Arab American University

Faculty of Graduate Studies

Department of Administrative and

Financial Sciences

Master's Program in Accounting and

Auditing

Using Altman and Sherrod Models in Predicting Financial Distress of Industrial Listed Firms: A Case from Palestinian Exchange

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This Thesis Was Submitted in Partial Fulfillment of the Requirements for the Master degree in Accounting and Auditing.

Palestine, October /2024

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Financial Sciences

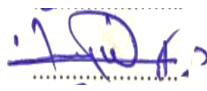**Master Program in Accounting and**

Auditing

Thesis Approval

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Palestine, October /2024

Declaration

I declare that, except where explicit reference is made to the contribution of others, this thesis is substantially my own work and has not been submitted for any other degree at the Arab American University or any other institution.

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Date of submitting the final version of the thesis: *19.1.2025*

Dedication

I dedicate my graduation, the fruit of my hard work, and the dream I long awaited—without ever giving up or becoming weary until I reached it—to my dear mother, who instilled in me ambition, removed obstacles from my path, and helped me get here. To my beloved father, who never ceased to support and encourage me, making my way easier in countless ways. To my beloved husband, who has been an incredible source of support and guidance throughout this journey. To the siblings of my soul and the beloved ones of my heart, my dear brothers and sisters, without whom life would not be complete. And to the joy of my heart and the light of my life, my beloved daughter.

Hams Mohammad Ali Abu Mushen

Acknowledgments

I thank Allah for granting me the completion of my thesis and bringing me through this stage.

"Whoever does not thank people does not thank Allah."

I extend my deepest gratitude to my beloved university, my second home, which has been a haven throughout my academic journey (Bachelor's and Master's).

To the esteemed faculty members who devoted their utmost efforts to impart their knowledge and helped me build and enhance my skills and expertise, and who never withheld their support in advancing my academic path.

To my thesis supervisor, Prof. Dr. Zahran Daraghmeh, who has provided invaluable support in completing this research.

And to everyone who extended a helping hand in completing this thesis.

Using Altman and Sherrod models in predicting financial distress of industrial listed firms: A case from Palestinian exchange

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Abstract

The study sought to investigate the application of the Altman and Sherrod models in predicting financial distress for industrial companies listed on the Palestine Exchange, using a case study approach. A descriptive-analytical methodology was adopted, and the research utilized a comprehensive survey method on (11) companies from the industrial sector in the Palestine Exchange, including pharmaceutical, cardboard, plastic, and vegetable oil companies, among others. A quantitative content analysis was conducted to evaluate each company's sustainability reports, utilizing secondary data extracted from annual reports. Stata 15 was used for statistical analysis, with descriptive tests, Pearson's test, multiple regressions, and the Breusch-Pagan test applied to the extracted financial data.

The results revealed that Bezeit and Jerusalem companies showed significant improvements in their financial health, with stable Altman and Sherrod model values. Bezeit's values increased over time, while Jerusalem's values also rose, reflecting financial growth. Beth Jala and Cartoon companies have shown recent improvements, though with fluctuations. Napco and Plastics companies experienced continuous deterioration, increasing financial risks. Vegetable Oils and Aziza achieved strong stability, while Golden Wheat and Jerusalem Cigarettes displayed diverse results, indicating financial challenges. Statistical analysis indicated that an increase in the ratio of retained earnings to tangible assets and the market value of shareholders' equity to total liabilities positively affects earnings per share (EPS), highlighting the importance of strong earnings retention and financial structures in enhancing profitability.

Additionally, improving the financial structure and increasing assets relative to liabilities, as well as net income before interest and taxes, are associated with better financial performance. Conversely, managing working capital and increasing sales negatively impacted EPS, suggesting these strategies may not significantly enhance profitability.

The weak positive effect of earnings before interest and taxes on tangible assets indicates limited operational efficiency benefits. Increases in current assets, net working capital, and total shareholders' equity to total assets also negatively affect EPS, underscoring the need for alternative strategies to improve financial performance. Based on these findings, the following recommendations are proposed: Companies should continue to implement financial improvement strategies that have contributed to current gains to ensure sustainable financial stability. It is advisable to strengthen current asset management and working capital to reduce volatility and achieve better stability. Improving operational efficiency and resource utilization effectiveness is essential to achieve better returns and reduce financial risks.

Keywords: Altman model, Sherrod model, financial distress prediction, industrial companies, Palestine Stock Exchange

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List of Definitions of Abbreviations

Abbreviation	Title
AICPA	American Institute of Certified Public Accountants
CMA	Capital Market Authority
EBIT	Earnings Before Interest and Taxes
EPS	Earnings Per Share
IMF	International Monetary Fund
PEX	Palestine Stock Exchange
PFMA	Palestinian Financial Market Authority
ROA	Return on Assets
SEC	Securities and Exchange Commission

Chapter One : Introduction

1.1. Background

Financial disaster forecasting is utilized to evaluate the concept of a company's stability in economic life, as well as its future ability to carry out its activities. The safety and stability of the financial sector are fundamental factors in ensuring financial stability Novak, et al.,(2022). There has been a pressing need for financial indicators, evolving with the increasing importance of financial data to extract measures and relationships that aid in decision-making. These ratios and indicators can be used to compare the performance of individual companies, similar institutions, or comparable periods, enabling the prediction of a company's future performance and financial position. One of the significant benefits of financial analysis and indicators is the ability to forecast potential problems by developing models and tools that provide early warnings of failure. Therefore, when companies face difficulties that may increase the likelihood of financial failure, they may struggle to sustain their operations. Controlling companies that have experienced failure is considered vital for the sustainability of national economic growth Uchenna & Okelue, (2012). For this reason, many companies resort to using financial failure prediction models, with the Altman and Sherrod models being prominent examples.

Based on this, the use of the Altman and Sherrod models constitutes a fundamental framework for assessing the financial situation and predicting financial problems in companies. This is particularly significant in the context of businesses. The Altman Z-Score model is considered a leading tool in analyzing insolvency risks, relying on the aggregation of multiple financial variables to produce a score that classifies the company into categories reflecting different levels of financial risk Elewa (2022). As for the Sherrod model, it provides an additional unique perspective for evaluating financial conditions, using variables and indicators that differentiate it from other models. It integrates additional financial factors for a comprehensive analysis, contributing to providing a more accurate insight into potential financial problems Jaafar & Bin Musa (2019). The strength of using these two models lies in their adaptability to the business context, incorporating local variables and factors that reflect the economic situation and business environment. This approach allows analysts and decision-makers to use

advanced prediction tools to assess risks and make sustainable decisions in the fields of investment and business management.

The effectiveness of financial operations plays a crucial role in a company's capacity to achieve its survival and long-term objectives. Mismanagement of financial aspects can lead to financial failure, which applies to all kinds of companies regardless of their legal structure or business activities. Financial stagnation poses significant challenges to companies as it not only affects them internally but also has negative repercussions on the overall economy. Decision-makers are particularly impacted by such situations; financial distress is considered one of the most important challenges facing companies, because of its impact on decision makers, such as investors, creditors, and others. Although companies are committed to preparing financial statements, in accordance with the requirements of accounting standards, which represent a source of information for decision makers, the information in these lists remains inadequate in providing them with a complete and clear picture of the entity, especially with regard to its future AlHamdani, et al (2013)

Specifically, matters related to the company's ability to continue remain ambiguous, and it is not easy to judge based on the information required by the standards. Therefore, it is necessary to rely on other methods to analyze the financial situation of companies and evaluate the risks surrounding them, and thus predict the possibility of their failure Hantono (2019) Increasing the ability to predict the company's future and its ability to continue would be in the interest of the parties related to the company's stakeholders and would enhance its governance aspects, especially after the bankruptcy of giant companies such as WorldCom and Enron Mohammed & Kim-Soon (2012).

The use of Altman and Sherrod models in predicting financial distress has become imperative and vital in the field of assessing the financial stability of companies. This model relies on a meticulous analysis of a set of financial indicators and ratios, enabling the identification of trends and changes that may indicate potential financial problems in the future. The model is based on a deep understanding of the interactions between various financial and economic variables, allowing for the early detection of fluctuations in financial performance. By employing the Altman and Sherrod models, companies can analyze weaknesses in their financial structure and anticipate potential challenges. This analysis contributes to early corrective actions, thereby reducing the risks of financial distress and improving the prospects for continued business operations. Consequently, the use of the Altman and Sherrod models enhances companies' ability to adapt to

financial challenges and ensures the sustainability of their financial performance over the long term Hamid, et al (2023).

This study aims to explore and analyze the effectiveness and use of the Altman and Sherrod models in predicting financial distress for industrial companies listed on the Palestine Exchange. The research seeks to understand how these models can contribute to assessing the financial stability of companies and detecting early warning signs indicating the possibility of future financial problems. The study will be conducted by analyzing financial data of industrial companies listed on the Palestine Exchange using the Altman and Sherrod models. It will focus on a diverse set of financial indicators and ratios utilized in these models, evaluating their ability to predict financial distress based on actual financial data. By concentrating on the Palestine Exchange, the study will provide a comprehensive analysis of the potential impact and effectiveness of these models within the specific economic and financial environment of Palestine. This research can contribute to enhancing the understanding of the relationship between the use of financial prediction models and the challenges faced by industrial companies in this regional context.

1.2 Research problem

The use of the Altman and Sherrod models in predicting financial distress for industrial companies is a significantly important step in the field of financial performance evaluation and risk management. The Altman model, relying on multiple financial variables, provides a robust framework for determining levels of financial risk and predicting the likelihood of bankruptcy. This model is considered a key analytical tool aiding investment decisions and capital management. As for the Sherrod model, it adds an additional dimension to predicting financial distress by incorporating additional financial indicators that may more accurately reflect shifts in the company's financial performance. This diversity in variables enhances and improves the assessment of financial risk, contributing to comprehensive insights into the financial health of the company. In the context of industrial companies, where changes in demand patterns and technology are rapidly evolving, relying on these models enhances the ability to adapt and make strategic decisions.

This increased utilization aids in improving the effectiveness of risk management and financial planning, enabling companies to respond effectively to financial challenges and market pressures. However, using these models requires careful consideration in the

context of Palestinian industrial companies. Local factors and unique challenges that may impact predictive accuracy, such as local economic conditions and structural constraints for companies, must be taken into account. The use of the Altman and Sherrod models represents a valuable tool to enhance risk management and make well-founded investment decisions with a strong financial foundation.The use of the Altman and Sherrod models in predicting financial distress for industrial companies listed on the Palestine Stock Exchange involves several aspects that warrant discussion and analysis. One of these aspects relates to the adaptation and cultural and economic suitability of these models in the Palestinian context. This aspect raises questions about the ability of these models to accurately identify signs of financial distress in a unique economic environment like Palestine, where economic, regulatory, and social conditions differ from other economic environments where the models have been tested.

Furthermore, differences in the economic and financial structures of industrial companies in Palestine, compared to companies in other global markets, are a factor influencing the accuracy of the models' predictions. These differences encompass local laws, accounting standards, the nature of financial markets, and geopolitical factors that may impact the performance of companies. Additionally, it is crucial to assess the efficiency of these models in the Palestinian context by presenting sufficient evidence of their ability to predict financial distress accurately and guide relevant stakeholders toward appropriate strategies for dealing with financial risks. Therefore, studying the effectiveness of the Altman and Sherrod models in predicting financial distress for industrial companies listed on the Palestine Stock Exchange is a significant challenge that requires a meticulous analysis of the suitability of these models and their adaptability to the local economic environment and the unique conditions of companies in Palestine. Based on the foregoing, we can formulate **the main research question as follows:**

"Can Altman and Sherrod Models Predict Financial Distress in Palestinian Listed Industrial Firms?"

1.3 Research Questions

1. Can the Altman model predict the occurrence of financial failure two years before it happens in Palestinian industrial companies?

2. Does Sherrod's model have the ability to forecast financial distress two years in advance in Palestinian industrial companies?

3. How applicable are the Altman and Sherrod models to industrial sector firms in Palestine?

4. Is there a consensus in the results obtained from applying the Altman and Sherrod models in predicting financial failure among Palestinian industrial companies?

5. Is there a statistically significant negative relationship between the Altman model and Earnings Per Share (EPS) in Palestinian industrial companies?

6. Is there a statistically significant negative relationship between the Sherrod model and Earnings Per Share (EPS) in Palestinian industrial companies?

1.4 Research Objectives:

1. Evaluate the ability of the Altman model to predict financial failure two years before it occurs in Palestinian industrial companies.

2. Analyze the capability of the Sherrod model to forecast financial distress two years in advance in Palestinian industrial companies.

3. Explore the applicability of the Altman and Sherrod models to industrial sector firms in Palestine.

4. Determine if there is a consensus in the results obtained from applying the Altman and Sherrod models in predicting financial failure among Palestinian industrial companies.

5. Study the negative relationship between the Altman model and Earnings Per Share (EPS) in Palestinian industrial companies.

6. Study the negative relationship between the Sherrod model and Earnings Per Share (EPS) in Palestinian industrial companies.

1.5 Significance of study

1.5.1 Theoretical Significance:

The theoretical importance of this study is evident in its contribution to financial modeling and forecasting theories. By measuring and comparing the effectiveness of various models in predicting financial default through financial statements, the study enhances our theoretical understanding of these predictive models. The findings may lead to advancements in the conceptual frameworks used in financial analysis, providing a theoretical foundation for refining and developing models for predicting financial failure and assessing the quality of such predictions.

1.5.2 Practical Significance:

The practical importance of this study lies in its potential to inform real-world decision-making within companies. Ascertaining whether the activity of a company will continue in the future or face financial distress is crucial for practical business operations. Additionally, by exploring the practical implications of the Altman and Sherrod models on actual company performance, the study provides insights that can guide companies in adapting their strategies and making informed decisions to navigate financial challenges effectively. The practical significance extends to the application of these findings in the Palestinian industrial sector, offering actionable insights for companies operating within this unique economic environment.

1.6. Research hypotheses:

1. The Altman model has the capability to predict the occurrence of financial default two years before it occurs.
2. Sherrod's model possesses the ability to forecast financial distress two years in advance.
3. The Altman and Sherrod models are applicable to industrial sector firms in Palestine.
4. There exists consensus in the results obtained from the Altman and Sherrod models when applied to predict financial failure among Palestinian industrial companies.
5. There is a statistically significant negative relationship between the Altman model and EPS
6. There is a statistically significant negative relationship between the Sherrod model and EPS

1.7 Research Justifications:

One of the key justifications for the study's use of Altman and Sherrod models in predicting financial distress for industrial companies listed on the Palestine Stock Exchange includes providing an opportunity to measure and compare the effectiveness of these models. This contributes to determining the efficiency and accuracy of these models within the context of the Palestinian stock market. The study also aims to enhance investor decisions by offering a better understanding of the models' ability to predict the financial conditions of companies. This empowers investors to make more informed investment decisions and strike a balance between risks and opportunities. The study promotes the

necessary adaptation of Altman and Sherrod models to the unique Palestinian economic environment, thereby improving the accuracy of predictions and guiding decisions more effectively. Additionally, the research plays a role in enhancing transparency and confidence in the financial market by providing scientific evidence of the models' capability to analyze financial performance. Lastly, the study adds value to academic knowledge by contributing to the development of concepts and theories related to financial performance assessment and predicting financial distress.

1.8 Operational definition:

1. **Altman Model:** Developed by Professor Edward Altman, this model is used to estimate the likelihood of bankruptcy for companies. The model relies on several financial variables such as the debt-to-equity ratio, liquidity, profitability, and others to assess the financial stability of the company (Marsenne et al., 2024).

2. **Sherrod Model:** Refers to a model developed by Professor Sherrod, aiming to predict financial distress for companies by analyzing multiple financial indicators, including debt, liquidity, profitability, among others (Yaseen & AL-Hmadane, 2024).

3. **Financial Distress:** Refers to the condition where a company finds itself unable to meet its expected financial obligations and faces difficulties in generating sufficient income to cover its expenses and debts (Rakshit, et al ,.2024).

4. **Predicting Financial Distress:** Signifies the ability of financial prediction models to identify companies that may face financial distress in the future through the analysis of a diverse set of financial variables and financial performance (Lotfi et al ,.2024).

5. **Industrial Companies:** These are companies that operate in the industrial sector, encompassing activities related to manufacturing products or providing services of an industrial nature. These companies can involve a wide range of activities, such as goods production, construction, and other services associated with the industrial sector. The sizes and types of industrial companies vary to align with the scope and nature of the businesses they engage in (Al-Khaja , 2020).

6. **Palestine Stock Exchange:** The Palestine Stock Exchange (PSE) is the primary securities market in Palestine, serving as the platform for the buying and selling of stocks, bonds, and other securities of listed companies. It provides a regulated marketplace where investors can engage in trading activities, facilitating the exchange of financial instruments and contributing to the overall functioning of the Palestinian financial system.

Chapter Two :Literature Review

2.1: Theoretical framework

2.1.1 Overview of the PEX

The Palestine Stock Exchange (PEX) serves as the principal securities market in Palestine, facilitating the buying and selling of various financial instruments, including stocks, bonds, and other securities, of listed companies. Established to promote economic development and investment opportunities in Palestine, the PEX plays a crucial role in providing a platform for businesses to raise capital and for investors to participate in the financial markets. Founded in 1995, the PEX has grown to become a key player in the Palestinian financial landscape. The exchange operates under the regulatory framework established by the Palestinian Capital Market Authority, ensuring transparency, fairness, and efficiency in its operations. The PEX is committed to maintaining high standards of governance and fostering an environment conducive to investment.

Listed companies on the PEX span various sectors, contributing to a diversified and vibrant market. Investors engage in trading activities through licensed brokerage firms, and the exchange employs modern technologies to facilitate secure and efficient transactions. The PEX also plays a pivotal role in enhancing financial literacy and awareness among investors and the public.Overall, the Palestine Stock Exchange serves as a vital institution for economic growth, capital mobilization, and investment in Palestine, contributing to the development of a robust and dynamic financial market in the region.

2.1.2 Sectors of the Listed Corporations in the PEX

The Palestine Stock Exchange (PEX) encompasses a diverse range of sectors, each represented by listed corporations that contribute to the overall market dynamics. The sectors of the listed corporations in the PEX include Palestinian Financial Market Authority, (2023):

Table (2-1) Distribution of Palestinian Public Shareholding Companies Listed on the Palestine Stock Exchange

Sector	Number of listed companies
Insurance Sector	7
Investment Sector	10
Industry Sector	13

Service Sector	11
Banking & Financial services sector	8
Total	49

Firstly :Insurance Sector:

The insurance sector in the Palestine Stock Exchange comprises 7 listed companies, and it revolves around the field of insurance as its core activities. This sector includes companies that provide insurance services covering various aspects such as life, property, automobiles, and more. These companies play a vital role in offering financial protection to individuals and institutions against potential risks. The presence of this sector reflects the diversity in the Palestinian financial market, enhancing confidence in the financial stability of individuals and the community. This contributes to the promotion of economic stability and achieving balance in the financial system. The following table illustrates the insurance companies operating in Palestine. (Palestinian Financial Market Authority, 2023)

Secondly :Investment Sector

Secondly, the Investment Sector in the Palestine Stock Exchange consists of 10 listed companies, reflecting the companies' interest in investment activities at various levels. Investment in this sector varies between securities, real estate, and other opportunities. These companies play a crucial role in stimulating economic activity and enhancing diversity in the securities market, contributing to the creation of diverse and sustainable investment opportunities (Capital Market Authority, 2023).

Thirdly: Industrial Sector

the Industrial Sector in the Palestine Stock Exchange comprises 13 listed companies, encompassing a wide range of businesses engaged in the production of goods and products. The activities within this sector vary among manufacturing companies operating in different industrial fields. This sector plays a vital role in supporting the local economy by providing employment opportunities and promoting industrial development. (Capital Market Authority, 2023)

Fourthly Services Sector

The Services Sector in the Palestine Stock Exchange consists of 11 listed companies and encompasses a variety of companies providing diverse services to consumers or other businesses. This sector includes financial services, technology, retail, and entertainment,

where these companies play a significant role in meeting market needs and providing services that enhance the local economy. (Capital Market Authority, 2023).

Fifthly :Banking and Financial Services Sector

The Banking and Financial Services Sector in the Palestine Stock Exchange comprises 8 listed companies, including a diverse range of banks and financial institutions. This sector provides a variety of banking and financial services tailored to the needs of customers, contributing to the support of the financial system and the enhancement of economic development in the region (Palestinian Monetary Authority, 2023)

2.1.3 Financial Solvency:

The concept of financial solvency has been defined in various ways, with notable definitions provided by different scholars. According to Habar (2024), financial solvency is the entity's or individual's ability to bear financial obligations and repay debts without significantly impacting its continuity in business. Another definition by Ben Hizia (2023) describes financial solvency as a state in which the entity or financial system is robust and capable of withstanding financial pressures while continuing to fulfill services and financial commitments. Al-Kholy & Soldier (2021) define it as "the extent of companies' ability to meet their financial obligations to others when due." Yahya (2020) defines it as "the companies' ability to cover their various costs."

As for the researcher, financial solvency is understood as the strength and capability of the entity or organization to survive and persist in business over the long term by managing its resources and achieving financial balance.

2.1.3.1 Financial Solvency Indicators

These are a set of ratios and indicators used to assess the ability of an entity (such as a company or individual) to meet its financial obligations. These indicators are employed to understand the financial position of the entity, its ability to fulfill obligations, and control financial risks. Some of the important financial solvency indicators, as highlighted by Habar (2024), include:

1. Current Ratio (Liquidity):   Evaluates the entity's ability to settle short-term obligations using liquid assets Formula: Current Ratio = (Current Assets / Short-term Liabilities)

2. Debt-to-Equity Ratio (Leverage):Measures the level of external financing compared to equity and indicates dependence on debt Formula: Debt-to-Equity Ratio = (Total Debt / Equity)

3. Self-Financing Ratio (Self-Financial Needs):Indicates the percentage of assets financed by internal resources compared to external financing Formula: Self-Financing Ratio = (Self-Financial Needs / Total Assets)

4. Debt-to-Income Ratio:Reflects the entity's debt burden in comparison to its annual income Formula: Debt-to-Income Ratio = (Total Debt / Annual Income)

5. Profitability Ratio:Shows the return on investment and evaluates the efficiency of asset management Formula: Profitability Ratio = (Net Profit / Total Assets)

6. Effective Coverage Ratio (Profit to Debt)Assesses the ability to repay debts using profits Formula: Effective Coverage Ratio = (Net Profit / Interest-bearing Debt)

2.1.3.2 Concept of Financial insolvency:

Several definitions have emerged to describe financial distress, with notable ones including the definition by Jabe & Al-Jaber (2015), where it is described as the state of a company when it lacks the ability to meet its financial obligations in general. This occurs when debts exceed assets, and the company is unable to generate sufficient profit to cover its costs. Sabeel (2013) defines financial distress as occurring when a company is unable to generate sufficient profit to meet its business commitments and outstanding debts, requiring asset liquidation or debt restructuring. Obaidat & Al-Shammari (2023) view financial distress as the condition of a company when it cannot fulfill its debts and outstanding financial obligations, potentially leading to legal actions such as settlements or bankruptcy.

The researcher defines financial distress as a state where entities, whether companies or individuals, are unable to fulfill their financial obligations. This condition is typically a result of liabilities outweighing assets and the entity's inability to bear or repay debts. Financial distress can be temporary or permanent and may lead to liquidation or bankruptcy, involving the liquidation of assets to settle debts.

2.1.3.3 Financial insolvency Indicators:

These are a set of ratios and indicators used to assess the likelihood of financial distress for a company or entity. Financial distress indicates the entity's inability to meet its financial obligations. These indicators serve as warnings to investors and managers about potential risks. Some common indicators of financial distress, as outlined by the International Monetary Fund IMF, (2014), include:

1. Leverage Ratio (Debt to Assets): Evaluates the entity's dependence on debt compared to its asset value. Calculated using the formula: Leverage Ratio = (Debt / Assets).
2. Debt Service Coverage Ratio (Debt to Income):Reflects the amount of debt used in comparison to the entity's income. Calculated using the formula: Debt Service Coverage Ratio = (Debt / Income).
3. Net Profit to Debt Ratio:Assesses the entity's efficiency in generating profit by comparing net profit to debt. Calculated using the formula: Net Profit to Debt Ratio = (Net Profit / Debt).
4. Cash Operating Ratio (Operating Income to Debt):Evaluates the entity's ability to generate cash through its operational activities compared to its debt. Calculated using the formula: Cash Operating Ratio = (Operating Income / Debt).
5. Debt Repayment Period:Assesses the time the entity needs to repay its debts. Calculated using the formula: Debt Repayment Period = (Average Cash Cycle / Average Debt).
6. Net Operating Ratio (Net Operating Income to Debt):Evaluates the ability to achieve profit through the entity's operations in comparison to its debt. Calculated using the formula: Net Operating Ratio = (Net Operating Income / Debt).

2.1.3.4 Financial Solvency in Mitigating Financial insolvency:

Financial analysis is a fundamental tool for assessing the financial condition of companies and predicting financial distress. This analysis helps companies understand their financial health and take necessary measures to avoid bankruptcy. Several techniques for financial soundness analysis have been discussed in this blog, including ratio analysis, cash flow analysis, and credit rating. In this context, recommendations have been provided to enhance the effectiveness of financial soundness analysis. One of the key reasons for improving financial soundness is the use of diverse techniques for analysis, with each technique offering a unique perspective that contributes to providing a comprehensive picture. Emphasis is placed on the importance of focusing on cash flow analysis to understand the ability to generate cash and meet financial obligations. Monitoring financial trends over time is crucial to identify potential problems early on. Effectively using industry standards for comparison and identifying areas that may need improvement is also stressed. Finally, the significance of considering qualitative factors, such as management quality and industry trends, and how they can impact the company's

financial situation is highlighted. Effective financial soundness analysis requires an integrated approach that benefits from multiple techniques and focuses on aspects such as cash flow, temporal trends, industry standards, and qualitative factors. By adopting such an approach, companies can enhance their ability to predict financial distress and take effective measures to avoid bankruptcy (faster capital, 2023).

2.1.4 Financial Distress:

Financial distress is a situation where individuals or companies face significant difficulties in managing or meeting their financial obligations. This condition can result from various factors, including deteriorating profitability, increasing debts, market fluctuations, and changes in economic conditions. Individuals in this situation encounter challenges in meeting their basic needs and covering the costs of their daily lives. Meanwhile, companies struggle with difficulties in repaying debts, funding operations, and maintaining business sustainability. Financial distress is often accompanied by increased levels of stress and pressure, requiring effective strategies to overcome financial challenges. Dealing with financial distress involves evaluating the root causes of the problem, making prudent financial decisions, and implementing corrective measures to improve the financial situation. With a deep understanding of the reasons for financial distress and the use of financial analysis tools, effective strategies for financial recovery can be developed, ensuring sustainability and future success (Biddle, Ma, & Song ,2022).

2.1.4.1 Definition of Financial Distress:

There have been many definitions of financial distress, among the most prominent is that provided by Bukalska & Maziarczyk (2023), which states that a company experiences difficulty in generating sufficient cash liquidity to meet daily financial obligations such as debt repayment and covering general expenses. In another definition, Ryu & Choi (2022) define financial distress as arising when a company's debt levels escalate to unsustainable levels, making it difficult for them to pay interest and repay principal debts in a timely manner. Additionally, Biddle, Ma, & Song (2022) noted that financial distress occurs when a company's ability to generate sufficient profits to cover fixed costs and meet growth or investment needs decreases, leading to funding shortages and escalating debt. Finally, Putri & ary binsar naibaho (2022) define financial distress as occurring when a company is negatively affected by market changes, such as decreased demand for its products or services, or due to technological advancements and changes in customer needs and preferences.

As a researcher, financial distress is defined as a state of inability to effectively meet financial obligations or bear daily expenses and debt commitments. This condition arises when individuals or entities face difficulties in achieving sufficient profit to cover their expenses and debts, leading to financial tensions and significant pressures.

2.1.4.2 Aspects of Financial Distress in Enterprises:

Researchers have varied perspectives in defining the criteria that identify aspects of financial distress, attributed to the diverse nature of enterprises, sectors, and the economy in general. It is believed that for most enterprises facing financial distress, a significant decline in profitability occurs, manifested by a decrease in earnings, a shortfall in incoming cash flows, and an increase in outgoing cash flows. These aspects can be easily discerned through analysis or by reviewing the published financial statements of the enterprise. Profits generating cash flows are considered the primary foundation for the continuity and survival of an enterprise. If operational losses accumulate continuously, the enterprise will be unable to meet its financial obligations, resulting in insufficient resources to cover operational costs such as employee salaries and other commitments (Abu Shihab, 2018).

Furthermore, aspects of financial distress in enterprises can be divided into tangible and intangible aspects. Enterprises may appear successful externally but could be failing in reality, with intangible aspects such as governance and ownership structure being attributed to this failure. Analyzing these factors reveals that control failure is considered the main reason for companies stumbling and failing without prior warning. Regarding tangible indicators, the most significant ones, according to the Australian Securities and Investments Commission ASIC, (2016), include:

- Weak accounting procedures and deviation from compliance with international standards.
- Absence of financial plans and budget estimates.
- Accumulation of debt (total liabilities exceeding total assets).
- Inability to pay bank interest.
- Outstanding debts exceeding 12 days.
- Presence of overdue debts and pending issues.

2.1.4.3 Causes of financial distress:

Financial distress can arise from various factors, both internal and external, that create challenges for an individual or entity to meet their financial obligations. Here are some common causes of financial distress Abu Shihab, (2018):

1. Poor Financial Management: Inadequate financial planning, budgeting, and monitoring can lead to financial distress. Mismanagement of funds, overspending, and lack of control over expenses contribute to financial instability.

2. High Debt Levels: Accumulation of excessive debt, whether through loans, credit cards, or other financial instruments, can strain financial resources. High debt servicing costs coupled with insufficient income can lead to financial distress.

3. Decline in Revenue or Income: A significant decrease in revenue or income, whether due to economic downturns, market shifts, or loss of clients, can lead to financial distress. Businesses rely on consistent cash flow to cover expenses, and a decline in revenue can quickly lead to financial difficulties.

4. Unforeseen Expenses or Losses: Unexpected expenses such as medical emergencies, legal fees, or major repairs can strain finances and lead to financial distress, particularly if there are no emergency funds or insurance coverage to mitigate the impact.

5. Market Volatility: Fluctuations in interest rates, exchange rates, commodity prices, or stock market values can adversely affect investments and financial portfolios, leading to financial distress for individuals, businesses, and investors.

6. Lack of Diversification : Overreliance on a single source of income, investment, or client can increase vulnerability to financial distress. Lack of diversification exposes individuals and businesses to greater risk if the primary source of income or revenue is disrupted.

7. Legal or Regulatory Issues: Legal disputes, lawsuits, fines, or regulatory violations can result in significant financial burdens for individuals and businesses. Legal expenses and penalties can strain finances and lead to financial distress if not adequately addressed.

8. Health Issues or Personal Crises: Personal crises such as health problems, divorce, or loss of a family member can disrupt financial stability. Medical bills, legal fees, and loss of income during periods of crisis can exacerbate financial distress.

9. Economic Factors : Economic recessions, inflation, unemployment, or changes in government policies and regulations can impact financial stability at both individual and macroeconomic levels, leading to widespread financial distress across industries and sectors.

10. Inadequate Risk Management : Failure to identify, assess, and mitigate financial risks such as market risks, credit risks, or operational risks can increase the

likelihood of financial distress. Effective risk management strategies are essential for maintaining financial stability and resilience against unforeseen events.

2.1.4.4 Stages of Financial Distress in Enterprises:

Extensive coverage has been given to the stages of financial distress in economic literature, where financial failure is considered a result of the emergence of aspects of distress and the failure of the enterprise. Financial failure does not occur suddenly; rather, it is marked by signs warning of the enterprise's stumbling towards failure. One of the most dangerous stages of financial distress is the neglect of the current situation. At this stage, the financial manager moves the enterprise from a state of financial distress to a state of financial failure due to ignoring early signs of financial problems. The stages of financial distress, according to Bazzam (2014), are as follows:

1. Early Warnings:In this stage, early signs of financial distress appear, such as a decline in profits, an increase in costs, or a slowdown in cash flow. The company should be cautious and consider these signs as an opportunity to take corrective actions.

2. Financial Situation Analysis: A detailed analysis of the financial situation of the company is conducted at this stage. This includes evaluating assets and liabilities and analyzing cash flow. This analysis allows the company to identify the roots of financial problems and take effective corrective actions.

3. Emergency Plan Development: Based on the financial situation analysis, an emergency plan is developed to address financial challenges. This includes cost reduction, improving capital management, and prioritizing spending.

4. Plan Implementation and Performance Monitoring: The company must implement the emergency plan and regularly monitor performance. This involves monitoring cash flow, ensuring the company adheres to the budget, and ensuring the achievement of financial goals.

5. Escalation of Financial Pressures:If corrective efforts do not improve the situation, financial pressures may escalate. This stage may include delays in debt repayment, an increase in financial costs, and tight cash flow.

6. Seeking Financial Solutions:The company may resort to seeking financial solutions to meet its financial needs, such as external financing or debt restructuring.

7. Liquidation or Settlement:In the case of ongoing deterioration, the company may be forced into liquidation or settlement. This step may involve selling assets to repay debts or negotiating plans to alleviate debt.

8. Final Liquidation or Bankruptcy:If improvement is not achieved, the company may reach the stage of bankruptcy or final liquidation, where business operations are terminated, and assets are distributed among creditors.

2.1.4.5 Types of Financial Distress for Entities:

Financial distress affecting an entity can manifest in three main forms **s**tudys marter (2023):

1. Economic Distress: This distress emerges as a result of the interaction of several factors when the return on capital is less than the average cost of capital. An economically failed entity finds it challenging to cover its expenses, where the return is negative and insufficient to meet the costs. An entity may face economic pressures without succumbing to bankruptcy, but it does not exempt it from bearing negative impacts on its sustainability (Susilowati et al , 2021).

2. Financial or Legal Distress: This type of distress can manifest in two scenarios. The first relates to insufficient liquidity, where the entity struggles to repay debts and due interests. The second scenario refers to financial distress occurring when the book value of assets is less than the cost of capital. Financial failure can lead to liquidation, a legal procedure involving selling all the entity's assets to settle its debts and other obligations (Mallinguh & Zéman, 2020).

3. Managerial Distress: Managerial distress arises from the inefficiency of the entity's management, resulting in negative outcomes affecting its operations and profits. Managerial failure includes a lack of future foresight and an inability to adapt to external changes, impacting stock value and contributing to the overall deterioration of the entity's performance (Susilowati et al , 2021).

2.1.5 Financial distress models

What precedes financial distress is the culmination of financial instability that affects an entity or a state of deterioration in financial indicators, coupled with the inability of the entity to meet its debt obligations. This situation impacts the stock prices of the entity in the stock market. Therefore, when auditors do not signal the entity's inability to continue, it implies the inefficiency of the auditing process and the absence of vital information for shareholders, investors, and stakeholders in the entity. Consequently, the failure to

declare the entity's inability to continue could cause harm to them (Al-Janabi ,2017). Auditors must consider quantitative models as effective tools to measure financial distress and predict it to assess the current situation of the entity. They should also take appropriate measures to address the occurrence of financial distress or adopt possible solutions to address distress issues. Financial distress is crucial for many categories related to the entity. The interest in predicting financial distress models emerged in the United States since the early 1960s, encouraged by the American Institute of Certified Public Accountants (AICPA) and the Securities and Exchange Commission (SEC). This was a result of the debate surrounding the role of auditors in excessive disclosure of the possibility of financial failure of entities and how to diagnose early signs of bankruptcy (Abdullah , 2019).

Financial distress models rely on comparative standards and the study of classifications of financial distress for economic units globally, especially in the continuity of the economic sector. Through this continuity, information is regularly updated and advanced techniques are utilized, as adopted in Britain. Numerous studies have emerged since the early 1960s to identify indicators that can be relied upon in predicting financial distress. The opinions of the American Institute of Certified Public Accountants recommend the necessity of determining the responsibility for imposing continuity on companies and how to diagnose financial distress early to prevent risks to investors, lenders, and others. Several researchers have introduced new models for prediction, and the most important of these models are presented in the following table, arranged according to the chronological order of the studies (Matar, 2016).

Table (2-7) Models for predicting financial distress

Researcher	Year
Beavers	1966
Altman	1968
Wilcox	1969
Lev	1969
Libby	1975
Argenti	1976
Moyer	1977
Altman	1977
Ohlson	1981
Kida	1981
Taffler	1982

Booth	1983
Campisi	1985
Casey	1986
Sherrord	1987
Koh	1990
Hat	1992
Ward and Foster	1997
Lennox	1999
Koh and Tan	1999

Among the models that used the method of multiple variables in one equation are Al-Rifai (2016):

2.5.1.1 Model (Beaver, 1966)

The Beaver model is considered one of the classical models in financial failure analysis. It was developed to identify variables that can contribute to predicting instances of bankruptcy for companies. The model examines a set of financial indicators to determine whether a company is susceptible to financial failure or not.

Equation:

The Beaver model includes several indicators and variables, but here is a basic equation to illustrate the concept of the model:

$$Z=1.2X1+1.4X2+3.3X3+0.6X4+0.999X5$$

Where:

- X1 represents the ratio of net profit to total assets.
- X2 represents the ratio of cash flow to total sales.
- X3 represents the ratio of current debt to total assets.
- X4 represents the ratio of equity to total assets.
- X5 represents the ratio of equity to debt.

If the value of Z is less than a certain threshold, the company may be prone to financial failure. This model allows analysts and investors to assess the stability of a company by analyzing key financial variables.

2.5.1.2 Model (Altman, 1968)

This model was developed by the finance professor at New York University, Edward Altman. He employed a multivariate linear discriminant analysis method to identify the best financial ratios capable of predicting financial distress. The study sample consisted of 66 industrial companies listed on the financial market, half of which were failing, and

the other half were non-failing. The sample was characterized by industry and asset symmetry.

Altman's model is based on five financial ratios, including liquidity, profitability, leverage, ability to meet short-term obligations, and activity. These ratios are represented as follows:

$$Z=1.2X1+1.4X2+3.3X3+0.6X4+1.0X5$$

Where:

- (Z)= is the financial distress index used to predict the success or failure of a project.
- (X1) is working capital to total assets (activity indicator).
- (X2)is retained earnings to total assets (indicator related to management's dividend policy).
- (X3) is operational profit before interest and taxes to total assets (profitability indicator).
- (X4)is market value of shareholder equity to total liabilities (financial leverage indicator).
- (X5) is sales to total assets (activity indicator).

Altman classified companies into three categories based on the Z-score:

1. Red Zone: If Z < 1.8, the company is likely to fail.

2. Gray Zone: If 1.9 < Z < 2.1, it's uncertain whether the company will fail or not.

3. Green Zone: If Z > 3.0, the company is not expected to fail.

Altman faced criticism for the model's limited application to public industrial companies and its disproportionate emphasis on the sales to total assets ratio. He later developed a modified model suitable for non-industrial companies, introducing a revised equation:

$$Z=6.5X1+3.26X2+1.05X3+6.72X4$$

Where:

- (X1) Net Working Capital to Total Assets.
- (X2) Accumulated Retained Earnings to Total Assets.
- (X3) Operating Profit Before Interest and Taxes to Total Assets.
- (X4) Book Value of Debt to Total Equity.

If (Z > 2.1), the model predicts that the company will not go bankrupt.

If (Z < 5.23), the model predicts that the company will go bankrupt.

If (2.1 < Z < 5.23), which is known as the gray zone, the model cannot accurately predict the probability of the company going bankrupt or not.

2.5.1.3 Model (Kida, 1982)

This model is one of the financial distress prediction models relying on five key independent variables of financial ratios. It adopts a discriminant analysis approach to classify observations into compatible categories, distinguishing between economically failed and non-failed units (Ghodrati & Monghaddam, 2013). The value of Z is determined by adding and subtracting the five variables multiplied by their respective weights according to the following equation:

$$Z=1.042X1+0.42X2−0.461X3−0.463X4+0.271X5$$

Where:

- **(X1)** Net profit before taxes to total assets, measures the rate of net profit earned by the entity for each dollar invested in assets before paying interest and income taxes. A higher value is considered favorable for the company's stability.
- **(X2)** Total equity to liabilities ratio, signifies the sufficiency of equity in covering financial obligations due. An increase in this ratio indicates the company's ability to meet its financial commitments, lowering the likelihood of financial distress.
- **(X3)** Current assets to current liabilities ratio, gauges the entity's ability to meet short-term financial obligations through its liquid assets. A higher value suggests the company's capability to fulfill short-term financial commitments, while a lower value indicates vulnerability to financial distress.
- **(X4)** Revenue to total assets ratio, measures the efficiency of the firm in utilizing its assets to generate revenue.
- **(X5)** Cash to total assets ratio, assesses the available cash compared to the total investment in assets. A higher value indicates sufficient liquidity to fulfill financial obligations, reducing the risk of financial distress.

Financial distress prediction is based on the Z value; a negative result implies a higher likelihood of financial distress, while a positive direction indicates increased company stability. The variables in this model play a crucial role in determining the financial health of a company, providing insights into its ability to meet financial obligations and avoid potential distress.

2.5.1.4 Model (Fulmer, 1984):

Fulmer developed a model to predict the failure of establishments using a sample consisting of 62 establishments, including 32 successful and 32 failed ones. He utilized 42 financial ratios and employed multivariate linear discriminant analysis to formulate the model:

H=5.528V1+0.212V2+0.073V3+1.270V4+0.120V5+2.335V6+0.575V7+1.083V8 +0.894V9−6.075

Where:

- (V1): Retained Earnings to Total Assets.
- (V2): Sales to Total Assets.
- (V3): Pre-Tax Profits to Shareholders' Equity.
- (V4): Cash Flow to Debt.
- (V5): Total Debt to Total Assets.
- (V6): Current Liabilities to Total Assets.
- (V7): Tangible Assets to Total Assets.
- (V8): Net Working Capital to Total Debt.
- (V9): Logarithm of Operating Profit Before Interest and Taxes to Interest.

An establishment is considered at risk of failure if (H < 0). The model achieved an accuracy rate of 18%.

2.5.1.5 Model (Zmijewski,1984):

Researcher Zmijewski conducted a study in 5184 on a sample of American establishments listed in the financial market, consisting of 42 bankrupt establishments and 822 non-bankrupt industrial establishments. In his model, he relied on three financial ratios from the financial reports of these establishments during the period 5178-5172. These ratios are the return on total assets, the debt ratio, and the turnover ratio. Zmijewski used the probit analysis to determine the values of the discrimination variables and find the relationship according to the following formula:

badjusted=−4.803−3.599X1+5.406X2−0.1X3

Zmijewski applied an additional step in his model compared to Altman's model by multiplying the constant and independent variables by the number 5.854. The modified formula is as follows:

badjusted=−8.7117−6.5279X1+9.8054X2−0.1814X3

Where:

- **(X1)** Return on total assets.
- **(X2)** Debt ratio.
- **(X3)** Turnover ratio.

The possible results of applying the equation indicate values between 0 and -5. Therefore, the likelihood of failure is based on the premise that if the result exceeds 2.1, the establishment is at risk of financial failure and possible bankruptcy.

2.5.1.6 Model (Sherrod, 1987)

The Sherrod model is a modern financial distress prediction model that relies on six independent financial indicators, in addition to the relative weights assigned to these variables through the discriminant function. The formulation of the model is expressed as follows:

$$Z=17·X1+9·X2+3.5·X3+20·X4+1.2·X5+0.10·X6$$

Where:

- **(X1)** : Working capital to total assets.
- **(X2)** Cash to total assets.
- **(X3)** Total shareholders' equity to total assets.
- **(X4)** Earnings before interest and taxes to total assets.
- **(X5)** Total assets to total liabilities.
- **(X6)** Total shareholders' equity to tangible fixed assets.

Based on the calculated Z score, companies are classified into five categories according to their ability to continue operating. The risk categories are as follows:

- Category: The company is not exposed to the risk of bankruptcy 5 =< Z
- Category: Low probability of bankruptcy risk 21< 20=< Z
- Category: Difficult to predict bankruptcy risk 22 < 5=< Z
- Category: The company is exposed to the risk of bankruptcy 1 < 5=< Z-
- Category: The company is significantly exposed to the risk of bankruptcy 5 > Z-

2.1.6 Distinguishing between solvent and insolvent corporation: theory and measurements:

2.1.6.1 Theory solvent corporation

A solvent corporation refers to a company that is financially stable and able to meet its financial obligations as they become due. The theory behind a solvent corporation revolves around several key principles. Rock, (2020):

1. Strong Financial Position: Solvent corporations typically have a strong financial position characterized by healthy balance sheets, sufficient cash flows, and adequate working capital. They often have assets that exceed liabilities, indicating a positive net worth.

2. Profitability: Solvent corporations are profitable entities that generate consistent revenues and earnings over time. They have effective revenue streams, efficient cost management, and sustainable profit margins.

3. Sound Capital Structure: These corporations maintain a balanced and sustainable capital structure. They avoid excessive leverage and debt burdens that could strain their financial health.

4. Cash Flow Management: Solvent corporations manage their cash flows effectively to ensure they have enough liquidity to cover operating expenses, debt payments, and other financial obligations.

5. Risk Management: They have robust risk management practices in place to mitigate financial risks and uncertainties. This includes prudent investment strategies, insurance coverage, and contingency planning.

6. Corporate Governance: Solvent corporations adhere to strong corporate governance principles and maintain transparent and accountable management practices. They prioritize shareholder interests while also considering the interests of other stakeholders.

2.1.6.2 Measurements:

To determine whether a corporation is solvent, various financial measurements and ratios are utilized, including Al-Asadi, (2019):

1. Current Ratio: This ratio compares a company's current assets to its current liabilities. A ratio greater than 1 indicates that the company has more current assets than current liabilities, which is a sign of solvency.

2. Debt-to-Equity Ratio: This ratio evaluates the proportion of debt financing relative to equity financing. A lower debt-to-equity ratio suggests a healthier financial position and lower financial risk.

3. Interest Coverage Ratio: It measures a company's ability to cover its interest expenses with its earnings before interest and taxes (EBIT). A higher interest coverage ratio indicates that the company is more capable of meeting its interest obligations.

4. Profitability Ratios: Ratios such as return on assets (ROA) and return on equity (ROE) assess the company's ability to generate profits from its assets and equity capital, respectively.

5. Operating Cash Flow: The amount of cash generated from operating activities provides insight into a company's ability to generate cash internally to meet its obligations.

2.1.6.3 Theory insolvent corporation:

An insolvent corporation refers to a company that is unable to meet its financial obligations as they become due. The theory behind insolvency revolves around financial distress and an imbalance between a company's liabilities and assets. Here are key aspects of the theory of an insolvent corporation Misra (2020):

1. Liabilities Exceed Assets: Insolvency occurs when a company's total liabilities surpass its total assets. In other words, the company owes more than it owns. This situation indicates a financial imbalance that may lead to an inability to cover debts.

2. Liquidity Issues: Insolvent corporations often face liquidity problems, meaning they lack sufficient cash or easily convertible assets to meet short-term obligations. This can lead to default on payments and financial distress.

3. Debt Overload: Excessive debt or unsustainable levels of borrowing contribute to insolvency. When a company borrows beyond its capacity to repay, it may face challenges in servicing its debt obligations.

4. Operating Losses: Continuous operating losses over an extended period can lead to insolvency. A company that consistently fails to generate profits may struggle to cover its operating expenses and debt obligations.

5. Negative Net Worth: When a company's liabilities exceed its assets, it results in negative net worth. This signifies that, theoretically, if the company were to liquidate its assets, there would not be enough to cover its outstanding debts.

6. Inadequate Cash Flow: Insolvent corporations often experience inadequate or negative cash flows from operating activities. This limits their ability to reinvest in the business, service debts, or fund necessary operations.

2.1.6.4 Measurements:

Several financial ratios and measurements are used to assess the insolvency of a corporation, including (Correa-Mejía & Lopera-Castaño, 2020):

1. Debt-to-Asset Ratio: This ratio compares a company's total debt to its total assets. A higher ratio indicates higher financial risk and potential insolvency.

2. Quick Ratio: Also known as the acid-test ratio, it measures a company's ability to cover its short-term liabilities with its most liquid assets. A ratio below 1 suggests potential liquidity issues.

3. Altman Z-Score: Developed by Edward Altman, this formula combines multiple financial ratios to predict the likelihood of bankruptcy. A lower Z-Score indicates higher financial distress.

4. Cash Flow Adequacy: Analyzing the company's ability to generate positive operating cash flows is crucial. Consistently negative or inadequate cash flows can signal insolvency.

5. Default Risk Metrics: Credit rating agencies assess a company's creditworthiness and the risk of default. A downgrade in credit ratings can indicate an increased risk of insolvency.

2.1.7 Ration that used as independent variables in financial distress models

2.1.7.1 The variables in the Altman model:

The Altman model, also known as the Z-score model, includes the following variables (Hosseini & Hajiannejad, 2022):

1. Working Capital to Total Assets (X1):Measures the proportion of a company's total assets that are financed by its working capital. Provides insights into the company's ability to cover short-term liabilities with its short-term assets.

X1 = Working Capital/Total Assets

2. Retained Earnings to Total Assets (X2): Reflects the portion of a company's total assets financed by its retained earnings .Indicates the reliance on internally generated funds for asset financing.

X2 = Retained Earnings/Total Assets

3. Operational Profit Before Interest and Taxes to Total Assets (X3): Measures the operational profitability of a company relative to its total assets. Indicates the efficiency of the company in generating profits from its asset base.

X3 = Operational Profit Before Interest and Taxes/Total Assets

4. Market Value of Shareholder Equity to Total Liabilities (X4): Compares the market value of a company's shareholder equity to its total liabilities. Reflects the market's perception of the company's financial health and risk.

X4 = Market Value of Shareholder Equity/Total Liabilities

5. Sales to Total Assets (X5): Assesses the company's ability to generate sales revenue relative to its total asset base. Indicates the efficiency of asset utilization in revenue generation.

X5 = Sales/Total Assets

These variables are used in the Altman model to calculate the Z-score, which is a composite index that predicts the likelihood of financial distress for a company. The Z-score is calculated as a weighted sum of these variables according to specific coefficients assigned by Altman.

2.1.7.2 Interpret the independent variables in the Sherroid model

The Sherrod model you provided is a financial distress prediction model that uses six independent financial indicators. Each of these indicators (X1) to (X6) contributes to a discriminant function, and the model calculates a composite score (Z) based on the weighted sum of these variables. Here is a breakdown of each variable (Yaseen & AL-Hmadane, 2024):

1. (X1) : Working Capital to Total Assets: Measures the efficiency of a company's working capital management relative to its total assets. It assesses the ability to cover short-term obligations using current assets.

2. (X2): Cash to Total Assets: Represents the proportion of a company's total assets held in the form of cash. It indicates the liquidity position and the ability to meet immediate financial needs.

3. (X3) :Total Shareholders' Equity to Total Assets: Reflects the extent to which a company is financed by shareholders' equity in comparison to its total assets. Higher equity to assets ratio signifies a lower level of financial leverage.

4. (X4): Earnings Before Interest and Taxes (EBIT) to Total Assets: Examines the profitability of a company by considering its earnings before interest and taxes in relation to total assets. It gauges the efficiency of asset utilization to generate earnings.

5. (X5) :Total Assets to Total Liabilities: Evaluates the proportion of a company's total assets financed by liabilities. It provides insights into the level of debt relative to the overall size of the company.

6. (X6) :Total Shareholders' Equity to Tangible Fixed Assets: Measures the reliance on shareholders' equity in funding tangible fixed assets. It considers the composition of equity in relation to tangible assets, providing insights into the capital structure.

2.1.8 Using Altman & Sherrod for Palestinian industrial corporations (industrial):

Using the Altman and Sherrod models to analyze the financial performance of Palestinian industrial institutions represents an effective tool for assessing the level of financial stability and predicting company failures. This model is based on a set of key

financial variables that reflect the company's performance and financial strength. The model includes several financial ratios, such as working capital to total assets, retained earnings to total assets, operational profit before interest and taxes to total assets, market value of shareholder equity to total liabilities, and sales to total assets. By analyzing these indicators, analysts and company management in the Palestinian industrial sector can gain a better understanding of the financial situation of companies and anticipate any potential challenges. The Altman and Sherrod models allow for classifying companies facing financial risks and those enjoying financial stability, facilitating strategic decision-making and preventive measures. Considering the economic and political challenges that may impact business in the region, using financial analysis models becomes crucial to maintaining the sustainability of companies and enhancing their effectiveness in facing future challenges.

The proposed model using the specific financial ratios in the Sherrod model is capable of achieving an effective prediction of financial failure before it occurs with sufficient lead time. This enhances the possibility of taking early preventive actions to avoid falling into a state of failure. The model underscores the importance of accurately collecting and analyzing financial information, providing an accurate picture of the financial position of companies in the Palestinian market, especially in the service sector. Through the analysis of the six financial ratios, the model enables managerial decisions to have a better understanding of financial challenges and potential risks. This allows companies to make strategic decisions that enhance sustainability and success. The study highlights the importance of accuracy in financial information and how the financial model can contribute to accelerating decision-making processes within companies. These results reflect companies' commitment to improving the quality and consistency of financial information to enhance business management and improve the effectiveness of future decisions (Zubdeh, 2021).

In Palestine, industrial companies apply both the Altman and Sherrod models, which is a significant recognition of their ability to predict financial distress for Palestinian industrial companies two years before it occurs. This has highlighted the need for a degree of consistency between the results of the two models, with a potential superiority of the Altman model over the Sherrod model in terms of accuracy. Despite the possibility that the accuracy rate resulting from the Altman model may be lower than that of the Sherrod model, the Altman model is characterized by fewer options in the results, making it more focused and easier to interpret. Although the result of the Sherrod model, "low probability

of failure," may be considered accurate in cases of success and failure, it may not reflect an accurate and true prediction result. This emphasizes the importance of using predictive models in general and the Altman and Sherrod models in particular to assess the sustainability of Palestinian companies. Increasing reliance on these model results and disclosing them in companies' annual reports encourages further research in this field, with a focus on comparing financial distress prediction models to enhance understanding and accuracy in this context (Abu Alia et al, 2021).

2.2 Previous studies

Revisiting previous research, a consensus emerges that highlights the importance of predictive models in assessing financial failure, identifying the Altman model and the Sherrod model as particularly critical. Moreover, there is widespread agreement, particularly clear in Middle Eastern countries, that emphasizes the necessity of calling for and urging companies and projects to give priority to financial failure forecasting activities, given their critical importance, especially in companies of various sectors in general and industrial sectors in particular, as this study will classify. Previous research is divided into two distinct sections:

2.2.1 Previous studies have examined Using the Altman model in predicting financial distress:

In 2024, multiple studies delve into the analysis of the Altman Z-Score model, each contributing to a broader understanding of its applications. One such study by Shi & Li (2024) focuses on assessing the predictive strength of the Altman Z-Score model concerning the bankruptcy of European airline companies. Notably, the Z00 (2017) score demonstrates satisfactory predictive power within the European aviation industry. In a different geographical context, Kumar & Chodisetty's (2024) research adapts the Altman model for implementation in the Indian banking sector. The results bring attention to extreme values in Indian banks, accompanied by an adequate capital adequacy ratio. Simultaneously, Salina et al (2024) study enhances the Altman Z model's effectiveness in predicting challenges faced by banks in Kazakhstan. Through reevaluation using different methods, the model achieves improved predictive accuracy, showcasing its effectiveness in identifying banks susceptible to economic challenges. Yuliana, et al (2024) investigation sheds light on the potential bankruptcy of listed aviation companies on the Indonesia Stock Exchange using the Altman Z-Score model. It discloses the

bankruptcy status of certain companies, emphasizing the necessity for improvement measures. Lastly, Sriwiyanti, et al (2024) study estimates the bankruptcy rate for Garuda Indonesia using the Altman Z-Score model. The results highlight a transition in the company's financial status from good to facing financial difficulties, as indicated by the average Z-Score. Together, these studies showcase the versatility and applicability of the Altman Z-Score model across diverse industries and regions.

In 2023 Multiple studies highlight the importance of using classification models such as Altman Z in assessing the financial stability of companies across various sectors. In Krishnamoorthy & Vijayapriya's (2023), the research aimed to classify automobile manufacturing companies in India using this model, revealing the presence of companies with strong financial positions and others facing financial challenges. Additionally, in their study, Bshina, Tawati, & Aljondi (2023) utilized the same model to predict the financial failure of Libyan commercial banks, emphasizing the versatility of Altman Z across financial and economic sectors. In a similar context, Abadi & Mubarok's study (2023) demonstrated the high accuracy of the Altman Z-Score model in predicting the bankruptcy of real estate companies in the Indonesian stock exchange, highlighting the significance of multiple financial factors in determining the model's final value. While Azam, Khan, Fahad, & Akhtar (2023) addressed the position of Indian banks using Altman's Z-score model, indicating variations in the financial status of banks and ongoing updates in their performance. In Shawqi & Naima's study (2023), the failure of small and medium-sized companies in the Malaysian stock market was analyzed using the Altman model, shedding light on continuous changes in the status of these companies. Finally, Anwar's study (2023) pointed out significant variations in the position of cement manufacturing companies in the Indonesian stock exchange using Altman Z-Score and Taffler models. These multiple studies translate into the importance of using evaluative models to examine financial performance and predict insolvency across a wide range of economic sectors.

In 2022, a study conducted by Elewa (2022) analyzed the impact of using Score-Z Altman models in predicting financial distress in Egypt based on a sample of 44 units over the period from 2016 to 2020. The study revealed that the use of these models plays a crucial role in the accuracy of predicting financial distress, indicating that employing Score-Z Altman models enhances the precision of predicting financial distress for companies. In light of these results, the study provided recommendations for investors to utilize its findings for early detection of potential financial distress in companies and

taking necessary preventive measures to avoid bankruptcy. As for the study by Ghaith (2022), the Altman model, along with stress tests, was employed to assess the risks of financial failure in banks in Iraq. The results showed that the prudent bank is susceptible to failure, emphasizing the importance of using a dual analysis that includes the Altman model and stress tests for a accurate understanding of financial risks and the implementation of effective reforms. The study's recommendations underscore the necessity of adopting dual analysis for a comprehensive assessment of banking risks and ensuring the stability of the financial system.Meanwhile, Salim & Ismudjoko (2022) focused on the financial distress fundamentals of coal mining companies in the Indonesian stock exchange using various models. The results indicated that Altman and Olszak modified models were the most accurate in predicting financial distress, highlighting the importance of choosing the appropriate model for financial analysis in specific sectors.

In 2021, Awwad & Razia (2021) studied the use of the Altman model to predict the performance of industrial companies on the Palestine Stock Exchange. The results showed that the Altman model has an effective ability to predict the performance of the Palestinian industrial sector, highlighting its importance as an evaluation tool for company performance in the financial market. In a study by Mabrouki (2021), the effectiveness of the Altman Zeta3 model in predicting financial failure in non-industrial economic institutions in Qatar was evaluated. The results indicated that the Altman Zeta3 model has a high predictive capability, enhancing its use as a crucial tool in financial performance assessment. In another study by Rahish. & Talkhukh (2021), the effectiveness of the Altman model in predicting financial failure of Algerian insurance companies was assessed. The results showed that the Altman model alone cannot be relied upon as an indicator for predicting the success or failure of insurance companies, emphasizing the importance of considering other aspects in risk assessment. in a study by Fauzi, Sudjono, & Saluy (2021), four bankruptcy prediction models were compared, and the results indicated that the Altman model was the most accurate and well-coordinated, making it a strong choice for assessing the stability of companies in the Indonesian market.

In 2020, a study conducted by Diana & Setiawan (2020) focused on the steel and iron industry in Indonesia. The results indicated that the Data Envelopment Analysis (DEA) approach, as a tool for predicting financial distress, achieved higher accuracy compared to the Altman model. This highlights the importance of achieving a balance between

various available tools for predicting financial conditions. Finally, in a study by Bjlaida & Al-Oubthani (2020), the Altman model was used to predict financial failure of industrial companies in the Saudi market. The results identified a threat of financial failure for 24 companies, underscoring the importance of using the model as an auxiliary tool for taking preventive measures and ensuring business sustainability in the economic environment.

Table (2.8): Summary of previous studies related to the Altman model

Authors and Year	Objective	Methodology and Statistical Method	Results	Conclusions
Shi & Li, 2024	Evaluate the predictive power of the updated Altman Z-score model in European airline companies	Use bankruptcy data of European airline companies (2009-2020)	Z00 (2017) score for the private sector shows satisfactory predictive power in the European aviation industry	Contributes a unique perspective on Altman's model accuracy in the European aviation sector
Kumar & Chodisetty, 2024	Adapt Altman model for use in the Indian banking sector	Financial analysis of Indian banks	Majority of Indian banks have suitable financial positions, except for two extreme cases	Recommends using a hybrid model for accurate conclusions about sustainability
Salina et al., 2024	Improve Altman Z model to predict economic challenges faced by banks in Kazakhstan	Re-estimation of the model using three different methods	Improved prediction accuracy to 70%	Altman Z model can be effective for detecting economic challenges in Kazakhstan's banking sector
Yuliana et al., 2024	Estimate the likelihood of bankruptcy for Indonesian stock exchange-listed airlines	Use Altman Z-Score model and financial data analysis	Bankruptcy decreased for Indonesian airlines listed on IDX	Emphasizes the need for a hybrid model for accurate predictions about sustainability
Sriwiyanti et al., 2024	Estimate the bankruptcy rate for Garuda Indonesia using Altman Z-Score model	Use financial data from 2012 to 2021 for analysis	Garuda Indonesia was not bankrupt until 2016, but its financial situation deteriorated in subsequent years	Garuda Indonesia in the gray zone or facing financial challenges
Krishnamoorthy & Vijayapriya, 2023	Classify Altman Z for Indian auxiliary automotive manufacturing companies	Economic analysis of ten companies listed on the Indian National Stock Exchange (NSE)	Some companies are sound, while others face financial challenges	Recommends using Altman model for evaluating and correcting company performance
Bshina et al., 2023	Predict financial failure of Libyan commercial banks using Altman model	Use Altman (-3Zeta) model on Al-Wahda Bank as a representation	Predicts financial failure likelihood for the studied bank	Recommends Libyan commercial banks utilize financial analysis models for performance improvement

Authors and Year	Objective	Methodology and Statistical Method	Results	Conclusions
Abadi & Mubarok, 2023	Calculate and analyze financial difficulties for Indonesian real estate companies using Altman Z-Score	Use Altman Z-Score and variables like liquidity, leverage, profitability, market ratios	High accuracy of Altman Z-Score in predicting bankruptcy	Companies in the gray zone or facing financial pressures
Authors and Year	Objective	Methodology and Statistical Method	Results	Conclusions
Azam, Khan, Fahad, & Akhtar (2023)	Analyze the financial situation of the top five specific Indian private banks over five years (2018-2022).	Used Altman's Z-score model to predict bankruptcy.	Varied financial levels over time for ICICI, HDFC, Axis, Kotak Mahindra, and IndusInd banks. ICICI improved from critical to safe, HDFC remained in the grey area, Axis maintained financial stability, Kotak Mahindra stayed financially secure, and Mahindra bank experienced changes between safe, critical, and back to the grey area.	Variations in financial performance present opportunities for further studies.
Shawqi & Naima (2023)	Predict financial failure of small and medium-sized listed companies on the Malaysian stock market (2016-2021) using Altman's model.	Applied Altman's model for prediction.	Two companies excluded from financial failure, two initially distant from failure but entered the grey area in 2021, one consistently in the grey area, and one considered prone to financial failure.	Highlighted cases of financial strength and challenges, suggesting potential bankruptcy.
Anwar (2023)	Determine the likelihood of financial distress in cement manufacturing companies listed on the Indonesia Stock Exchange (2018-2021) using Altman Z-Score and Taffler models.	Used Altman Z-Score and Taffler models for financial assessment.	Varying financial positions for cement companies; some in safe zones, others in grey areas, and some experiencing insolvency in specific periods.	Identified financial variations, indicating both strength and challenges leading to potential bankruptcy.
Elewa (2022)	Evaluate the impact of using Score-Z Altman models on predicting financial distress in Egypt using a sample from the EGX index (2016-2020).	Employed Score-Z Altman models for prediction.	Score-Z Altman had a significant impact on predicting financial distress, with the modified model providing better results than the original Altman 1968 model.	Recommended investors utilize the results for predicting company financial distress.
Ghaith (2022)	Examine the dual use of Altman model and stress	Applied five equations forming	Results indicated the bank's vulnerability to failure, supporting the	Recommended the dual use of Altman model and stress tests for

Authors and Year	Objective	Methodology and Statistical Method	Results	Conclusions
	tests in managing banking risks, using data from the Iraqi Hila Bank.	the basic Altman model.	research hypothesis. Stress tests emphasized the importance of a dual analysis for a more accurate risk understanding and effective reforms.	precise risk assessment and quick reforms.
Salim & Ismudjoko (2022)	Determine the financial distress foundations of coal mining companies in the Indonesia Stock Exchange using Altman, Springate, Zmijewski, Olszak, and Grover models (2015-2019).	Relied on descriptive design and quantitative data.	Altman and modified Olszak models were the most accurate, followed by Zmijewski and Grover, while Springate was the least accurate.	Identified accurate models for predicting financial distress in the coal mining sector.
Awwad & Razia (2021)	Use Altman model to predict the performance of industrial companies in the Palestine Stock Exchange (2013-2017).	Analyzed a sample of 12 industrial companies using multiple linear regression.	Altman model demonstrated statistical significance in predicting the performance of the Palestinian industrial sector. Highlighted challenges in adapting Altman model to the Palestinian environment.	Emphasized the need to adapt Altman model to the Palestinian context.
Mabrouki (2021)	Evaluate the effectiveness of Altman Zeta3 model in predicting financial failure in non-industrial economic institutions in Qatar (2018-2019).	Applied Altman Zeta3 model on Qatari Stock Exchange-listed institutions.	Altman Zeta3 effectively classified economic institutions into successful and failed categories with high predictive ability.	Acknowledged the high predictive power of Altman Zeta3 in classifying economic institutions.
Authors and Year	Objective	Methodology and Statistical Method	Results	Conclusions
Rahish. & Talkhukh (2021)	Evaluate the effectiveness of Altman model in predicting financial failure for Algerian insurance companies.	Applied Altman model to five Algerian insurance companies using financial statements from 2014 to 2018.	Altman model alone cannot be relied upon as an indicator for predicting success or failure of insurance companies accurately.	Cautioned against relying solely on Altman model for predicting financial status.
Fauzi, Sudjono, & Saluy (2021)	Compare the predictive accuracy of Altman, Springate, Zmijewski, and Grover models for bankruptcy in the Indonesian	Used purposive sampling method for companies listed on the Indonesian Stock Exchange in the telecommunications sector.	PT. Telkom was financially healthy, while PT. Indosat, PT. XL Axiata, and PT. Smartfren showed financial unhealthiness based on Altman and Springate models. Zmijewski and	Altman model was the most accurate and consistent for bankruptcy analysis in the telecommunications sector.

Authors and Year	Objective	Methodology and Statistical Method	Results	Conclusions
	telecommunications sector (2014-2019).		Grover models produced inconsistent results. Altman model was considered the best due to its accuracy and consistency.	
Diana & Setiawan (2020)	Examine financial distress as an early indicator of bankruptcy and compare Altman's Z-score model with Data Envelopment Analysis (DEA) in predicting financial distress in the steel and iron industry in Indonesia (2013-2018).	Focused on seven listed companies in the steel and iron industry.	DEA achieved higher accuracy (92.86%) compared to Altman model (85.71%) in predicting financial distress. Highlighted the value of DEA as a tool for predicting financial distress in the steel and iron industry in Indonesia.	Highlighted the value of DEA as a tool for predicting financial distress in the steel and iron industry.
Bjlaida & Al-Oubthani (2020)	Use Altman model to predict financial failure for a sample of 75 industrial companies listed on the Saudi stock market (2012-2018).	Utilized Altman model for prediction.	Identified 24 companies at risk of failure, 30 successful companies with no threats to continuity, and the model did not determine the fate of the remaining companies. Companies were advised to use Altman model and take necessary actions to avoid bankruptcy.	Altman model highlighted financial risks for some companies, urging them to take preventive measures.

2.2.1.1 Areas of Agreement:

- Versatility of Altman Z-Score Model: Across the years, studies consistently highlight the versatility of the Altman Z-Score model in various industries and regions. Researchers have applied the model to assess financial stability, predict bankruptcy, and analyze the distress of companies across sectors such as airlines, banking, real estate, manufacturing, and insurance.

- Predictive Capability: Despite differences in contexts and methodologies, studies generally agree on the Altman Z-Score model's predictive capability in assessing financial distress and bankruptcy risk. Many studies demonstrate the model's effectiveness in identifying companies or banks susceptible to economic challenges or financial failure.

- Importance of Financial Analysis Models: Multiple studies underscore the importance of using evaluative models like the Altman Z-Score model to examine financial performance and predict insolvency across a wide range of

economic sectors. They emphasize the significance of these models in providing valuable insights for investors, stakeholders, and policymakers.

2.2.1.2 Areas of Difference:

- Contextual Variation: While the Altman Z-Score model consistently demonstrates predictive power, its performance may vary across different economic contexts and sectors. Some studies highlight specific challenges faced by industries or regions, indicating the need for context-specific analysis and model adaptation.

- Model Comparison and Preferences: Studies conducted across different years sometimes favor different predictive models or methodologies for financial analysis. While some studies compare the Altman model with other bankruptcy prediction models, others focus solely on its effectiveness. This variation reflects different research objectives and preferences among researchers.

- Recommendations and Policy Implications: Studies offer diverse recommendations and policy implications based on their findings. While some advocate for the adoption of dual analysis combining stress tests with the Altman model for a comprehensive assessment of financial risks, others emphasize the importance of considering multiple factors beyond the Altman model alone.

2.2.2 Previous studies have examined Using the Sherrod model in predicting financial distress

In 2024, a study conducted by Yaseen & AL-Hmadane used the Sherrod model to estimate and predict financial failure in a diverse group of financial institutions in Iraq. The results indicated that the National Company for Tourism Investment did not experience financial failure during the studied period, suggesting an accurate assessment of financial conditions and a good understanding of risks. In 2023, Dahmani & Gharebi focused on the importance of predicting financial distress in banks using the Sherrod model. The results revealed flaws in the bank's financial indicators, highlighting the need to activate risk management to identify and address the causes of financial distress. Another study by Suleiman & Al-Shakarchi in 2023 addressed the consequences of financial failure for banks in Iraq, utilizing the Sherrod model to define the boundaries of financial failure. The results emphasized the importance of liquidity ratio and the accuracy of the Sherrod model in testing financial failure, indicating its effectiveness in the banking environment. In another study by Ahmed & Saeed in 2023, the Sherrod model

was employed to predict financial failure in private Iraqi banks, with results showing the model's ability to predict financial failure effectively, underscoring the importance of such tools in guiding financial strategies.

The study by Hafsi, Drissi, & Sha'ran in 2023 targeted predicting credit default in Algerian commercial banks using the Sherrod and Kida models. The results indicated the difficulty of the Sherrod model in predicting financial distress, while the Kida model succeeded in doing so. Zinal (2023) conducted an analysis of several applied studies using the Sherrod model to assess and predict financial failure in various institutions. The findings concluded that most commercial banks in the Iraqi securities market are safe from financial failure, except for some facing a threat of insolvency. Additionally, the study by Khaled & Boutraa in 2023 addressed the effectiveness of the Sherrod model in predicting financial failure for economic institutions, showing the model's potential adoption for identifying financial distress with a high percentage.

In 2022, a study by Hamid, Haji, & Kurdistan emphasized the importance of using the B-Sherrod model to detect and predict challenging economic conditions. The study highlighted the model's utility in assessing companies' ability to continue operations. However, in 2021, a study by Belkacem & Kalkhal revealed limitations in the Sherrod model's ability to distinguish between successful and failing institutions in Algeria, indicating a lack of compatibility with the Algerian institutional environment. Another study by Rezhin in 2021 conducted a pilot test on commercial banks in the Iraqi securities market using the Sherrod model. The results showed strong financial strength for some banks and challenges faced by others, underscoring the importance of evaluating the risks of financial failure and preparing for challenges.

In 2021, Abdel Khaleq, Abu Bakr, & Shashua analyzed companies listed on the Algerian stock exchange using both Kida and Sherrod models. The study concluded that all companies face financial failure risks according to the Kida model, while Sherrod model results indicated a threat of bankruptcy for only one company. Researchers recommended formulating a model that aligns with the reality of companies listed on the Algerian stock exchange. In 2020, Abed utilized the Sherrod model to predict financial distress in economically listed units on the Palestine Stock Exchange. The study demonstrated the potential reliance on the Z value of the Sherrod model to assess future distress opportunities. In 2020, Razzaq employed Kida and Sherrod models to predict

financial failure in an Algerian economic institution, indicating good financial strength for the institution and difficulty in predicting financial failure using the Sherrod model.

In the study conducted by Ben Musa & Abdel Nour in 2019, the Sherrod model was utilized to predict financial failure in economic institutions in Lebanon. The study affirmed the model's importance in predicting failure and making future financial decisions. Another study by Al-Shamri in 2019 discussed the significance of predicting financial failure in financial institutions using the Sherrod model. The study emphasized the model's importance in assessing bank activity and predicting their ability to survive in the working environment. Rahish & Shanouf in 2019 conducted an analysis to predict financial failure in Algerian insurance companies using both Kida and Sherrod models. The study concluded that there was a contradiction between the two models. Babela & Mohammed in 2016 shed light on predicting the financial failure of banks listed on the Iraq Stock Exchange using Sherrod and Kida models. The results showed a clear contradiction between the two models. Alsaydia & Al-Hashmee in 2016 used the Sherrod model to analyze non-performing loans in Iraqi banks. The study indicated that an increase in credit risks negatively affects capital and liabilities. Arkan in 2015 analyzed the effectiveness of the Sherrod model in predicting financial distress in a manufacturing company in Kuwait. The study demonstrated that the model could be used to evaluate the company's performance and predict its ability to move forward. Orabi in 2014 provided an evaluation of the effectiveness of predictive models for financial failure in Jordanian establishment companies using Altman and Sherrod models. The study clarified a clear contradiction between the two models, indicating that each model has its own features and challenges.

4Table (2.9): Summary of previous studies related to Sherrod's model

Authors and Year	Objective	Methodology and Statistical Method	Results	Conclusions
Yaseen & AL-Hmadane, 2024	Use Sherrod model to predict tourism companies' failure in Iraq and take preventive measures.	Applied Sherrod model to National Tourism Investment Company in Iraq using financial statements (2016-2021).	Company showed no financial failure risk with Z quality index rising to 25. Recommends proper assessment and risk avoidance.	Sherrod model effective for financial evaluation and risk prevention in Iraqi tourism companies.
Dahmani & Gharebi, 2023	Highlight importance of predicting financial distress in banks using Sherrod model. Applied to	Sherrod model analysis revealed financial indicators issue in the studied bank. Recommends risk	Sherrod model effective in predicting financial distress in Algerian banks. Emphasizes its use in	Useful for credit risk management.

Researchers	Goal	Methodology and Statistical Method	Results	Conclusions
		Algerian National Bank.	management for credit issues.	guiding financial decisions.	
Suleiman & Al-Shakarchi, 2023	Examine financial failure consequences in Iraqi banks, use Sherrod model to define failure limits.	Studied ten Iraqi commercial banks (2017-2021) using financial and statistical analysis. Liquidity ratio most impactful in financial failure. Sherrod model accurate in failure testing.	Recommends commercial banks in Iraq to use Sherrod model for financial decision-making and avoiding failure.	
Ahmed & Saeed, 2023	Use Sherrod model to predict financial failure in Iraqi private banks. Applied to Commercial Iraqi Bank and Islamic Iraqi Bank.	Sherrod model effectively predicted financial failure in Iraqi private banks. Used various financial and accounting variables in the model.	Important in understanding how mathematical models like Sherrod predict financial failure in banks. Aids in guiding financial strategies and decisions.	
Hafsi, Drissi, & Sha'ran, 2023	Predict banking credit default in Algerian commercial banks using Sherrod and Kida models on Algerian National Bank.	Sherrod model struggled to predict financial default in the bank. Kida model successful in predictions.	Sherrod model faced challenges in predicting financial default, while Kida model succeeded.	
Zinal, 2023	Illuminate financial failure in commercial banks due to various financial risks using Kida and Sherrod models.	Kida and Sherrod models applied to Iraqi stock market banks. Most banks safe from financial failure except Baghdad Bank, United Investment Bank, and Mansour Investment Bank.	All commercial banks, except three, safe from financial failure as per Kida and Sherrod models.	
Khaled & Boutraa, 2023	Assess effectiveness of Sherrod model in predicting economic entities' financial failure. Applied to Soumifous Institution (2019-2021).	Sherrod model effective in predicting financial failure in economic units. Study recommends Sherrod model application for predicting financial failure.	Recommends using Sherrod model for predicting financial failure in economic entities.	
Hamid, Haji, & Kurdistan, 2022	Evaluate applicability of B-Sherrod model on Iraqi banks for 2009-2015.	B-Sherrod model useful in detecting financial constraints. Benefits investors and stakeholders in assessing company performance.	B-Sherrod model helpful in detecting financial constraints, aiding investors in evaluating company continuity.	
Researchers	Goal	Methodology and Statistical Method	Results	Conclusions
Belkacem & Kalkhal (2021)	To assess Sherrod model's ability to	Applied on a sample of 30 institutions (25	The Sherrod model showed low accuracy	The Sherrod model is not

	distinguish between successful and failed institutions in Algeria's industrial sector.	successful, 5 failed). Found that Sherrod model couldn't effectively distinguish, with a classification accuracy of 30.83%.	(30.83%) in distinguishing between economic institutions in Algeria's industrial sector. Therefore, it cannot be relied upon in the Algerian institutional environment.	capable of distinguishing between economic institutions in the Algerian industrial sector based on the study's findings.
Rezhin (2021)	To conduct a pilot test on commercial banks in the Iraqi stock market for early prediction of financial failure using Sherrod model.	Sample of ten listed commercial banks. Results indicated five banks had strong financial positions, while one showed vulnerability to financial failure. Four other banks faced difficulty in predicting financial failure. Successful application of Sherrod model implies no bank was at risk.	Successful application of Sherrod model revealed varying financial positions of the banks. Five had strong positions, one was vulnerable, and four had difficulty predicting financial failure.	The study recommends the application of the Sherrod model for assessing the financial viability of banks in the Iraqi stock market.
Abdel Khaleq et al. (2021)	To predict financial failure of companies listed on the Algerian Stock Exchange using Kida and Sherrod models.	All listed companies faced financial failure risk per the Kida model, emphasizing liquidity to cover short-term obligations. Sherrod model predicted financial failure only for AN-CI-AROUÏBA company. Suggested need for a model tailored to Algerian companies and their external environment.	Kida model predicted financial failure for all companies due to inadequate liquidity. Sherrod model predicted failure only for AN-CI-AROUÏBA. Recommends the formulation of a model suited to Algerian companies and their external environment.	The Kida model emphasizes liquidity, predicting financial failure for all Algerian Stock Exchange-listed companies, while Sherrod model predicted failure only for AN-CI-AROUÏBA. A call for a model tailored to Algerian companies and their external environment.
Abed (2020)	To use Sherrod model to predict financial distress in Palestinian economic units.	Applied Sherrod model on listed Palestinian units. Study found 61% of units fell within the third category (5 <= Z <= 20), suggesting moderate financial distress. Recommends Sherrod model application for financial analysis and performance evaluation.	Sherrod model application showed 61% of Palestinian units in moderate financial distress. Recommends using Sherrod model for financial analysis and performance evaluation.	Recommends implementing Sherrod model for financial distress prediction in Palestinian economic units as part of financial analysis.
Razzaq (2020)	To highlight the importance of	Applied Kida and Sherrod models on an	Kida model indicated good financial	Kida model indicates good

Researchers	Goal	Methodology and Statistical Method	Results	Conclusions
	predicting financial failure using Kida and Sherrod models in Algerian economic entities.	Algerian economic institution. Kida model showed good financial condition, while Sherrod model faced challenges predicting financial failure.	condition. Sherrod model had challenges predicting financial failure due to critical Z values.	financial condition, while Sherrod model faces challenges predicting financial failure.
Ben Musa & Abdel Nour (2019)	Analyze financial ratios to predict financial failure using Sherrod model on listed economic institutions.	Applied Sherrod model on listed companies. Results emphasized the model's significance in predicting failure and guiding future decisions.	Sherrod model's application proved significant in predicting failure and guiding future decisions for listed companies.	The Sherrod model holds significance in predicting financial failure and guiding future decisions for listed companies.
Al-Shamri (2019)	To predict financial failure in an Iraqi private bank using Sherrod model.	Applied Sherrod model on Babylon Bank, assessing its credit activity. Results suggest banks use Sherrod model for financial analysis to gain insights into their performance.	Sherrod model application on Babylon Bank recommended for financial analysis and gaining insights into performance.	Banks should adopt Sherrod model for financial analysis to gain insights into their credit activity and overall performance.
Rahish & Shanouf (2019)	Study the feasibility of predicting financial failure in Algerian insurance companies using Kida and Sherrod models.	Applied Kida and Sherrod models on Algerian insurance companies (CAAR and SAA). Identified a clear contradiction between Kida and Sherrod models.	Kida and Sherrod models showed a clear contradiction in predicting financial failure for Algerian insurance companies.	There's a clear contradiction between Kida and Sherrod models in predicting financial failure for Algerian insurance companies.
Researchers	Goal	Methodology and Statistical Method	Results	Conclusions
Babela & Mohammed (2016)	Verify if listed banks in the Iraqi stock exchange are prone to financial failure using Sherrod and Kida models.	Studied 16 banks during 2011-2014. Sherrod model suggested low bankruptcy risk, while Kida model indicated high bankruptcy risk for all 16 banks. Excluded Kida model from the test due to its mismatch with the banks' financial situation.	Sherrod model indicated low bankruptcy risk, while Kida model suggested high bankruptcy risk for all 16 banks. Excluded Kida model due to its mismatch with the banks' financial situation.	
Alsaydia & Al-Hashmee (2016)	Illuminate and analyze the reality of non-performing loans and their causes and consequences using the Sherrod model.	Included 20 Iraqi banks for 2013. Found that credit risks significantly impact bank activities and directly lead to losses in the bank's portfolio,	Credit risks significantly impact bank activities, leading to losses and a negative impact on capital and fulfilling obligations,	

		negatively affecting capital and fulfilling bank obligations. Significant risk of bankruptcy.	posing a significant risk of bankruptcy.	
Arkan (2015)	Utilized Sherrod model to determine if a manufacturing company in Kuwait is susceptible to financial stress.	Studied a Kuwaiti air conditioning company as a case study from 2003 to 2013. Concluded that Sherrod model is a reliable method for detecting financial stress and assessing the company's performance. Sherrod model can assist in evaluating the company's ability to continue its operations.	Sherrod model proved reliable for detecting financial stress and evaluating the company's performance. It can aid users in assessing and predicting the company's ability to continue its operations.	
Orabi (2014)	Evaluated the effectiveness of Altman and Sherrod models in predicting financial failure in Jordanian founding companies.	Conducted on five successful and five insolvent companies using Altman and Sherrod models from 2011 to 2012. Identified suitable ratios for predicting financial failure in both models. Uncertainty in accurately predicting financial failure due to external factors.	Altman model applicable in services and manufacturing, while Sherrod model more effective in services. Uncertainty in predicting financial failure accurately due to external factors.	

2.2.2.1 Areas of Agreement:

▪ Utility of Sherrod Model: Across multiple studies conducted in various years, there is a consensus on the utility and importance of the Sherrod model in predicting financial failure and assessing the viability of institutions. Researchers consistently utilize the Sherrod model to evaluate economic entities, including banks, insurance companies, and manufacturing companies.

▪ Predictive Power: The studies generally acknowledge the predictive power of the Sherrod model in identifying financial distress and potential failure in different economic institutions. The model is frequently employed to assess the financial strength or weakness of the entities under investigation.

▪ Importance in Risk Management: Several studies highlight the significance of the Sherrod model in risk management. It is seen as a valuable tool for identifying and addressing the causes of financial distress, guiding financial strategies, and preparing for challenges.

- Model Contradictions: There are instances across different years where researchers observe contradictions between the Sherrod model and other models, such as the Kida model and Altman model. This suggests an awareness of the limitations and variations in the predictive capabilities of different models.

2.2.2.2 Areas of Difference:

- Contextual Compatibility: There are variations in the perception of the Sherrod model's compatibility with specific institutional environments. While some studies emphasize its effectiveness in Iraq and Algeria, others point out limitations in distinguishing between successful and failing institutions in Algeria, indicating a need for models aligned with the local reality.

- Focus on Specific Sectors: Different studies focus on predicting financial failure in various sectors, including banks, insurance companies, manufacturing, and economic institutions. The context-specific focus may lead to varied results and recommendations based on the nature of the entities being analyzed.

- Contradictions Between Models: Several studies report contradictions between the Sherrod model and other models, such as the Kida and Altman models. These contradictions suggest that different models may yield different results and emphasize the importance of choosing the right model for specific evaluations.

- Recommendations for Model Formulation: Some studies recommend formulating new models that align better with the reality of institutions in a particular stock exchange or economic environment. This reflects an acknowledgment of the evolving nature of predictive models and the need for continuous improvement.

2.3. Research Gap

The existing research on financial distress prediction models, including the Altman Z-Score, Sherrod, and Kida models, reveals several critical research gaps. Primarily, there is a lack of comparative comprehensive analyzes between different models, hindering a nuanced understanding of their relative strengths and weaknesses. Many studies are region-specific, focusing on countries such as Algeria, Iraq, Kuwait, and Jordan, thus neglecting a global perspective on model applicability across diverse economic environments. Additionally, the studies often overlook industry-specific nuances, emphasizing the need for research that delves into the effectiveness of these models within specific business contexts. Temporal dynamics and longitudinal analyzes are

insufficiently explored, limiting insights into how these models adapt to changing economic conditions over time. The potential for modifying or adapting existing models to enhance accuracy and relevance is an underexplored area, as is the validation of these models across companies of varying sizes, particularly small and medium-sized enterprises (SMEs). Moreover, the literature lacks a comprehensive consideration of external factors and macroeconomic indicators influencing financial distress. Lastly, the incorporation of advanced analytics, machine learning, and artificial intelligence for improving predictive accuracy is an overlooked avenue for future research. Addressing these gaps would significantly contribute to a more robust understanding of financial distress prediction models and their practical implications for diverse stakeholders.

Chapter Three :Methodology

3.1. Overview of the Chapter

This chapter provides a general overview of the Palestine Stock Exchange and the listed companies before transitioning to field analysis. This includes a description of the study methodology, data sample selection, defining the study population, estimating independent and dependent variables, in addition to statistical analysis.

3.2 Listed Companies in the Palestine Stock Exchange

In 1997, 18 companies were listed on the Palestine Stock Exchange with a capital of $81.6 million. By 2000, the number of companies rose to 25 with a capital of $766 million, and in 2007, the companies increased to 35 with a capital of $950 million. The exchange expanded in 2008 by adding two new companies, raising the number of listed companies to 37. In 2019, the number of companies increased to 48, and by early 2024, the number of listed companies reached 49 with a capital of $1.3 billion (Capital Market Authority, 2024).

In terms of the industrial sector in 1997, the Palestine Stock Exchange was established, with 10 companies in the industrial sector and a total capital of $30 million. By 2000, the number of listed companies in the industrial sector increased to 15, with a total capital of $50 million. In 2005, the number of companies decreased to 12, with a total capital of $40 million. In 2010, the number of companies remained stable at 12, with a total capital of $40 million. In 2015, the number of companies increased to 14, with a total capital of $55 million. In 2020, the number of companies significantly increased to 20, with a total capital of $80 million. In 2022, the number of listed companies in the industrial sector reached 11, with a total capital of $95 million (Pex, 2023).

3.3 Research Methodology

The methodological approach adopted in this study aims to achieve comprehensive inclusivity through the application of quantitative research techniques. This approach is deemed suitable for gathering relevant data for analysis and statistically determining the study's outcomes. Specifically, a quantitative content analysis is conducted to evaluate the sustainability reports of each company, utilizing secondary information extracted from annual reports.

3.4 Population Research

In order to ensure inclusivity and representativeness in the study community, the researcher relied on the Palestine Stock Exchange Guide for the years 2018-2023 as a reliable and trustworthy source for identifying listed companies during that period. By focusing on this specific timeframe, the researcher aimed to gain a comprehensive overview of industrial companies operating in the Palestinian private sector. The rationale behind choosing the years 2018-2023 stems from the necessity of providing a sufficiently large and diverse sample of companies for analysis. These six years provide an adequate time period for monitoring and analyzing sustainability reporting practices among the selected industrial companies. Additionally, the use of consecutive years enhances the ability to track changes and trends in sustainability reporting over time.

The selection of 11 companies from various industrial sectors such as pharmaceuticals, cardboard, plastics, vegetable oils, among others, was intended to ensure the presence of a representative sample covering different segments of the industrial sector. By including companies from these diverse sectors, the study can capture variations in sustainability reporting practices across industries and provide a more comprehensive understanding of the overall landscape. The selected companies, along with their number of employees, are represented in the following table:

Table (3.1) Distribution of the industrial sector (Capital Market Authority, 2023)

Name of Company	Number of Employee
Arab Paints Company	232
Palestinian Poultry Company	398
Beit Jala Pharmaceuticals Company	456
Birzeit Pharmaceuticals Company	432
Golden Wheat Mills	47
Jerusalem Cigarettes Company	101
Jerusalem Pharmaceutical Company	420
Palestine Plastics Industries	145
National Aluminum and Profiles Company NAPCO	345
National Carton Industry	77
Vegetable Oil Industries Company	121
Total	2754

3.5 Sampling and Data Collection

The sample consists of the industrial sector, with a total of 11 companies. There are two methods of obtaining data: primary data and secondary data. According to Hox and

Boeije (2005), primary data refers to information collected by the researcher for the first time from sources, whereas secondary data are pre-collected information. The collection of secondary data is pertinent to this study. The researcher gathers information from selected annual reports of publicly traded companies for the years 2018 to 2023, listed on the Palestine Stock Exchange and the Capital Market Authority (Capital Market Authority, 2024). For the purpose of this study, data regarding financial performance reports were collected, where annual reports, websites, and companies serve as examples of data sources (see Table 3-2), obtained by the researcher from the Palestinian Capital Market Authority.

Table (3-2) Financial statements of companies Industry sector Industry sector (Capital Market Authority, 2023)

Company	Symbol	Currency	Transaction Value	Share Price	Market Cap	Net Profit	Dividends	Price Change
Arab Paints Company	APC	Dinar	1,500,000	6.15	13,011,281	801,163	1,418,296	-43.51%
Palestinian Poultry Company	AZIZA	Dinar	13,440,000	2.9	54,973,193	3,980,641	4,192,860	-5.06%
Beit Jala Pharmaceuticals Company	BJP	Dinar	7,000,000	2.85	28,138,218	2,794,196	1,228,849	127.38%
Birzeit Pharmaceuticals Company	BPC	Dollar	38,764,898	4.41	170,953,200	7,934,039	12,166,341	-34.79%
Golden Wheat Mills	GMC	Dinar	15,000,000	0.85	17,983,072	2,310,627	1,035,427	-323.16%
Jerusalem Cigarettes Company	JCC	Dinar	10,000,000	1.9	26,798,303	3,069,743	5,918,687	-48.13%
Jerusalem Pharmaceutical Company	JPH	Dollar	18,000,000	3.28	59,040,000	7,002,217	6,218,251	12.61%

Palestine Plastics Industries	LADAEN	Dinar	700,000	2.5	2,468,265	54,882	46,757	17.38%
National Aluminum and Profiles Company NAPCO	NAPCO	Dinar	11,000,000	1.49	23,117,062	-1,289,093	1,216,189	-205.99%
National Carton Industry	NCI	Dollar	5,000,000	1.81	9,050,000	656,981	1,147,856	-42.76%
Vegetable Oil Industries Company	VOIC	Dinar	4,000,000	17.5	98,730,590	12,239,784	17,626,300	-30.56%

3.6 Study Variables:

3.6.1 Dependent Variables:

3.6.1.1 EPS : Earnings Per Share

EPS stands for "Earnings Per Share" and is an abbreviation for "Earnings Per Share." EPS plays a crucial role in the continuous financial reports of the company in achieving its objectives. EPS is calculated by dividing the net profit of the company by the number of shares issued by the company. Earnings per share (EPS) is a fundamental indicator for investing in the company, as it shows the amount of profit per share, providing investors with an effective evaluation of the company. The higher the EPS, the more profit the company achieves per share, reflecting effective management and sufficient performance of the company.

3.6.2. Independent Variables

3.6.2.1. Models for Financial Distress Prediction

3.6.2.2. Altman Model

- X1 = Working Capital / Total Assets:Working Capital divided by Total Tangible Assets represents the company's capability to meet short-term obligations relative to its total assets with tangible value. Working Capital denotes the difference

between current assets and liabilities, illustrating liquidity for immediate financial demands. Total Tangible Assets encompass all assets with physical worth that can be swiftly converted into cash if necessary.

- X2 = Retained Earnings / Total Assets: Retained Earnings divided by Total Tangible Assets signifies how effectively the company utilizes accumulated profits to bolster its tangible asset base. Retained Earnings are profits retained within the company instead of being distributed to shareholders, earmarked for growth initiatives or enhancing asset quality.

- X3 = Earnings Before Interest and Taxes / Total Assets :Earnings Before Interest and Taxes divided by Total Tangible Assets measures the company's operational efficiency in generating profits relative to its tangible asset base. Earnings Before Interest and Taxes (EBIT) denotes profits before subtracting interest and tax expenses, highlighting the profitability derived from core business operations independent of financial factors.

- X4 = Market Value of Shareholders' Equity / Total Liabilities: Market Value of Shareholders' Equity divided by Total Liabilities reflects the market valuation of shareholders' equity against all liabilities, assessing the efficiency of equity management and its capacity to cover financial obligations.

- X5 = Net Sales / Total Assets: Net Sales divided by Total Tangible Assets gauges the efficiency of utilizing tangible assets to generate net sales revenue. Net Sales represent total revenues after deducting direct costs such as materials and wages, indicating the effectiveness of asset utilization in revenue generation.

3.6.2.1.2 Sherrod Model

- x1 = Net Working Capital / Total Assets: Net Working Capital divided by Total Assets represents the company's net current assets relative to its total assets. Net Working Capital is the difference between current assets (like cash, accounts receivable) and current liabilities (like accounts payable, short-term debt). This ratio assesses the company's liquidity and its ability to cover short-term obligations with its total asset base.

- x2 = Liquid Assets / Total Assets: Liquid Assets divided by Total Assets indicates the proportion of assets that are highly liquid (easily convertible to cash) compared to the company's total assets. Liquid Assets typically include cash,

marketable securities, and accounts receivable, providing insight into the company's immediate liquidity position.

- x3 = Total Shareholders' Equity / Total Assets: Total Shareholders' Equity divided by Total Assets reflects the proportion of the company's assets financed by shareholders' equity. It shows the extent to which the company's assets are funded by shareholders rather than debt, providing a measure of financial leverage and solvency.

- x4 = Net Profit Before Interest and Taxes / Total Assets: Net Profit Before Interest and Taxes divided by Total Assets measures the company's profitability relative to its total asset base. It indicates how efficiently the company generates profit from its total assets before accounting for interest and taxes, providing insight into operational profitability.

- x5 = Total Assets / Total Liabilities: Total Assets divided by Total Liabilities assesses the company's asset coverage of its liabilities. It indicates the extent to which the company's total assets exceed its total liabilities, providing a measure of financial leverage and solvency.

- x6 = Total Shareholders' Equity / Fixed Assets: Total Shareholders' Equity divided by Fixed Assets represents the proportion of the company's fixed (tangible) assets financed by shareholders' equity. Fixed Assets include property, plant, and equipment (PP&E), reflecting the extent to which these long-term assets are financed by equity rather than debt.

3.7 Study Model

3.7.1 Traditional Method (Ratio Method):

The study model takes into account several previous studies that have shed light on the role of risk factors in building their models. These studies analyzed financial distress prediction using Altman's model or the Sherrod model for various companies. The study model used is similar to that of Masi, Khalidi, and Bin Lulu (2021), who utilized both models. Yuliana et al. (2024) and Salina et al. (2024) used Altman's model, as it is foundational for predictive models, while studies such as Fauzi, Sudjono, and Saluy (2021) and Diana and Setiawan (2020) examined the Sherrod model along with other measures like the Springate, Zmijewski, and Grover models. Therefore, these factors are aggregated into a single equation calculated for each company to obtain a Z-score. The

final value is used to classify the company as either successful or needing additional financial monitoring using the following equations. Through specific classifications, we can determine whether the company passes or fails the test, which illustrates the factors of each model along with its specific formula and calculation method as follows:

3.7.1.1 Altman Model

This model was developed in 1986 to measure financial distress prediction with the aim of developing forecasts regarding a company's continuity. This model can be expressed by the following equation:

$$Z = 1.2X1 + 1.4X2 + 3.3X3 + 0.6X4 + 1.0X5$$

Where:

- X1 = Working Capital / Total Tangible Assets.
- X2 = Retained Earnings / Total Tangible Assets.
- X3 = Earnings Before Interest and Taxes / Total Tangible Assets.
- X4 = Market Value of Shareholders' Equity / Total Liabilities.
- X5 = Net Sales / Total Tangible Assets.

Z serves as an indicator of financial failure. The higher the value of Z, the better the financial position of the firm (Halla, 2004). Financial distress is classified according to this model into three categories:

- If Z is greater than 2.7, the performance of the firm is good, and it will not fail.
- If Z is less than 2.7 and greater than 1.8, it is difficult to determine the firm's condition and further analysis is needed, as the company's position is questionable.
- If Z is less than 1.8, the firm's condition is very difficult and it may go bankrupt at any moment with a very high probability of failure.

The Altman model is used as a tool for investment evaluation because it helps investors understand the true financial position of the firm. The model contains a set of related ratios and relies on discriminant analysis to distinguish between distressed and non-distressed companies (Altman, 1968) The Altman model has proven its effectiveness in predicting corporate failure/distress through studies conducted outside the Arab world, such as Yasser and Al Mamun (2015), Meeampol et al. (2014), and Chieng (2013), as well as those conducted in some Arab countries such as Jordan (Al-Badawi, 2004), Iraq (Ramo, 2010), and Saudi Arabia (Ahmed, 2013)

3.7.1.2 Sherrod Model

The Sherrod Model emerged in 1987 with the aim of assessing credit risks when granting loans to economic projects. It is used to evaluate the sustainability of bank activities in the long term (Almarshadi, 2018). The model is represented by the following equation:

$$Z = 17x1 + 9x2 + 3.5x3 + 20x4 + 1.5x5 + 0.1x6$$

Where:

- Z =is the failure index.
- x1 = represents net working capital / total assets.
- x2 = represents liquid assets / total assets.
- x3= represents total shareholders' equity / total assets.
- x4= represents net profit before interest and taxes / total assets.
- x5 =represents total assets / total liabilities.
- x6 represents total shareholders' equity / fixed assets.

Based on the Sherrod Z-factor, risk degrees are determined and categorized into five classes, as shown in Table 1:

Table (3.3): Sherrod Model Z-scores

Category	Risk Exposure Degree	Critical Z Value
1	Company is not at risk	Z > 25
2	Low likelihood of exposure	20 < Z < 25
3	Difficult to predict	5 < Z < 20
4	Company is at risk	5- < Z < 5
5	High risk exposure	Z < -5

3.8 Statistical Model:

A few studies have used statistical models to illustrate the impact of financial distress prediction models such as Altman's and Sherrod's. Notable examples include Awwad and Razia (2021) and Diana and Setiawan (2020). Most studies tend to use the traditional approach, as seen in the majority of previous research. What makes this study distinctive is our use of a statistical model and the development of a comprehensive statistical equation based on our review of the aforementioned studies. The models will be as follows:

3.8.1 Model 1:

EPS= β_0+ β_1 Z- Altman +e

EPS= β_0+ $\beta 1 x_1$+ $\beta 2 x_2$+ $\beta 3 x_3$+ $\beta 4 x_4$+ $\beta 5 x_5$

Where,

- EPS = Earnings Per Share
- **Z-Altman= Altman Mode**
- X1 = Working Capital ÷ Total Assets.
- X2 = Retained Earnings ÷ Total Assets.
- X3 = Earnings Before Interest and Taxes (EBIT) ÷ Total Assets.
- X4 = Market Value of Shareholders' Equity ÷ Total Liabilities.
- X5 = Net Sales ÷ Total Assets.
- $\beta 0$ = Constant
- $\beta 1$, $\beta 2$ and $\beta 5$ = Coefficients of Performance Disclosure Indices
- e = Error term

3.8.2 Model 2:

EPS= β_0+ β_1 Z- Sherrod +e

EPS= β_0+ $\beta 1x_1$+ $\beta 2x_2$+ $\beta 3x_3$+ $\beta 4x_4$+ $\beta 5x_5$+ $\beta 6x_6$

- EPS = Earnings Per Share
- **Z- Sherrod = Sherrod Model**
- X1 =Net Working Capital / Total Assets.
- X2 =Current Assets / Total Assets.
- X3 =Total Shareholders' Equity / Total Assets.
- X4 =Net Income Before Interest and Taxes / Total Assets.
- X5 =Total Assets / Total Liabilities.
- X6= Total Shareholders' Equity / Fixed Assets.
- $\beta 0$ = Constant
- $\beta 1$, $\beta 2$ and $\beta 6$ = Coefficients of Performance Disclosure Indices
- e = Error term

3.9 Statistical Methods Used in the Analysis:

Advanced statistical methods were employed to conduct the necessary analysis to achieve the objectives of this study, which aims to understand the use of Altman's and Sherrod's models in predicting financial distress for listed industrial companies: A Case from the Palestinian Stock Exchange. To analyze the study model, STATA14.2 software was used, and multiple regression techniques were applied to examine potential relationships between relevant variables. Accumulated data were collected and analyzed to test and evaluate the study hypotheses. Additionally, rigorous tests were carried out to validate the study data, and appropriate statistical tests were adopted to ensure the quality and

reliability of the data used in the analysis, enhancing the results and ensuring the scientific accuracy of the study. The statistical tests included:

3.9.1. Descriptive Statistics:

Descriptive statistics encompass a set of methods used to summarize and describe data in a concise and effective manner. These statistics aim to understand and analyze the fundamental characteristics of variables without the need for complex statistical analyses.

3.9.2. Variance Inflation Factor (VIF) Test:

The Variance Inflation Factor (VIF) measures the strength of the linear relationship in regression analysis. It is used to estimate relationships between a dependent variable and one or more independent variables, and can be utilized to assess the strength of these relationships and future analysis of their interactions. VIF is considered a statistical indicator that reflects increased variance in regression coefficients due to linear interdependencies among variables. The VIF formula typically expresses:

$$\mathbf{VIFi} = \frac{1}{1 - Ri2}$$

R2 is the coefficient of determination in regression analysis. This coefficient shows the extent of multicollinearity caused by linear relationships between independent variables. High VIF values indicate a strong interdependence between variables, reflecting the depletion of statistical precision and suggesting the need to reassess the regression model.

3.9.3 Correlation Test (Pearson's Correlation):

Correlation coefficients will be used to measure the strength of the relationship between two variables. In statistics, correlation types are divided into three categories: positive correlation, negative correlation, and zero correlation. The correlation coefficient ranges between -1 and 1:

- A correlation coefficient of 1 indicates a strong positive relationship, meaning that for every positive increase in one variable, there is a corresponding positive increase in the other variable.
- A correlation coefficient of -1 indicates a strong negative relationship, meaning that for every positive increase in one variable, there is a fixed negative decrease in the other variable.

- A correlation coefficient of 0 indicates no relationship at all, meaning there is no positive or negative change corresponding to changes in the other variable; in other words, the variables are uncorrelated.

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[\, n\sum x^2 - (\sum x)^2\,]\,[\, n\sum y^2 - (\sum y)^2\,]}}$$

3.9.4. Pooled Regression Model (MRP):

According to Aamer (2015), the pooled regression model is the simplest form of time-series cross-sectional model, primarily because the coefficients α and β are constant across all time periods. This means that the temporal effects are disregarded. The equation for the pooled regression model is expressed as follows:

$$Y_{it} = \alpha + \sum_{j=1}^{k} \beta j \, X j_{(it)} + \varepsilon_{it} \quad \text{,, } i=1,2,\ldots\ldots N \text{ ,,, } t=1,2,\ldots\ldots T$$

$$Var(\varepsilon_{it}) = Q^2_{\varepsilon} \quad E\,(\varepsilon_{it}) = 0$$

3.9.5 Breusch–Pagan Test:

The Breusch–Pagan test is a statistical tool used to assess whether there is a significant difference between the means of two independent groups. The aim of the test is to determine if there is a statistically significant difference between these means. The process involves setting up hypotheses, specifying an acceptable level of significance, collecting data, calculating test statistics, and then making a decision to accept or reject the hypotheses based on the results. The Breusch–Pagan test is commonly used in analyzing differences between independent groups and helps in understanding the extent of variance between the means and determining if the differences are statistically significant The formula for the Breusch–Pagan test statistic is given by:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\dfrac{s_1^2}{n_1} + \dfrac{s_2^2}{n_2}}}$$

Where:
- t : is the test statistic.
- x1 and x2 :are the means of the two groups.

- $s1^2$ and $s2^2$: are the sample variances of each group.
- n1 and n2 : are the sample sizes of each group.

A high value of (t) indicates a significant difference between the means of the two groups, suggesting that the variance in the residuals is not constant across observations, which can impact the reliability of the regression analysis.

Chapter Four: Results

4.1 Introduction:

In this chapter, we will present the results derived from applying the Altman and Shirod ratios models, as well as multiple regression analysis, which were used in examining financial performance and analyzing the relationship between the studied variables. This chapter is crucial for providing precise insights into whether the research objectives and hypotheses established in the study have been met. The chapter will also offer a comprehensive analysis of the results, explaining how the findings from both ratio analysis and multiple regression contribute to a thorough understanding of the study's subject. Additionally, it will explain how financial results relate to changes in various variables and how this information can be used for strategic decision-making.

4.2 Results Analysis

4.2.1 Ratio Analysis for the Altman and Shirod Models:

We will discuss the results of the ratio analysis for the Altman and Shirod models, which are used to assess financial performance by calculating a set of key financial ratios. This includes analyzing profitability, liquidity, efficiency, and leverage ratios, and interpreting how these ratios contribute to evaluating the financial condition of the institution under study. The results will be presented in detail, with a comparison between actual results and benchmark standards or related previous research.Before diving into the detailed results, it is essential to outline the calculation methodology for the results through the following equations:

4.2.1.1 Altman Model

The Altman model, developed in 1986, measures the prediction of financial distress with the goal of forecasting the company's continuity. The model can be expressed by the following equation:

$$Z = 1.2X1 + 1.4X2 + 3.3X3 + 0.6X4 + 1.0X5$$

Z is considered an indicator of financial failure. The more positive the value of Z is, the better the financial position of facility A is (Hala, 2004). According to this model, financial distress is classified into three categories:

Z-Score Value	Financial Status of the Organization
Greater than 2.7	The organization's performance is good, and it will not default.
Between 1.8 and 2.7	The organization's status is uncertain and requires further analysis.
Less than 1.8	The organization is in severe trouble and is highly likely to default.

4.2.1.2 Sherrod Model

This model appeared in 1987 with the aim of evaluating credit risks when granting loans to economic projects. It is used to evaluate the continuity of banks' activities in the long term. The model is represented by the following equation:

$$Z = 17\ x1 + 9\ x2 + 3.5\ x3 + 20\ x4 + 1.5\ x5 + 0.1\ x6$$

Based on Sherrod's Z coefficient, the degree of risk was determined and divided into five categories: as shown in the following table:

Category	degree of risk of failure	critical Z value
1	The company is not at risk	Z > 25
2	Low risk of exposure	20 < Z < 25
3	6+Hard to predict	5 < Z < 20
4	The company is at risk	5- < Z < 5
5	Highly vulnerable	-5 > Z

4.2.1.3. Results of the Altman and Sherrod test on the companies in the study sample:

In this part of the chapter, we present the results of the proportions test for the Altman and Sherrod model that was applied to the companies sampled in the study. This test aims to provide a comprehensive assessment of the financial performance of these companies by analyzing a set of basic financial ratios and testing and knowing the companies' ability to succeed or fail and make financial predictions over the years of study as follows:

1. **Birzeit Pharmaceutical Company (BPC)** is a Palestinian company specialized in the pharmaceutical industry. It was founded in 1974 and is headquartered in Birzeit, Palestine. The company produces and distributes various medicines to treat many diseases, and aims to provide high-quality medicines that meet the needs of the local and international market.

Table No. (4.1): Results of testing the Altman model and Sherrod model for Birzeit Pharmaceutical Company

Company Name	Year	Altman Prediction	Altman Result	Sherrod Prediction	Sherrod Result
Bizet Pharmaceuticals	2018	4.895281428	Pass	26.51379432	Pass
	2019	4.58398744	Pass	25.286412	Pass
	2020	4.73396192	Pass	25.01584734	Pass
	2021	5.072778801	Pass	27.2576837	Pass
	2022	6.661511143	Pass	30.0023885	Pass
	2023	6.325324562	Pass	28.74363292	Pass

The results indicate that the Altman model, which focuses on financial ratio analysis to estimate the likelihood of financial failure, showed stable and promising results for Birzeit Pharmaceuticals over the years from 2018 to 2023. The company was consistently classified under the "success" category based on predicted values that increased from 4.895 in 2018 to 6.325 in 2023. This upward trend in predicted values suggests a continuous improvement in the company's financial health, enhancing its resilience and success in the business environment. On the other hand, the Shirod model also provided positive and consistent results for Birzeit Pharmaceuticals, indicating the company's "success" each year from 2018 to 2023. The predicted values under the Shirod model, which rose from 26.51379432 in 2018 to 28.74363292 in 2023, reflect strong financial stability and gradual improvement in the company's financial performance, with a significantly reduced likelihood of failure.The researcher observes that the results from both models, Altman and Shirod, show a high level of agreement in assessing the financial health of Birzeit Pharmaceuticals. Both models indicate that the company maintains strong and stable financial health over the covered years. The increasing positive predictions in the Altman model, along with the continuous "success" results in the Shirod model, suggest the company's ability to maintain financial stability and enhance its performance. The analysis indicates that Birzeit Pharmaceuticals is on a positive trajectory, with notable improvements in its financial performance indicators. This alignment between the models enhances confidence in the company's health assessment and reflects its ability to adapt and succeed in changing economic conditions.

2. **Jerusalem Pharmaceuticals Company (JPH)** is a pharmaceutical and medical preparations manufacturing company based in Jerusalem. The company produces and distributes a variety of medicines and therapeutics, and is keen to provide high-quality

products. The company focuses on developing new medicines and ensures that its products are safe and effective.

Table No. (4.2): Results of testing the Altman model and Sherrod model for Al-Quds Cosmetics Company

Company Name	Year	Altman Prediction	Altman Result	Sherrod Prediction	Sherrod Result
Al-Quds Pharmaceuticals	2018	4.055000618	Pass	25.06182234	Pass
	2019	3.283518073	Pass	22.66656971	Low Risk of Failure
	2020	3.366515766	Pass	23.50738924	Low Risk of Failure
	2021	3.461818774	Pass	25.12102081	Pass
	2022	3.872553255	Pass	25.35040172	Pass
	2023	4.261703439	Pass	26.00644576	Pass

The results show that the Altman model provided positive results for Al-Quds Pharmaceuticals over the period from 2018 to 2023. The results ranged from "Success" to "Low Probability of Failure," with the predicted values gradually increasing from 3.283518073 in 2019 to 4.261703439 in 2023. This upward trend in values indicates a noticeable improvement in the company's financial condition, reflecting its ability to enhance its financial stability. Conversely, the Sherrod model also showed consistently positive performance for Al-Quds Pharmaceuticals during the same period. The Sherrod model predicted the company's "Success" continuously, with the risk of failure decreasing to a low level in 2019 and 2020, and a gradual improvement in predicted values from 25.06182234 in 2018 to 26.00644576 in 2023. These values reflect strong financial stability and ongoing improvement in the company's financial performance. The researcher believes that there is significant agreement in the assessment of Al-Quds Pharmaceuticals' financial health. Both models show a gradual improvement in the company's financial situation over time. While the Altman model provides increasing values indicating a notable improvement in financial health, the Sherrod model demonstrates continuous stability with reduced risk of failure. This alignment between the two models enhances confidence in the company's stability and its ability to maintain

good financial performance, suggesting its capacity to successfully navigate financial challenges and achieve sustainable performance.

3. **Beit Jala Pharmaceuticals Company (Bjp):** is a Palestinian company that produces and distributes medicines and medical preparations. Located in Beit Jala, it provides a variety of medicines and nutritional supplements, and aims to improve people's health through its products. The company is considered one of the important companies in the pharmaceutical sector in Palestine.

Table No. (4.3): Results of testing the Altman model and Sherrod model for the Beit Jala Cosmetics Company

Company Name	Year	Altman Prediction	Altman Result	Sherrod Prediction	Sherrod Result
Beit Jala Pharmaceuticals	2018	3.765467092	Pass	20.70622825	Low Risk of Failure
	2019	3.626205899	Pass	20.80676866	Low Risk of Failure
	2020	3.297968992	Pass	18.254261	Hard to Predict
	2021	2.540960612	Hard	17.23172541	Hard to Predict
	2022	3.48235722	Pass	21.05171721	Low Risk of Failure
	2023	4.764048585	Pass	24.94682631	Low Risk of Failure

The results show that the Altman model presented varying results for Beit Jala Pharmaceuticals over the period from 2018 to 2023. Although the model generally describes the company as a "success," some years, such as 2020 and 2021, faced difficulties in predicting outcomes, with values declining significantly to 3.297968992 and 2.540960612, respectively. However, predictions significantly improved in recent years, with values reaching 4.764048585 in 2023, indicating a notable improvement in the company's financial health. On the other hand, the Shirod model, which provides estimates based on different criteria, indicated that Beit Jala Pharmaceuticals was in a "low risk of failure" state in most years, with exceptions in years where predictions were difficult, such as 2020 and 2021. The predicted values in the Shirod model showed a gradual increase from 20.70622825 in 2018 to 24.94682631 in 2023, reflecting improved financial performance and continued stability with reduced financial risks. The researcher

believes that Beit Jala Pharmaceuticals has shown a significant improvement in its financial health over the studied years. While the Altman model displayed some variation in predictions, with lower values in certain years but significant improvement in recent years, the Shirod model indicated a stable condition with low risk of failure most of the time. This alignment between the models enhances confidence in the company's ability to improve its financial stability and overcome challenges, reflecting positive and strong financial performance over time.

4. **The National Carton Manufacturing Company**: is a company specialized in manufacturing cardboard used in packaging. The company produces different types of cardboard, including corrugated cardboard, which is used to protect and package products. The company is considered one of the prominent companies in this field, as it provides high-quality products to meet customer needs.

Table No. (4.4): Results of testing the Altman model and Sherrod model for the cardboard company

Name	Year	Altman Prediction	Altman Result	Sherrod Prediction	Sherrod Result
Al-Karton	2018	1.976772329	Hard	15.49844597	Hard to Predict
	2019	2.011329483	Hard	17.04214113	Hard to Predict
	2020	3.380957054	Pass	22.48043568	Low Risk of Failure
	2021	3.52636693	Pass	22.65590908	Low Risk of Failure
	2022	3.227080728	Pass	20.14457172	Low Risk of Failure
	2023	3.039313948	Pass	19.32182175	Hard to Predict

The results show that the Altman model produced varying results for the Carton Company from 2018 to 2023. In the early years of the analysis, the results indicated "difficult prediction" with low values, such as 1.976772329 in 2018 and 2.011329483 in 2019. However, the model began to provide more positive evaluations in the following years, with relatively higher values reaching 3.52636693 in 2021 and 3.039313948 in 2023, indicating a gradual improvement in the company's financial condition. On the other hand, the Shirod model provided assessments indicating "difficult prediction" in the early years, with values like 15.49844597 in 2018 and 17.04214113 in 2019. However, in the

following years, the predictions shifted to "low risk of failure" starting from 2020, with expected values rising to 22.48043568 and 22.65590908 in 2021. This suggests a significant improvement in the company's financial stability over the recent years. The researcher notes that the Carton Company has experienced changes in its financial assessments over the years. While the Altman model provided low evaluations in the early years with difficulty in prediction, it showed a notable improvement in recent years, indicating a gradual enhancement in financial health. Conversely, the Shirod model initially indicated difficult prediction but later showed significant improvement with reduced financial risks in recent years. This alignment between the models reinforces the view of the company's stability and improved financial performance, indicating that the Carton Company has managed to enhance its financial position over time and overcome some economic challenges.

5. **NAPCO** is one of the leading companies in the field of manufacturing and distributing plastic products in the local and international market. The company specializes in producing a variety of plastic materials, including bags, containers and other supplies, which are used in many commercial and industrial applications.

Table No. (4.5): Results of testing the Altman model and Sherrod model for NAPCO

Company Name	Year	Altman Prediction	Altman Result	Sherrod Prediction	Sherrod Result
NAPCO	2018	1.349003419	Fails	11.43411326	Hard to Predict
	2019	1.296791908	Fails	12.03343592	Hard to Predict
	2020	0.759329989	Fails	9.83681469	Hard to Predict
	2021	1.195096573	Fails	11.0967406	Hard to Predict
	2022	1.083953431	Fails	10.44438476	Hard to Predict
	2023	0.480701571	Fails	7.121384585	Hard to Predict

The results show that the Altman model presented findings indicating a continuous deterioration in the financial health of Napco over the years from 2018 to 2023. The values obtained were within the "failure" range, ranging from 0.480701571 in 2023 to 1.349003419 in 2018. This negative trend suggests a persistent weakness in the

company's financial situation, reflecting an increasing likelihood of financial failure during the studied period. On the other hand, the Shirod model indicated "difficulty in predicting" Napco's financial health during the same period, with values ranging from 7.121384585 in 2023 to 11.43411326 in 2018. Although the model did not specify direct failure, its description of the company as "difficult to predict" reflects a level of concern about the company's financial stability, with results remaining unclear and undefined over the years. The researcher observes that Napco faces significant challenges over the covered years. While the Altman model clearly indicated ongoing financial failure, with decreasing values over the years, the Shirod model pointed to "difficulty in predicting" with a high level of financial concern but did not definitively describe the situation as "failure." This discrepancy between the models suggests that Napco is experiencing major financial difficulties, with varying assessments on the clarity of predicting its financial health, highlighting the need for immediate attention to reassess financial strategies and improve the company's financial situation.

6. **Palestine Plastics Industries Company (PPIC)** is an organization working in the manufacture and transformation of plastic materials to meet the needs of the local and regional market. The company's products include a range of plastic materials used in packaging, furniture manufacturing and various other sectors.

Table No. (4.6): Results of testing the Altman model and Sherrod model, Plastics Company

Company Name	Year	Altman Prediction	Altman Result	Sherrod Prediction	Sherrod Result
Al-Ladan	2018	0.848069532	Fails	4.552932476	At Risk of Failure
	2019	0.420148237	Fails	1.538557294	At Risk of Failure
	2020	0.894666741	Fails	4.306193616	At Risk of Failure
	2021	1.327804531	Fails	5.718276521	Hard to Predict
	2022	1.962415133	Hard	8.707874663	Hard to Predict
	2023	1.816782233	Hard	10.66051132	Hard to Predict

The results indicate that the Altman model showed a deteriorating assessment for Plastics Company over the years from 2018 to 2023. The results consistently indicated

"failure," with values ranging from 0.420148237 in 2019 to 1.962415133 in 2022. This trend suggests a persistent weakness in the company's financial health, reflecting a significant increase in the likelihood of financial failure over the years. On the other hand, the Shirod model provided an assessment indicating that Plastics Company was "at risk of failure" in the early years of the study, with values such as 4.552932476 in 2018 and 1.538557294 in 2019. Over time, the predictions became "difficult to predict" in the later years, with forecasted values increasing from 5.718276521 in 2021 to 10.66051132 in 2023. This suggests that the company's financial stability was unclear and required careful assessment over time. The researcher finds that Plastics Company is facing significant financial difficulties, with evaluations indicating persistent "failure" and declining values over the years. Conversely, the Shirod model provides estimates suggesting that the company was "at risk of failure" in the early years, but by the later years, the financial situation became more difficult to predict. This discrepancy between the models reflects that Plastics Company is experiencing major financial challenges, with assessments indicating the need for urgent action to improve the financial situation and stabilize the company.

7. **Vegetable Oil Company** : focuses on the production and distribution of a wide range of vegetable oils that are used in the cooking and food industries. The company seeks to provide high-quality products that meet the needs of individuals and factories, and is considered one of the prominent companies in this field.

Table No. (4.7): Results of testing the Altman model and Sherrod model for the vegetable oil company

Company Name	Year	Altman Prediction	Altman Result	Sherrod Prediction	Sherrod Result
Vegetable Oils Company	2018	4.081	Pass	13.599	Hard to Predict
	2019	4.715	Pass	13.99	Hard to Predict
	2020	5.179	Pass	14.789	Hard to Predict
	2021	3.274	Pass	10.041	Hard to Predict
	2022	3.192	Pass	9.039	Hard to Predict
	2023	3.654	Pass	10.032	Hard to Predict

The results show that the Altman model provided a stable and positive assessment for Vegetable Oils Company over the years from 2018 to 2023. The values obtained consistently indicate "success," ranging from 3.274 in 2021 to 5.179 in 2020. These results reflect strong and stable financial health for the company, suggesting a low likelihood of financial failure and an overall improvement in financial conditions. In contrast, the Shirod model indicated that Vegetable Oils Company was "difficult to predict" throughout the studied period, with values ranging from 9.039 in 2022 to 14.789 in 2020. Although the results were classified as "difficult to predict," the relatively high values suggest some level of financial stability, albeit not entirely clear. These assessments reflect some ambiguity in predicting the company's financial health but without strong signals of failure.

The researcher finds that Vegetable Oils Company has strong and stable financial health over the years, with high values indicating a low probability of financial failure. Conversely, the Shirod model provided an assessment indicating difficulty in predicting the company's future financial state, with values ranging from 9.039 to 14.789. This discrepancy between the models reflects that Vegetable Oils Company has positive financial stability but may have some uncertainty regarding the precise details of its future financial capacity. Overall, this variation provides positive indications of the company's financial stability but also suggests the need for careful monitoring of financial performance to ensure continued success.

8. **Aziza Poultry Company**: is a company specialized in raising, producing and distributing poultry in local markets. The company focuses on providing high-quality fresh and frozen poultry, and is considered one of the most prestigious companies in the poultry production sector.

Table No. (4.8): Results of testing the Altman model and Sherrod model for Aziza Poultry Company

Company Name	Year	Altman Prediction	Altman Result	Sherrod Prediction	Sherrod Result
Aziza	2018	3.356763066	Pass	15.00804025	Hard to Predict
	2019	3.911319431	Pass	18.21562351	Hard to Predict
	2020	3.826533984	Pass	19.92046181	Hard to Predict

	2021	4.150665838	Pass	19.96724459	Hard to Predict
	2022	4.53952691	Pass	20.27100415	Low Risk of Failure
	2023	4.070606465	Pass	18.10821948	Hard to Predict

The results show that the Altman model indicates stable results suggesting "success" for Aziza Company over the years from 2018 to 2023. The values obtained ranged from 3.356763066 in 2018 to 4.53952691 in 2022, reflecting strong and stable financial health for the company. This trend suggests that the company has a low likelihood of financial failure and that its financial position was good during the studied period. In contrast, the Shirod model indicated that Aziza Company was "difficult to predict" in most years, with values ranging from 15.00804025 in 2018 to 19.92046181 in 2020. Only in 2022 did the result change to "low probability of failure" with a value of 20.27100415. This means that predicting the company's financial health was ambiguous in most periods, but the significant improvement in 2022 indicates a decrease in financial risks. The researcher finds that Aziza Company enjoyed stable and strong financial health, with assessments indicating "success" over the years. This reflects a good financial position and low risk of failure. On the other hand, the Shirod model indicated "difficulty in predicting" the company's financial health in most years, with a change in risk assessment in 2022 to "low probability of failure." The discrepancy between the models highlights that the company has good financial health according to the Altman model, but there is some ambiguity regarding its long-term financial stability according to the Shirod model. This discrepancy suggests that the company may need close monitoring to ensure the continuation of its financial success.

9. **Palestinian Golden Wheat Company:** works in the production and manufacture of wheat products, including flour and bread. The company is committed to providing high-quality wheat products to meet the needs of the Palestinian market and contribute to strengthening the grain sector in the region.

Table No. (4.9): Results of testing the Altman model and Sherwood model, Golden Wheat Company

Company Name	Year	Altman Prediction	Altman Result	Sherrod Prediction	Sherrod Result

	2018	2.171150806	Hard	20.12338489	Low Risk of Failure
	2019	3.595295771	Pass	25.87244633	Pass
	2020	3.627140457	Pass	24.11449859	Low Risk of Failure
Golden Wheat	2021	1.908506933	Hard	16.25049984	Hard to Predict
	2022	2.312252457	Hard	19.27536762	Hard to Predict
	2023	2.044730185	Hard	16.63462134	Hard to Predict

The results show that the Altman model indicates varied results for Golden Wheat Company over the years from 2018 to 2023. The values ranged from 1.908506933 in 2021 to 3.627140457 in 2020, with a "difficult" classification in most years. This suggests that the company faces challenges in maintaining strong financial health or achieving clear financial stability, reflecting a high level of expected financial risk. In contrast, the Shirod model indicated that Golden Wheat Company was classified as having a "low probability of failure" during the studied years, with values ranging from 20.12338489 in 2018 to 24.11449859 in 2020. Although the financial risk was classified as relatively low, predicting the company's financial health was "difficult" in recent years. This suggests a relative stability but with some degree of uncertainty in forecasting future financial stability.

The researcher finds that Golden Wheat Company faces significant financial difficulties, as the results were classified as "difficult" in most years, indicating weak financial stability and the inability to accurately predict the company's financial health. On the other hand, the Shirod model provides a more optimistic assessment, indicating that the company has a "low probability of failure" in most years, despite the difficulty in predicting the company's financial health in recent years. This discrepancy reflects a variation in assessing financial risks between the models and suggests that the company may be in a relatively stable financial position but with some uncertainty about its future financial stability.

10. **Arabian Paints Company** is a company specializing in the manufacture and distribution of paints and coatings for a variety of uses, including residential,

commercial and industrial applications. The company offers integrated solutions in the field of colors and finishes to ensure quality and innovation in every product.

Table No. (4.10): Results of testing the Altman model and Sherwood model, Arab Paints Company

Company Name	Year	Altman Prediction	Altman Result	Sherrod Prediction	Sherrod Result
Arab Paints Company	2018	7.30255172	Pass	34.01942749	Pass
	2019	6.179648631	Pass	33.14790223	Pass
	2020	5.620922053	Pass	32.5872347	Pass
	2021	6.345278662	Pass	33.90465891	Pass
	2022	6.077421111	Pass	30.53917343	Pass
	2023	6.867378661	Pass	31.52381201	Pass

The results show that the Altman model indicates positive and stable results for Arab Paints Company from 2018 to 2023. The obtained values ranged from 5.620922053 in 2020 to 7.30255172 in 2018, with a "success" classification in all years. These results reflect the company's ongoing financial strength and stability, indicating a significant reduction in the likelihood of financial failure and the company's ability to maintain a healthy and stable financial position. In contrast, the Shirod model indicated that Arab Paints Company was classified as "successful" in all years from 2018 to 2023, with values ranging from 30.53917343 in 2022 to 34.01942749 in 2018. These classifications suggest good financial stability throughout all years, with a decrease in financial risks, although the results were all within the success range.

The researcher finds that the Altman model shows Arab Paints Company enjoyed strong and stable financial health, consistently classified as "successful" over the years. This reflects the company's high ability to avoid financial failure, demonstrating strong financial performance. On the other hand, the Shirod model provided an assessment consistent with the Altman results, also classifying the company as "successful" in all years, with high values indicating reduced financial risks. The variation between the two models is not notable in this case, as both models agree on the company's positive financial stability, enhancing confidence in Arab Paints Company's continued financial success.

11. **Jerusalem Cigarette Company**: produces and distributes cigarettes and other tobacco products. The company is one of the major players in the Palestinian tobacco

market, and is distinguished by providing high-quality products to meet the needs of consumers in the region.

Table No. (4.11): Results of testing the Altman model and the Sherwood model for the Jerusalem Cigarette Company

Company Name	Year	Altman Prediction	Altman Result	Sherrod Prediction	Sherrod Result
Jerusalem Cigarettes	2018	1.042047083	Fails	6.39440804	Hard to Predict
	2019	1.295444409	Fails	5.378258168	Hard to Predict
	2020	1.635304591	Fails	8.529144257	Hard to Predict
	2021	2.187568151	Hard	8.798829837	Hard to Predict
	2022	2.029520051	Hard	8.232014071	Hard to Predict
	2023	1.624616146	Fails	6.979497925	Hard to Predict

The results show that the Altman model yielded low results for Jerusalem Cigarettes Company over the years from 2018 to 2023. The values ranged from 1.042047083 in 2018 to 2.187568151 in 2021, with a "failure" classification in most years. These values indicate weak levels of financial stability, suggesting that the company faces significant financial challenges and may be at high risk of financial failure. On the other hand, the Shirod model indicated that Jerusalem Cigarettes Company was classified as "difficult to predict" in all the years studied, with values ranging from 5.378258168 in 2019 to 8.798829837 in 2021. The "difficult to predict" classification means that the model could not accurately determine a specific level of financial risk, reflecting a state of uncertainty about the company's financial health. Despite these results, the predictions did not reach the "failure" level but showed difficulty in clearly assessing the financial situation.

The researcher notes a clear disparity between the results of the two models for Jerusalem Cigarettes Company. While the Altman model suggests that the company is at significant risk of financial failure, with "failure" ratings in most years, the Shirod model provides an assessment that reflects a state of financial uncertainty rather than a clear identification of risks. The Altman results confirm significant weaknesses in financial stability, indicating ongoing financial problems, whereas the Shirod model shows that the financial situation is difficult to predict, reflecting a state of uncertainty rather than specific failure. This discrepancy reflects the

difference between the ability to accurately identify financial risks and the ability to handle a state of uncertainty in financial predictions.

4.3 Statistical Analysis:

This section presents the descriptive statistics of the study variables and examines the presence of multicollinearity and heteroscedasticity issues using the Variance Inflation Factor test and the Breusch-Pagan test. Finally, pooled data analysis is employed to estimate the results of the regression model and test the study hypotheses. Table (**4.12**) provides a description of the study variables used in the model.

4.3.1 Descriptive Statistics Results

Table (**4.12**) shows the main descriptive statistics for the study variables of the 11 industrial companies included in the sample, while Table (**4.12**) presents the descriptive statistics results for the industrial companies.

Table (4.12): Results of descriptive statistics for the study variables

Variable	Obs	Mean	Std. Dev.	Min	Max
EPS	66	0.3541473	0.5793956	-0.15	3.124
X1 = Working Capital / Total Tangible Assets.	66	0.2148548	0.2681038	-0.4845361	0.6156809
X2 = Retained Earnings / Total Tangible Assets.	66	0.1261555	0.2812901	-0.5957388	0.7615723
X3 = Earnings Before Interest and Taxes / Total Tangible Assets.	66	0.0587273	0.0433862	-0.0406809	0.1483903
X4 = Market Value of Shareholders' Equity / Total Liabilities.	66	3.583597	2.14112	0.3358458	8.77157
X5 = Net Sales / Total Tangible Assets	66	0.5316806	0.3228372	0.0859442	1.382751
X1 =Net Working Capital / Total Assets.	66	0.2148548	0.2681038	-0.4845361	0.6156809
X2 =Current Assets / Total Assets.	66	0.4505787	0.1963049	0.0430705	0.8519822
X3 =Total Shareholders' Equity / Total Assets.	66	0.9977636	0.596434	0.1888887	2.385826
X4 =Net Income Before Interest and Taxes / Total Assets.	66	0.0587273	0.0433862	-0.0406809	0.1483903
X5 =Total Assets / Total Liabilities.	66	3.617494	1.465657	1.402807	7.775272
X6= Total Shareholders' Equity / Fixed Assets	66	2.812962	3.324563	0.3305719	13.6004

The descriptive statistics reveal significant diversity in the financial performance of the studied companies. The Earnings Per Share (EPS) variable shows a mean of (0.354) and a standard deviation of (0.579), highlighting variability in profitability, with some companies experiencing losses and others substantial profits. For the Sherrod model

variables, Working Capital as a percentage of Tangible Assets (X1) has a low average of (0.215) with a standard deviation of (0.268), indicating challenges in managing working capital. Retained Earnings as a percentage of Tangible Assets (X2) varies widely, with a mean of (0.126), a minimum of (-0.596), and a maximum of (0.762), reflecting differing profit retention strategies. Earnings Before Interest and Taxes as a percentage of Tangible Assets (X3) has a mean of (0.059), suggesting generally low operational performance. The Market Value to Total Liabilities ratio (X4) has a high mean of (3.584), showing substantial variability in financial strengths. The ratio of Net Sales to Tangible Assets (X5) has a mean of (0.532), indicating varied revenue generation capabilities.

The Sherrod model's six key financial variables provide further insights. The ratio of Net Working Capital to Total Assets (X1) has a mean of (0.215) and a standard deviation of (0.268), showing significant variation in working capital management. The ratio of Current Assets to Total Assets (X2) has a mean of (0.451) and a standard deviation of (0.196), reflecting substantial liquidity. The ratio of Total Shareholders' Equity to Total Assets (X3) has a mean of (0.998) and a standard deviation of (0.596), indicating a strong capital base with notable differences in financing structures. The ratio of Net Income Before Interest and Taxes to Total Assets (X4) has a mean of (0.059) and a standard deviation of (0.043), pointing to modest operational performance with variability in operating profits. The ratio of Total Assets to Total Liabilities (X5) has a mean of (3.617) and a standard deviation of (1.466), reflecting moderate debt levels and diverse debt management strategies. The ratio of Total Shareholders' Equity to Fixed Assets (X6) has a mean of (2.813) and a standard deviation of (3.325), showing significant variation in capital use in fixed assets. The study concludes that companies should adopt comprehensive financial strategies to enhance liquidity management, improve operational efficiency, and balance debt and equity for financial sustainability and superior performance.

4.3.2 Results of Pearson correlation analysis

Table No. (4.13) Pearson correlation results

Results of Pearson test for Altman model							
Variable	EPS	Alt_1_WorkingCapital	Alt_2_Retained Earnings	Alt_3_EBIT	Alt_4_Shareholders Equity	Alt_5_Sales	
EPS	1						
X1 = Working Capital / Total Tangible Assets.	-0.0759	1					
X2 = Retained Earnings / Total Tangible Assets.	0.6733	0.5326	1				
X3 = Earnings Before Interest and Taxes / Total Tangible Assets.	-0.1079	0.5927	0.1897	1			
X4 = Market Value of Shareholders' Equity / Total Liabilities.	0.2979	0.4438	0.3603	0.32	1		
X5 = Net Sales / Total Tangible Assets	-0.3113	0.2018	0.0358	0.2084	-0.2802	1	
Pearson test results for Sherrod's model							
Variable	EPS	Sherrod_X1_WorkingCapital	Sherrod_X2_LiquidAssets	Sherrod_X3_Shareholders Equity	Sherrod_X4_EBIT	Sherrod_X5_TotalAssets	Sherrod_X6_Shareholders Equity
EPS	1						
X1 =Net Working Capital / Total Assets.	-0.0759	1					
X2 =Current Assets / Total Assets.	-0.4009	0.8271	1				
X3 =Total Shareholders' Equity / Total Assets.	0.1685	-0.0933	-0.0547	1			
X4 =Net Income Before Interest and Taxes / Total Assets.	0.1684	0.5927	0.5778	0.1383	1		
X5 =Total Assets / Total Liabilities.	0.1917	0.6245	0.2045	-0.0300	0.2723	1	
X6= Total Shareholders' Equity / Fixed Assets	0.0487	0.4949	0.5972	0.6480	0.4111	0.1407	1

4.3.2.1 Pearson correlation results for the Altman model

The previous table shows the Pearson correlation, the strength and direction of the relationships between the various variables, and these results can be interpreted as follows. The previous results indicate that the relationship between the various financial variables and earnings per share (EPS) provides important information about the financial performance of companies, as follows:

1. The relationship between Working Capital as a percentage of Tangible Assets and EPS shows a weak negative correlation of (-0.0759). This suggests that working capital management may not have a significant impact on EPS. This weak correlation indicates that other factors might play a larger role in determining EPS, or that improving working capital management alone might not be sufficient to significantly boost profitability.

2. The relationship between Retained Earnings as a percentage of Tangible Assets and EPS reflects a strong positive correlation of (0.6733). This indicates that companies that retain a larger portion of their earnings tend to achieve higher profitability. This result highlights the effectiveness of profit retention strategies in enhancing financial performance, suggesting that retaining earnings may be a strong indicator of increased EPS.

3. The relationship between Earnings Before Interest and Taxes as a percentage of Tangible Assets and EPS shows a weak positive correlation of (0.1897). This indicates a weak link between operational performance and profitability, suggesting that improving operational efficiency may be necessary to enhance EPS. Despite the positive correlation, the effect remains limited, reflecting the need to consider other factors influencing profitability.

4. The relationship between Market Value of Shareholders' Equity to Total Liabilities and EPS demonstrates a moderate positive correlation of (0.2979). This suggests that companies with a higher market value of shareholders' equity relative to liabilities may achieve higher profitability. This result reflects that companies with a strong and stable financial structure, and a better balance between equity and liabilities, are in a better position to achieve higher EPS.

5. The relationship between Net Sales to Tangible Assets and EPS shows a negative correlation of (-0.3113). This indicates that a high focus on achieving sales may not be sufficient to significantly enhance profitability. It may be necessary to consider

more comprehensive strategies that focus on improving operational efficiency and cost management to achieve higher EPS.

4.3.2.2 Results of Pearson Correlation for the Sherrod Model

The following are professional comments on the impact of each variable in the Sherrod model based on Pearson correlation test results:

1. The weak negative correlation (-0.08) between Net Working Capital and Earnings Per Share (EPS) suggests that changes in net working capital do not significantly affect financial performance. This result indicates that improving working capital management may not have a notable impact on EPS, and it may be necessary to focus on other factors to enhance financial performance.

2. The moderate negative correlation (-0.40) between Current Assets and EPS shows that an increase in current assets may be associated with a decrease in profitability. This could imply that increasing current assets without improving their efficiency might lead to reduced profitability, necessitating improvements in current asset management to enhance operational efficiency.

3. The weak negative correlation (-0.17) between Shareholders' Equity and EPS** indicates that changes in shareholders' equity do not have a significant impact on EPS. This result suggests that increasing shareholders' equity may not substantially contribute to improving profitability, and it might be preferable to focus on enhancing returns from assets rather than solely increasing shareholders' equity.

4. The weak positive correlation (0.14) between Net Income and EPS indicates that an increase in net income before interest and taxes may lead to improved EPS, though the effect is weak. It is recommended to improve operational performance and increase net income before interest and taxes to ensure a positive impact on EPS.

5. The weak to moderate positive correlation (0.27) between the ratio of Assets to Liabilities and EPS suggests that increasing this ratio may contribute to improved profitability. Enhancing the financial structure and increasing assets relative to liabilities can have a positive effect on financial performance, strengthening the company's financial position and ability to achieve higher profits.

6. The weak positive correlation (0.05) between Shareholders' Equity and EPS indicates that changes in the ratio of shareholders' equity to fixed assets do not have a significant impact on EPS. It may be necessary to examine other factors to improve profitability,

as the ratio of shareholders' equity to fixed assets may not be a decisive factor in enhancing financial performance.

4.3.3 Results of Variance Inflation Factor (VIF)

The results of the Variance Inflation Factor (VIF) test, as shown in Table (5.5), reveal notable differences between the Sherrod and Altman models regarding multicollinearity among independent variables.

In the Altman model, all variables show low VIF values, with Working Capital to Total Assets Ratio (X1) at (2.35), Retained Earnings to Total Assets Ratio (X2) at (1.66), Earnings Before Interest and Taxes to Total Assets Ratio (X3) at (1.59), Market Value of Shareholders' Equity to Total Liabilities Ratio (X4) at (1.49), and Net Sales to Total Assets Ratio (X5) at (1.30). This indicates minimal multicollinearity in the Altman model compared to the Sherrod model, enhancing the reliability of the model's results and reducing the impact of multicollinearity on the analysis. Overall, the results suggest that the Sherrod model faces challenges with multicollinearity that may affect the accuracy of the analysis, whereas the Altman model demonstrates greater stability in the independent variables.

In the Sherrod model, the Net Working Capital to Total Assets Ratio (X1) shows the highest VIF at (10.99), indicating a significant multicollinearity issue between this variable and others in the model. Similarly, the Current Assets to Total Assets Ratio (X2) has a high VIF of (8.07), suggesting a strong correlation with other variables, while Shareholders' Equity to Total Assets Ratio (X3) shows a VIF of (5.99), reflecting a certain degree of multicollinearity. On the other hand, Earnings Before Interest and Taxes to Total Assets Ratio (X4) shows a VIF of (4.12), indicating a moderate level of multicollinearity, while the Total Assets to Total Liabilities Ratio (X5) records a lower VIF of (3.38), indicating a relatively low level of multicollinearity. The Shareholders' Equity to Fixed Assets Ratio (X6) shows a low VIF of (1.77), suggesting minimal multicollinearity and less impact on the model's results.

Table (4.14) Variance inflation factor (VIF) test results for multicollinearity

Dependent variable EPS					
Altman model			Sherrod model		
Variable	VIF	1/VIF	Variable	VIF	1/VIF
X1 = Working Capital / Total Tangible Assets.	2.35	0.424732	X1 =Net Working Capital / Total Assets.	10.99	0.091031

X2 = Retained Earnings / Total Tangible Assets.	1.66	0.60269	X2 =Current Assets / Total Assets.	8.07	0.123894
X3 = Earnings Before Interest and Taxes / Total Tangible Assets.	1.59	0.628926	X3 =Total Shareholders' Equity / Total Assets.	5.99	0.166996
X4 = Market Value of Shareholders' Equity / Total Liabilities.	1.49	0.66897	X4 =Net Income Before Interest and Taxes / Total Assets.	4.12	0.242838
X5 = Net Sales / Total Tangible Assets	1.3	0.768349	X5 =Total Assets / Total Liabilities.	3.38	0.296201
■■■■■■■■			X6= Total Shareholders' Equity / Fixed Assets	1.77	0.563684
Mean VIF		1.68	Mean VIF		5.67

4.3.4 Results of the Breusch-Pagan Test

The Breusch-Pagan test is used to determine whether the estimated variance of the residuals (error term) is homogenous or not. Heteroscedasticity is present when the null hypothesis (homogeneity of residual variance) is rejected. The Breusch-Pagan test results indicated that the Chi-squared statistic is not statistically significant. Consequently, the null hypothesis is accepted, suggesting that the residual variance is homogenous, and heteroscedasticity is absent (Breusch & Pagan, 1979). Table (6.5) presents the results of the Breusch-Pagan test.

Table (4.15) Results of the Breusch-Pagan test for homogeneity

Dependent variable EPS			
Altman model		Sherrod model	
chi2	prob.>chi2	chi2	prob.>chi2
3.73	0.2921	3.33	0.1921

• Significance level at 1%*, significance level at 5%**, significance level at 10%***

4.6 Results of Estimation

The Breusch-Pagan Lagrangian Multiplier (LM) test is used to determine whether to use panel data analysis or pooled data analysis in regression. Table (5.6) shows the results of the LM test, where the Chi-squared statistic is not statistically significant. Therefore, using pooled data analysis in this study would be better and more appropriate (Breusch & Pagan, 1979).

Table (4.16) Breusch-Pagan Lagrangian Multiplier test results

Dependent variable EPS			
Altman model		Sherrod model	
chi2	prob.>chi2	chi2	prob.>chi2
3.73	0.02921**	7.33	0.01921*

- Significance level at 1%*, significance level at 5%**, significance level at 10%***

4.3.5 Multiple regression test results

4.3.5.1 The Altman model in predicting the financial distress of industrial companies listed on the Palestinian Stock Exchange

Table (4.17) shows the varying results of EPS as a dependent variable:

Table (4.17) Estimated results of the Altman model in predicting the financial distress of industrial companies listed on the Palestinian Stock Exchange

Dependent variable EPS				
	V	Coef.	t	P>t
X1 = Working Capital / Total Tangible Assets.		-1.492874	-7.79	0.000*
X2 = Retained Earnings / Total Tangible Assets.		1.98935	13.67	0.000*
X3 = Earnings Before Interest and Taxes / Total Tangible Assets.		1.329561	1.34	0.186
X4 = Market Value of Shareholders' Equity / Total Liabilities.		0.0472632	2.4	0.02**
X5 = Net Sales / Total Tangible Assets		-0.3199521	-2.7	0.009*
_cons		0.3465895	3.32	0.002*
R-squared		0.7995		
Adj R-squared		0.7828		
		Value		P
Prob > F		47.86		0.000*

• Significance level at 1%*, significance level at 5%**, significance level at 10%***

The estimation results of the Altman model provide a detailed analysis of the impact of financial variables on the Earnings Per Share (EPS) for industrial companies listed on the Palestinian stock exchange. The model reveals varying effects of different independent variables on EPS, which helps in predicting the financial distress of these companies.

The coefficient of determination (R-squared) is (0.7995), indicating that the model explains approximately (79.95%) of the variations in EPS. The adjusted R-squared (Adj R-squared) is (0.7828), which confirms the model's strength in explaining the data. Finally, the overall significance level of the model (Prob > F) is (0.00) with an F-value of (47.86), which enhances the statistical significance of the model and shows that the

constant term (_cons) has a positive effect of (0.3465895) with a significance level of (0.002). This suggests the presence of other constant factors positively affecting EPS.

The researcher finds that the model used is robust and effective in explaining variations in EPS. The R-squared value indicates that the model explains most of the variations in EPS, which enhances its reliability. The adjusted R-squared confirms that the model maintains its strength even after adjusting for the number of independent variables, indicating the accuracy of the results. Moreover, the overall significance level of the model demonstrates that the results are not random but statistically significant, which increases confidence in the model's validity. Finally, the positive effect of the constant term suggests the presence of other constant factors contributing positively to EPS. Collectively, these results indicate that the model used is capable of effectively and reliably explaining EPS.

Regarding the Working Capital to Total Tangible Assets Ratio (X1), the results indicate a significant negative effect on EPS, as evidenced by the estimated value of (-1.492874), with a large negative t-value of (-7.79) and a significance level of (0.000). This indicates that an increase in the working capital to tangible assets ratio leads to a noticeable decrease in EPS. Studies such as those by Salim and Ismudjoko (2022) and Bashir and Ali (2023) support this result, finding that an increase in the working capital to tangible assets ratio is associated with decreased financial performance and EPS. However, the study by El-Sayed and Aly (2021) showed a positive effect of this ratio on EPS in some industries, suggesting variability in effects by sector.

For the Retained Earnings to Total Tangible Assets Ratio (X2), the results show a strong positive effect of (1.98935), supported by a large t-value of (13.67) and a significance level of (0.00), indicating that companies retaining a larger portion of their earnings achieve better EPS performance. Studies by Anwar (2023) and Azam, Khan, Fahad, and Akhtar (2023) support this conclusion, showing that companies retaining a larger portion of earnings achieve financial stability and better performance. However, the study by Al-Khatib and Taktak (2022) found that retained earnings had no significant impact on EPS, suggesting that other factors may play a larger role in determining financial performance.

Regarding the Earnings Before Interest and Taxes to Total Tangible Assets Ratio (X3), the positive effect of (1.329561) was not statistically significant (significance level of 0.186), indicating that its impact on EPS is not sufficiently clear. Studies such as those by Salim and Ismudjoko (2022) and Elewa (2022) agreed that this ratio was not

statistically significant in Indonesia and Egypt, respectively. On the other hand, the study by Khan and Iqbal (2023) showed a notable positive effect of this ratio on EPS, indicating variability in results based on context and geographic location.

For the Market Value of Shareholders' Equity to Total Liabilities Ratio (X4), the results show a significant positive effect of (0.0472632), supported by a t-value of (2.4) and a significance level of (0.02), indicating that companies with a higher market value of shareholders' equity achieve better EPS performance. Studies such as those by Salina et al. (2024) and Awwad and Razia (2021) support this conclusion, finding that companies with a higher market value perform better in terms of EPS in Kazakhstan and Palestine. However, there may be different results based on regional economic changes and local practices.

Finally, for the Net Sales to Total Tangible Assets Ratio (X5), the negative effect of (-0.3199521) with a negative t-value of (-2.7) and a significance level of (0.009) suggests that an increase in this ratio may lead to a decrease in EPS. Studies such as those by Fauzi, Sudjono, and Saluy (2021) and Bshina et al. (2023) support this conclusion, finding that an increase in the net sales to tangible assets ratio was associated with a decrease in EPS. However, there may be variations in results based on changes in sales strategies and financial management.

4.3.5.2 Estimating the Sherrod model in predicting the financial distress of industrial companies listed on the Palestinian Stock Exchange

Table (4.18) shows the results of estimating the Sherrod model equation as dependent variables:

Table (4.18): Results of estimating the Sherrod model in predicting the financial distress of industrial companies listed on the Palestinian Stock Exchange

Dependent variable EPS			
V	Coef.	t	P>t
X1 =Net Working Capital / Total Assets.	2.437501	4.02	0.000*
X2 =Current Assets / Total Assets.	-5.57758	-7.86	0.000*
X3 =Total Shareholders' Equity / Total Assets.	-0.4278716	-2.57	0.013**
X4 =Net Income Before Interest and Taxes / Total Assets.	1.071442	0.71	0.479
X5 =Total Assets / Total Liabilities.	-0.114495	-1.86	0.067***
X6= Total Shareholders' Equity / Fixed Assets	0.1589786	4.41	0.000*
_cons	2.674554	6.74	0.000*

	Value	P
R-squared	0.5779	
Adj R-squared	0.535	
Prob > F	13.5	0.000*

The estimation results of the Sherrod model provide a comprehensive analysis of the impact of financial variables on Earnings Per Share (EPS) for industrial companies listed on the Palestinian stock exchange, aiding in predicting the financial distress of these companies. The table displays the effects of independent variables on EPS and their statistical significance. The coefficient of determination (R-squared) is (0.5779), indicating that the model explains approximately (57.79%) of the variations in EPS. The adjusted R-squared (Adj R-squared) is (0.535), enhancing the model's reliability. The overall significance level of the model (Prob > F) is (0.000) with an F-value of (13.5), indicating that the model is statistically significant overall. The constant term (_cons) shows a strong positive effect of (2.674554), with a significance level of (0.000) and a t-value of (6.74), suggesting that the Sherrod model identifies constant factors contributing to improved EPS predictions. Overall, the model enhances understanding of the financial performance of industrial companies listed on the Palestinian stock exchange and helps in accurately predicting financial distress.

For the Net Working Capital to Total Assets Ratio (X1), the results show a strong positive effect with an estimated value of (2.437501), supported by a t-value of (4.02) and a significance level of (0.000). This indicates that an increase in the net working capital to total assets ratio significantly boosts EPS. In other words, when this ratio rises, it positively contributes to improving EPS, reflecting improved financial performance and effective use of assets. Studies indicate that the Net Working Capital to Total Assets Ratio (X1) has a strong positive effect on EPS, reflecting improved financial performance for companies increasing their working capital. For instance, the study by Anwar (2023) on financial distress in cement companies listed on the Indonesia Stock Exchange found that an increase in net working capital ratio significantly enhances EPS. Similarly, the study by Azam, Khan, Fahad, & Akhtar (2023) showed that private banks in India maintaining a high working capital ratio achieve better financial performance, supporting the notion that increasing working capital improves EPS.

For the Current Assets to Total Assets Ratio (X2), the results show a significant negative effect with a value of (-5.57758), a large negative t-value of (-7.86), and a

significance level of (0.000). This means that an increase in the ratio of current assets to total assets is associated with a significant decrease in EPS, which may indicate a decline in the company's financial performance. In other words, when the share of current assets increases relative to total assets, it may lead to a noticeable decrease in EPS, reflecting a deterioration in financial performance. Studies indicate that an increase in the Current Assets to Total Assets Ratio (X2) has a significant negative effect on EPS, reflecting a decline in performance for companies increasing their share of current assets. For example, the study by Fauzi, Sudjono, & Saluy (2021) on bankruptcy in the telecommunications sector in Indonesia found that an increase in current assets ratio led to a significant decrease in EPS. Similarly, the study by Bshina et al. (2023) on financial failure of Libyan commercial banks found that an increase in the current assets ratio was associated with a decrease in EPS, reflecting a deterioration in financial performance.

For the Total Shareholders' Equity to Total Assets Ratio (X3), the results show a negative effect with a value of (-0.4278716), a t-value of (-2.57), and a significance level of (0.013). This suggests that an increase in the ratio of shareholders' equity to total assets leads to a decrease in EPS, which may be an indicator of weakened profitability. In other words, when the ratio of shareholders' equity compared to total assets increases, it may mean that the company achieves lower returns on equity, reflecting a decline in its ability to effectively generate profits. Studies indicate that an increase in the Total Shareholders' Equity to Total Assets Ratio (X3) has a negative effect on EPS, reflecting weaker profitability for companies increasing their equity ratio. For example, the study by Salim & Ismudjoko (2022) on coal mining companies in Indonesia found that an increase in shareholders' equity ratio led to a decrease in EPS. Similarly, the study by Elewa (2022) on Egyptian companies found that an increase in shareholders' equity was not statistically significant to confirm its effect, suggesting that this factor may have an undefined or unclear impact.

For the Net Income Before Interest and Taxes to Total Assets Ratio (X4), the positive effect of (1.071442) was not statistically significant (significance level of 0.479), indicating that the observed positive effect is not reliable enough to be considered strong evidence of a true relationship between the ratio and EPS. In other words, this relationship may be uncertain or result from random fluctuations in the data. Therefore, this result cannot be relied upon to confirm that the Net Income Before Interest and Taxes to Total Assets Ratio affects EPS reliably. Studies indicate that the Net Income Before Interest

and Taxes to Total Assets Ratio (X4) may show a positive effect on EPS, but without strong statistical significance. For example, the study by Salina et al. (2024) on banks in Kazakhstan showed that this ratio was not statistically significant enough to confirm its positive effect. Similarly, the study by Awwad & Razia (2021) on Palestinian industrial companies found that this ratio may not be reliably impactful on EPS, suggesting that the relationship may be due to random fluctuations.

For the Total Assets to Total Liabilities Ratio (X5), the results indicate a negative effect of (-0.114495). Although this effect is negative, the t-value is (-1.86) and the significance level is (0.067), indicating that the statistical significance is not strong enough to confirm a substantial effect. In other words, while the trend suggests that an increase in this ratio might lead to a decrease in EPS, the results are not decisive enough to confirm that this effect is statistically significant or has a noticeable impact. Studies indicate that the Total Assets to Total Liabilities Ratio (X5) might have a negative effect on EPS, but the statistical significance is not strong enough to confirm this effect. For example, the study by Fauzi, Sudjono, & Saluy (2021) on the telecommunications sector in Indonesia found that an increase in this ratio might lead to a decrease in EPS, but the results were not decisive. Similarly, the study by Bshina et al. (2023) on Libyan banks found that this negative effect was not strong enough to confirm a significant impact.

For the Total Shareholders' Equity to Fixed Assets Ratio (X6), the results show a strong positive effect of (0.1589786), with a t-value of (4.41) and a significance level of (0.000). This suggests that an increase in the ratio of shareholders' equity to fixed assets significantly enhances EPS. In other words, when the ratio of shareholders' equity to fixed assets is higher, it means that the company achieves better returns on equity, reflecting improved financial performance and effective use of fixed assets. Studies indicate that an increase in the Total Shareholders' Equity to Fixed Assets Ratio (X6) has a strong positive effect on EPS, reflecting improved financial performance for companies increasing their equity to fixed assets ratio. For example, the study by Anwar (2023) on Indonesian cement companies showed that increasing this ratio significantly boosts EPS. Similarly, the study by Azam, Khan, Fahad, & Akhtar (2023) on private banks in India showed that increasing the ratio of shareholders' equity to fixed assets greatly enhances financial performance and EPS.

Chapter Five: Discussion

5.1 Introduction:

In this chapter, we present the results of the study aimed at understanding the relationship between corporate financial structure and performance, with a focus on the impact of various financial variables on the Earnings Per Share (EPS) of industrial companies listed on the Palestinian stock exchange. We will analyze the results obtained from the statistical model used and provide recommendations based on these findings, aimed at improving financial structure and liquidity management to enhance financial performance. Finally, we will discuss the limitations encountered and suggest areas for future research to further enhance understanding of the impact of financial factors on financial performance.

5.2. Results of Ratio Analysis Method:

1. Bezeit Company: The Altman model showed a significant improvement in the financial health of Bezeit, with values increasing from (4.90) in 2018 to (6.33) in 2023, indicating a good and stable financial condition. Similarly, the Shirod model indicated an improvement in values from (26.51) in 2018 to (28.74) in 2023, reflecting strong financial stability and a reduction in the likelihood of failure.

2. Jerusalem Company: The Altman model showed a notable improvement in the financial health of Jerusalem, with values rising from (3.28) in 2019 to (4.26) in 2023. On the other hand, the Shirod model indicated positive financial stability, with values increasing from (25.06) in 2018 to (26.01) in 2023, with a continuous decrease in failure risk.

3. Beth Jala Company: The Altman model showed significant fluctuations in the financial health of Beth Jala, with a decline in 2020 and 2021, but a substantial improvement to (4.76) in 2023. Meanwhile, the Shirod model consistently provided positive estimates, with values rising from (20.71) in 2018 to (24.95) in 2023, indicating improvement and stability in financial performance.

4. Cartoon Company: The Altman model demonstrated a gradual improvement in the financial health of Cartoon, with values increasing from low levels in the early years to (3.53) in 2021 and (3.04) in 2023. Conversely, the Shirod model showed "difficulty predicting" in the early years, but values improved to "low risk of failure" starting in 2020, reflecting an enhancement in financial stability.

5. Napco Company: The Altman model showed a continuous deterioration in the financial health of Napco, from (1.35) in 2018 to (0.48) in 2023, indicating an

increased likelihood of financial failure. The Shirod model indicated "difficulty predicting" the company's health, with values ranging between (11.43) in 2018 and (7.12) in 2023, reflecting ongoing concern about financial stability.

6. Plastics Company: The Altman model showed a deteriorated assessment of Plastics from (0.42) in 2019 to (1.96) in 2022, indicating continued weakness in financial health. The Shirod model indicated "exposed to failure" in the early years, with values such as (4.55) in 2018 and (10.66) in 2023, reflecting difficulty in predicting financial health.

7. Vegetable Oils Company: The Altman model showed a stable and flourishing assessment for Vegetable Oils, with values ranging between (5.18) in 2020 and (3.27) in 2021, indicating strong financial health and a reduced likelihood of failure. The Shirod model indicated that the company was "difficult to predict" throughout the period, with values ranging between (14.79) in 2020 and (9.04) in 2022.

8. Aziza Company: The Altman model showed a stable and flourishing assessment for Aziza, with values ranging between (3.36) in 2018 and (4.54) in 2022, indicating strong and stable financial health. On the other hand, the Shirod model indicated that the company was "difficult to predict" in most years, with improvement in 2022 to "low risk of failure" with a value of (20.27)

9. Golden Wheat Company: The Altman model showed diverse results for Golden Wheat, with values ranging between (3.63) in 2020 and (1.91) in 2021, with a "difficult" classification in most years, reflecting challenges in maintaining strong financial health. On the other hand, the Shirod model indicated a "low risk of failure" with values ranging between (24.11) in 2020 and (20.12) in 2018, indicating relative stability with some uncertainty in predicting financial stability.

10. Arab Paints Company: The Altman model showed positive and stable results for Arab Paints, with values ranging between (7.30) in 2018 and (5.62) in 2020, indicating continuous financial strength and stability. The Shirod model indicated good financial stability, with values ranging between (34.02) in 2018 and (30.54) in 2022, reflecting a reduction in financial risks.

11. Jerusalem Cigarettes Company: The Altman model showed poor results for Jerusalem Cigarettes, from (2.19) in 2021 to (1.04) in 2018, indicating significant financial challenges. The Shirod model indicated "difficult to predict" with values

ranging between (8.80) in 2021 and (5.38) in 2019, reflecting a state of uncertainty about the company's financial health without reaching the "failure" level.

5.2.1. Conclusion:

The researcher concludes that companies such as Bezeit and Jerusalem have shown notable improvements in their financial health, with significant increases in values related to their financial condition, reflecting good financial stability. On the other hand, companies like Beth Jala and Cartoon have experienced fluctuations in their financial health, with significant improvements in the recent period but with previous fluctuations. Companies such as Napco and Plastics have shown continuous deterioration in their financial health, indicating an increase in financial risks. Conversely, companies like Vegetable Oils and Aziza have achieved good financial stability, reflecting strong financial performance. Finally, companies like Golden Wheat and Jerusalem Cigarettes have shown diverse results, ranging from relative stability to financial challenges, indicating difficulty in maintaining strong financial health consistently.

5.3. Results of Statistical Analysis Method:

1. The results show that an increase in retained earnings to tangible assets (0.67) and the market value of shareholders' equity to total liabilities (0.30) are positively associated with earnings per share (EPS). This indicates that companies that retain a larger portion of their earnings and have a strong financial structure may achieve higher profitability, reflecting the effectiveness of earnings retention strategies and a strong financial structure in improving financial performance.

2. On the other hand, the negative relationship between working capital to tangible assets (-0.08) and net sales to tangible assets (-0.31) with EPS suggests that managing working capital and increasing sales may not be sufficient to significantly improve profitability. Additionally, the weak positive relationship between earnings before interest and taxes to tangible assets (0.19) reflects a limited impact of operational efficiency on profitability, implying that companies need to focus on other strategies besides managing working capital and sales to achieve a substantial improvement in profitability.

3. The results indicate that improving financial structure and increasing assets relative to liabilities (0.27) and net income before interest and taxes (0.14) are positively associated with EPS. This suggests that companies that enhance their financial structure and increase assets relative to liabilities, as well as those that increase their

net income before interest and taxes, may achieve better financial performance and higher profitability.

4. On the other hand, the results show that there are negative relationships between some financial variables and EPS. The moderate negative relationship between current assets and EPS (-0.40) and the weak negative relationship between net working capital and EPS (-0.08) indicate that increasing current assets and net working capital may not be sufficient to improve profitability, and could be associated with a decrease in earnings. Additionally, changes in shareholders' equity (-0.17) did not show a significant impact on earnings, implying that focusing on increasing shareholders' equity may not lead to a noticeable improvement in profitability, and there is a need to focus on other strategies to enhance financial performance.

5. The results showed that an increase in the ratio of working capital to total tangible assets leads to a decrease in EPS by (1.49%). This indicates that improving working capital management may not be sufficient to enhance profitability and could negatively affect financial performance.

6. The results showed that an increase in the ratio of retained earnings to total tangible assets leads to an increase in EPS by (1.99%). This indicates that companies that retain a larger portion of their earnings achieve better financial performance.

7. The results showed that an increase in the ratio of earnings before interest and taxes to total tangible assets leads to an increase in EPS by (1.33%). However, its effect is not statistically significant, suggesting that improving operational efficiency alone may not be sufficient for a substantial improvement in profitability.

8. The results showed that an increase in the ratio of the market value of shareholders' equity to total liabilities leads to an increase in EPS by (0.05%). This indicates that companies with higher market value enjoy better financial performance.

9. The results showed that an increase in the ratio of net sales to total tangible assets leads to a decrease in EPS by (0.32%). This suggests that focusing on increasing sales without improving operational efficiency may harm profitability.

10. The results showed that an increase in the ratio of net working capital to total assets leads to an increase in EPS by (2.44), reflecting a significant improvement in financial performance and effective use of assets.

11. The results showed that an increase in the ratio of current assets to total assets is associated with a decrease in EPS by (-5.58), indicating a significant decline in financial performance when the proportion of current assets increases.

12. The results showed that an increase in the ratio of total shareholders' equity to total assets leads to a decrease in EPS by (-0.43), which may indicate weak profitability when the ratio of shareholders' equity to assets increases.

13. The results showed that the effect of the ratio of net income before interest and taxes to total assets on EPS is positive by (1.07), but without strong statistical significance, suggesting that the effect may be uncertain or due to random fluctuations.

14. The results showed that an increase in the ratio of total assets to total liabilities leads to a decrease in EPS by (-0.11), but the statistical significance is not strong enough to confirm a notable effect.

15. The results showed that an increase in the ratio of total shareholders' equity to fixed assets leads to an increase in EPS by (0.16), reflecting a significant improvement in financial performance when the ratio of shareholders' equity to fixed assets increases.

5.4. Recommendations:

Based on the previous results, the following recommendations can be made:

1. It is recommended to improve the management of current assets and working capital to reduce fluctuations and achieve better financial stability.

2. It is recommended to enhance operational efficiency and increase the effectiveness of resource utilization to improve returns and reduce financial risks.

3. It is recommended to develop long-term financial stability strategies to ensure continued good financial performance and maintain financial stability.

4. It is recommended to improve financial risk management strategies and planning to handle financial challenges and ensure financial stability.

5. It is recommended to continue with earnings retention strategies that show a positive impact on earnings per share (EPS), as these strategies contribute to improving financial performance and profitability.

6. It is recommended to improve the financial structure and increase the ratio of market value of shareholders' equity to total liabilities, as this shows improvement in EPS and better financial performance.

7. It is recommended to review working capital management strategies due to their negative impact on EPS, and focus on improving capital management and returns in other ways to enhance profitability.

8. It is recommended to further enhance operational efficiency due to the limited impact of earnings before interest and taxes on EPS.

9. It is recommended to improve asset-to-liability management strategies, as this shows a positive impact on EPS and contributes to better financial performance.

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Appendices

Appendix No. 1: Companies operating in the Palestine Stock Exchange based on each sector

Table (2.2) Distribution of the Insurance Sector

Name of Company
AL-Ahleia Insurance group (AIG)
United Global Insurance (GUI)
Mashreq Insurance Company (MIC)
National Insurance Company (NIC)
Palestine Insurance Company (PICO)
Palestinian Takaful Insurance Company (TIC)
Trust International Insurance (TPIC)

Table (2.3) Distribution of the Investment Sector

Name of Company
Arab Palestinian Investment Company (APIC)
Commercial Real Estate Investment (AQARIYA)
Arab Investors (ARAB)
Arkan Real Estate (ARKAAN)
Jerusalem for Real Estate Investments (JREI)
Palestine Development and Investment Company (PADICO)
Palestinian Investment and Development (PID)
Palestine Industrial Investment Company (PIIC)
Palestine Real Estate Investment (PRICO)
Sanad for Construction Resources (SANAD)
Union for Reconstruction and Investment (Name not provided)

28Table (2.4) Distribution of the Industrial Sector

Name of Company
Arab Palestinian Paint Company (APC)
Palestine Poultry (AZIZA)
Beit Jala Pharmaceuticals (BJP)
Birzeit Pharmaceuticals (BPC)

Golden Wheat Mills Company (GMC)
Jerusalem Cigarette Company (JCC)
Jerusalem Pharmaceuticals (JPH)
Palestine Plastics Industries (LADAEN)
National Aluminum and Profiles Company (NAPCO)
National Carton Industry (NCI)
Vegetable Oil Mills (Name not provided)

Table (2.5) Distribution of the Services Sector

Name of Company
National Towers (ABRAJ)
Arab Hotels Corporation (AHC)
Nablus Specialized Surgical Center (NSC)
Palestine Telecommunications Company (OOREDOO)
Balaqar Real Estate for Development, Management, and Operation (PALAQAR)
Palestinian Telecommunications Company (PALTEL)
Palestinian Electricity Company (PEC)
Ramallah Summer Resorts (RSR)
Palestinian Distribution and Logistics Services (WASSEL)

Table (2.6) Distribution of the Banking and Financial Services Sector

Name of Company
Arab Islamic Bank (AIB)
Bank of Palestine (BOP)
Palestinian Islamic Bank (ISBK)
Palestinian Investment Bank (PIBC)
Palestine Stock Exchange (PSE)
Al-Quds Bank (QUDS)
Safa Bank (SAFABANK)
National Bank

استخدام نموذجي ألتمان وشيرود في التنبؤ بالضائقة المالية للشركات الصناعية المدرجة: دراسة حالة من بورصة فلسطين

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ملخص

تهدف الدراسة إلى فحص استخدام نماذج ألتمان وشيرود في التنبؤ بالضائقة المالية للشركات الصناعية المدرجة في بورصة فلسطين: دراسة حالة. استخدمت الدراسة منهجاً وصفياً تحليلياً واستعانت بطريقة المسح الشامل لــ 11 شركة من القطاع الصناعي في بورصة فلسطين، بما في ذلك شركات الأدوية والكرتون والبلاستيك وزيوت الخضار وغيرها. تم تحليل التقارير السنوية للشركات من خلال تحليل كمي للمحتوى باستخدام المعلومات الثانوية المستخرجة من تلك التقارير. تم استخدام برنامج Stata 15 لإجراء التحليل الإحصائي، حيث تم تطبيق الاختبارات الوصفية، اختبار بيرسون، الانحدار المتعدد، واختبار بريوش باجان على البيانات المالية المستخرجة. وكشفت النتائج أن شركتي بيت زيت والقدس أظهرتا تحسناً كبيراً في صحتهما المالية، مع استقرار في قيم نماذج ألتمان وشيرود. ارتفعت قيم بيت زيت على مدار الوقت، وكذلك ارتفعت قيم القدس، مما يعكس نمواً مالياً. أظهرت شركتا بيت جالا وكرتون تحسناً مؤخراً، رغم وجود تقلبات. في المقابل، شهدت شركتا نابكو وبلاستيك تدهوراً مستمراً مما زاد من المخاطر المالية. حققت شركتا زيوت الخضار وعزيزة استقراراً قوياً، بينما أظهرت شركتا القمح الذهبي وسجائر القدس نتائج متباينة تشير إلى تحديات مالية.

أظهر التحليل الإحصائي أن زيادة نسبة الأرباح المحتجزة إلى الأصول الملموسة، والقيمة السوقية لحقوق المساهمين إلى إجمالي الخصوم تؤثر إيجابياً على ربحية السهم(EPS) ، مما يبرز أهمية الاحتفاظ القوي بالأرباح والهياكل المالية في تعزيز الربحية. علاوة على ذلك، يرتبط تحسين الهيكل المالي وزيادة الأصول بالنسبة للخصوم والدخل الصافي قبل الفوائد والضرائب بأداء مالي

أفضل. في المقابل، أدى إدارة رأس المال العامل وزيادة المبيعات إلى تأثير سلبي على ربحية السهم، مما يشير إلى أن هذه الاستراتيجيات قد لا تعزز الربحية بشكل كبير. كما أن التأثير الإيجابي الضعيف للدخل قبل الفوائد والضرائب على الأصول الملموسة يشير إلى فوائد تشغيلية محدودة. كذلك، فإن زيادة الأصول الحالية، رأس المال العامل الصافي، وإجمالي حقوق المساهمين إلى إجمالي الأصول أثرت سلباً على ربحية السهم، مما يبرز الحاجة إلى استراتيجيات بديلة لتحسين الأداء المالي.

بناءً على هذه النتائج، نُقترح التوصيات التالية: يجب على الشركات الاستمرار في تطبيق استراتيجيات التحسين المالي التي ساهمت في المكاسب الحالية لضمان الاستقرار المالي المستدام. يُنصح بتعزيز إدارة الأصول الحالية ورأس المال العامل لتقليل التقلبات وتحقيق استقرار أفضل. تحسين الكفاءة التشغيلية وفعالية استخدام الموارد أمر ضروري لتحقيق عوائد أفضل وتقليل المخاطر المالية.

الكلمات المفتاحية : نموذج ألتمان ، نموذج شيرود، التنبؤ بالضائقة المالية، الشركات الصناعية،

بورصة فلسطين.