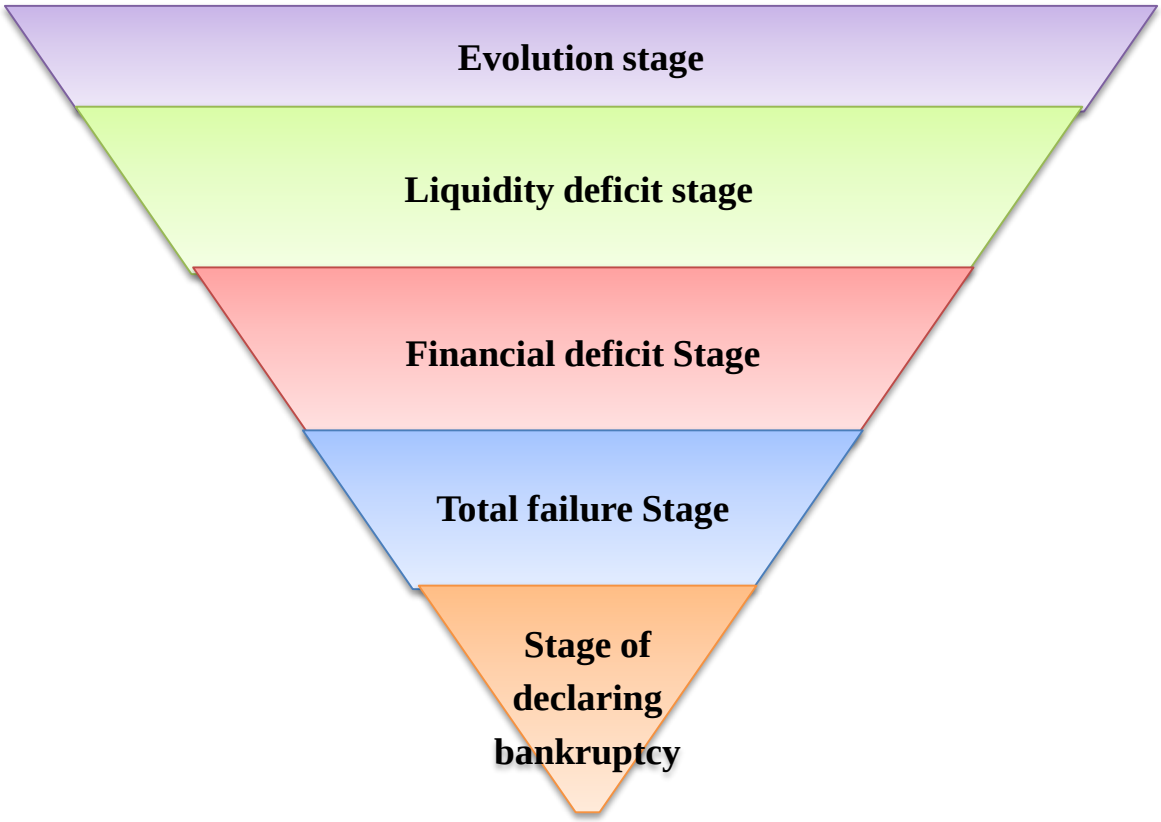
Financial crises are defined as a complete financial collapse accompanied by the failure of a large number of financial and non-financial institutions with a sharp contraction in macroeconomic activity, or it is the sudden decline in the prices of one or more types of assets, either physical capital such as machinery and equipments, or financial assets such as stocks and savings accounts, and their characteristics include:

- The occurrence of the element of violent surprise when it explodes.
- Insufficient and inaccurate information on the part of those responsible for the crisis.
- Lack of control, i.e. outside the scope of the decision-maker.

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The Chief Financial Officer must therefore avoid this crisis and predict the financial failure he/she will face; by analyzing the status of the institution and identifying any stage it has reached, the following figure shows this:

Fig.1. Stages of financial failure



Source: Prepared by the researcher, relying on Salim Ammari. (2015). The role of assessing financial performance in predicting the financial failure of companies, a case study of a sample of companies in the Kuwait Stock Exchange during the period 2009-2012. Magister's dissertation in commercial sciences, University of Ouargla, p. 40.

Evolution stage (emergence): it is the first stage of financial failure, as some indications appear: (Ammari, 2015)

- The change in demand for products and the continuous increase in indirect costs.
- The large increase in operating costs, and poor efficiency and production methods.

- Approval of investment expansions without the availability of sufficient working capital to meet them and the lack of credit facilities.

Financial deficit stage (liquidity deficit): in this stage, the institution suffers from its inability to meet current liabilities and its urgent need for cash despite the increase in fixed assets, and this is evident through the following aspects : (Bassam, 2004)

- The company's assets are greater than its liabilities.
- Difficulty converting assets into cash to cover outstanding debts.
- The institution's inability to meet its immediate cash needs.

Financial insolvency: this stage lies in the institution's inability to obtain the necessary funds to cover its outstanding debts, and it appears in:

- An amendment to the financial policies of the institution or a change of management.
- Working on issuing additional shares or issuing bonds.

Most of the institutions that pass through this stage are successfully dealt with if the defect is discovered in a timely manner and appropriate measures are taken. As for the institutions that cannot carry out the necessary treatment in a timely manner, they move to the fourth stage, which is the stage of total failure. (Matar, 2010)

Total failure stage (all insolvency): several indicators appear in this stage that warn of the possibility of bankruptcy of the company, including: (Ammari, 2015, p. 42)

- The company's dependence on borrowing and the deterioration of current assets and liquidity ratios.
- The continuous rise in the volume of debt and its rescheduling.
- Low profitability, faltering for consecutive periods, and the company's inability to compete.

This makes this stage a critical point in the life of the institution, when the administration's attempts to fight this total hardship achieved become futile.

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The stage declaring bankruptcy or confirm: this stage is characterized by the institution taking legal measures to protect the rights of the lenders, and the company is declared bankrupt ; i.e. the liquidation of the company, which is the final stage, and thus the company has reached the stage of failure. (Bassam, 2004, page 30)

After identifying the stage of financial failure, the financial manager proposes an effective strategy to avoid this crisis through statistical models. Below are some models for predicting financial failure in economic institutions.

The Approach Used in the Study for Predicting Financial Failure:

1.3. Edward Altman Model (1986):

Edward Altman developed his model in 1968 using financial ratios and relying on multiple-variable discriminant analysis. Through this model, he managed to distinguish between successful and failing institutions in the industrial sector. This model consists of five financial ratios aggregated from the development of 30 financial ratios. The model takes the following form (Assaous and Mourad, 2018, pp. 278-279).

$$Z = 0.012x_1 + 0.014x_2 + 0.033x_3 + 0.006x_4 + 0.01x_5$$

Whereas:

x_1: Net Working Capital / Total Assets.

x_2: Retained Earnings / Total Assets.

x_3: Earnings Before Interest and Taxes / Total Assets.

x_4: Equity / Total Liabilities.

x_5: Sales / Total Assets.

Where Z is a financial distress indicator, then:

- When $Z < 2.99$, the model predicts that the institution will not encounter financial distress.

- When $Z > 1.81$, the model predicts that the institution will face financial distress.

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- If the value of Z falls between (1.81 and 2.99), which is known as the gray area, the model cannot accurately determine the likelihood of the institution encountering financial distress or not.

1.4. The (Sherrod) 1987 Model:

It is defined as: "One of the modern models for predicting financial failure. This model relies on six independent financial indicators, in addition to the relative weights of the discrimination coefficients given to these variables. It is used to predict financial failure in banks."

While the Sherrod model makes objectivity a target, it does not negate the role of personal judgments of the credit manager in assessing other factors related to lending decisions, such as competition conditions, management efficiency, and client quality. All of these conditions affect loan risks, but the Sherrod model does not take them into account, given its quantitative nature rather than qualitative. (Medjoub & Houas, 2020, p. 97).

- **Sherrod Model Equation:** The Sherrod model equation is represented mathematically as follows (Fakhriou Boudi, p. 402-403).

$$Z = 17x_1 + 9x_2 + 3.5x_3 + 20x_4 + 1.2x_5 + 0.1x_6$$

The financial ratios comprising the Sherrod model: are used by financial institutions to predict the financial failure of credits applicants. This model relies on financial ratios, and each ratio has its own relative weight, as illustrated in the following table (Almorchidi, 2018, p. 262).

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Table 1. Financial Ratios in the Sherrod Model and Their Weightings

Indicator	Financial Ratio	Relative Weight	Type of Indicator
x_1	Net Working Capital / Total Assets	**17**	Liquidity
x_2	Cash Assets / Total Assets	**9**	Liquidity
x_3	Shareholders' Equity / Total Assets	**3.5**	Leverage
x_4	Net Profit Before Tax / Total Assets	**20**	Profitability
x_5	Total Assets / Total Liabilities	**1.2**	Leverage
x_6	Shareholders' Equity / Fixed Assets	**0.1**	Leverage

Source : (Ben Zaghda, 2021, p.343)

Based on the Z-score value, institutions are classified into five categories according to their ability to continue, and these categories are as follows:

Table 2. Z-score Classifications for the Sherrod Model

Category	Risk Level	Z-score
1st	Not at risk of bankruptcy	$Z \geq 25$
2nd	Low probability of bankruptcy	$25 > Z \geq 20$
3rd	Difficult to predict bankruptcy risk	$20 > Z \geq 5$
4th	Company is exposed to bankruptcy risk	$5 > Z \geq -5$
5th	Company is highly exposed to bankruptcy risk	$Z < -5$

Source : (Elchikh, 2008, p.102)

2. Field Study

2.1. Institution Under Study:

The community and sample of the study are represented by the company "Saidal" in the province of Medea. It is a joint-stock company with a capital estimated at 2,500,000,000 DZD. It operates as an industrial complex engaged in the development, production, and marketing of pharmaceutical products for human medicine. 80% of

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Saidal's capital is owned by the state, and the remaining 20% was transferred to investors from institutions and individuals through the stock exchange in 1999. The company obtained the ISO 9001 quality certificate, version 2000, awarded by the French organization for auditing and quality. It has managed to cover approximately 50% of the national market's needs and requirements and seeks to enter foreign markets and continuously explore the possibility of improving economic performance while addressing the concerns of public health in Algeria.

2.2. Study Tools:

The study uses the Altman and Sherrod models to predict financial failure and avoid bankruptcy for the Saidal complex in the Medea province. Financial statements for the period 2017-2020 were collected, mainly consisting of financial statements and income statement schedules. This was done in order to calculate the indicators that make up the selected financial failure prediction models, as previously discussed.

2.3. Study Steps with Analysis and Interpretation of Results:

In this section, we will apply both models to the Saidal institution in Medea during the period 2017-2020.

2.3.1. Application of Altman Model for Predicting Financial Failure in the Saidal Company in Médéa

The Altman model is constructed based on five financial ratios in the form of an equation with the following formula, which will be applied to the Saidal institution in Medea:

$$Z = 0.012x_1 + 0.014x_2 + 0.033x_3 + 0.006x_4 + 0.01x_5$$

The following table shows the elements used to calculate the model's variables based on the financial statements of the institution under study during the period 2017-2020.

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Table 3. Some Elements of the Abbreviated Financial Statements of the Saidal Institution in Medea during the Period 2017-2020

Statement	2017	2018	2019	2020
Retained Earnings	-65522891.4	74678485.08	/	/
Sales	1424834	974992	2306080	2031802
Shareholders' Equity	/	/	/	/
Profit Before Tax	829208523.83	1140188016.73	1011248915.05	688545199.02
Total Assets	1639143711.65	2279663676.91	2270003991.14	2402762493.60
Total Debt	553439764.51	804708762.9	447130918.82	583136000.17
Working Capital	832270505.4	1076009923.3	1389999902.9	1456950969.3

Source: Financial reports of the Saidal institution in the Medea province for the years 2017-2020.

In the following, we will present the values of the variables for the Altman model applied, which have been summarized in the following table:

Table 4. Values of the Altman Model Variables for the Saidal Institution in Medea during the period 2017-2020

Statement	2017	2018	2019	2020
x_1	0.5077	0.4720	0.6123	0.6063
x_2	-0.0399	0.0327	0	0
x_3	0.5058	0.5001	0.4454	0.2865
x_4	0	0	0	0
x_5	0.0008	0.0004	0.0010	0.0008
Z	0.5077	0.4720	0.6123	0.6063

Source: Compiled by the researcher based on the financial reports of the Saidal institution in Medea province during the period 2017-2020.

2.3.1.1. Interpretation of Results:

From the table, we observe the following:

1. Value x_1: This represents working capital as a percentage of total assets, indicating liquidity. The positive value of x_1 suggests a surplus in short-term liquidity, meaning

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the company operates without financial difficulties during the operating cycles. This makes its value acceptable throughout the study years.

2. Value x_2: This represents retained earnings as a percentage of total assets. We notice that the value of retained earnings was negative in 2017 but increased relatively in 2018, while it remained negligible in other years. This indicates that the company is not financially stable.

3. Value x_3: It represents the net profit before interest and taxes as a percentage of total assets, indicating profitability. We observe that it is generally high during the study years but starts to decline in 2019 and 2020 due to a decrease in profits.

4. Value x_4: This represents shareholders' equity as a percentage of total liabilities, and we notice that it is negligible throughout the study years.

5. Value x_5: It represents total sales as a percentage of total assets. We observe that it is generally acceptable during the study years, indicating good sales, and hence, no financial difficulties during the operating cycle.

6. Value Z: This represents the model's value, which can be used to assess the company's financial success or failure in the future. The results show that during the study years from 2017 to 2019, the value of Z falls within the range ($1.81<Z>2.99$), known as the gray zone. In this zone, the model cannot accurately predict the likelihood of the company's success or failure. However, in 2020, we observe that $Z>1.81$, indicating that the model predicts that the company is likely to face financial difficulties.

2.3.2. Application of Sherrod Model for Financial Failure Prediction in Saidal Institution in the Medea Province:

The Sherrod model is based on six financial ratios in the following equation, which will be applied to Saidal Institution in the Medea Province:

$$Z = 17x_1 + 9x_2 + 3.5x_3 + 20x_4 + 1.2x_5 + 0.1x_6$$

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The following table presents various values of some asset and liability elements derived from the financial statements of Saidal Institution for the period from 2017 to 2020, which help calculate the variables of the Sherrod model.

Table 5. Some elements of the condensed financial statements of Saidal Institution in Medea Province during the period 2017-2020.

Statement	2017	2018	2019	2020
Net profit before tax	829208523.83	1140188016.73	1011248915.05	688545199.02
Total Shareholders' Enquity	/	/	/	/
Cash Assets	92906366.96	62709213.53	2042516.70	10565047.07
Current Assets	1125455128.66	1679044307.91	1618605518.69	1786259988.51
Fixed Assets	513688582.99	600619369	651398472.45	616502505.09
Total Liabilities	1639143711.65	2279663676.91	2270003991.14	2402762493.60

Source: Financial reports of Saidal Institution in Medea Province for the years 2017-2020.

After reviewing the values of some asset and liability elements of Saidal Institution, which are used to calculate the variables of the Sherrod model and summarized in the following table:

Table 6. Values of Sherrod Model Variables for Saidal Institution in the Medea Province during the period 2017-2020.

Statement	2017	2018	2019	2020
x_1	0.5077	0.4720	0.6123	0.6063
x_2	0.0566	0.0275	0.008	0.0043
x_3	0	0	0	0
x_4	0.5058	0.5001	0.4454	0.2865
x_5	1	1	1	1
x_6	0	0	0	0
Z	**20.45**	**19.47**	**20.58**	**17.27**

Source: (Prepared by the researcher based on the financial reports of Saidal Institution in the Medea Province during the period 2017-2020)

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2.3.2.1. Interpretation of Results:

From the table, we observe the following:

Value x_1; x_3; x_4 have been explained previously.

Value x_2: This represents cash assets as a percentage of total assets. We notice that the cash ratio is very low throughout the study years, indicating that the company is unable to meet its short-term obligations and is unable to pay its operating cycle.

Value x_5: This represents total assets as a percentage of total liabilities. According to accounting principles, total assets should be equal to total liabilities, which are recorded as a value of 1.

Value x_6: It represents total shareholders' equity as a percentage of total fixed assets, and it is negligible during the study years.

Value Z: Through the values of Z in the Sherrod model, which is applied in the field of predicting and assessing the continuity of the company in the economic life, we obtain a range of $20 < Z < 5$. In this range, it becomes difficult for us to predict whether the company is in good condition or at risk.

Conclusion:

Financial failure prediction models share the commonality of being built on a set of financial ratios, differing in terms of their types and the weights assigned to each ratio. These models form a set of indicators that can be adopted to assess the likelihood of future financial failure for companies. Companies' reliance on modern indicators for financial performance evaluation has yielded better results compared to traditional financial ratios.

In this research, we attempted to evaluate the effectiveness of the Altman Z-score model and the Sherrod model for Saidal institution in the Medea Province in predicting financial failure. Additionally, we aimed to determine which of the two models is better

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at providing early warnings of financial distress, allowing necessary corrections to avoid bankruptcy.

After applying both models over the study years, we arrived at the following results:

- The study demonstrated the Altman Z-score model's ability to predict Saidal institution's financial failure during the period 2017-2020 with a high accuracy rate of 100%.
- Similarly, the study showed the Sherrod model's capacity to predict Saidal institution's financial failure during the period 2017-2020 with a high accuracy rate of 80%.
- Comparing the two models, it was evident that the Sherrod model couldn't provide results with high precision compared to the Altman Z-score model. The results also indicated that the company is at risk of bankruptcy and facing a challenging situation in the last year.

Based on the results obtained, we recommend the following:

- Encouraging Saidal institution to use and implement the Sherrod model due to its high predictive capability for financial failure.
- Raising the company's capital by attracting new shareholders to increase its capital base.
- Providing financial data for financial crisis prediction studies through a dedicated platform to allow researchers to conduct in-depth and new studies on this topic.
- Enhancing transparency and disclosure in the financial reports to achieve accurate results regarding the studied phenomena about the company.
- The necessity to review the investment policies of Saidal institution to identify the reasons for the decline in sales volume.
- The importance of training, qualifying, and motivating the management of Saidal institution, as the primary reason for financial failure lies in weak and inefficient management.

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