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HOW EFFECTIVE IS THE MODIFIED ALTMAN MODEL IN PREDICTING FINANCIAL FAILURE IN ECONOMIC INSTITUTIONS- AN ANALYTICAL STUDY OF A SAMPLE OF IRAQI BANKS LISTED ON THE IRAQI STOCK EXCHANGE FOR THE PERIOD (2018-2022) / PROPOSED MODEL

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Abstract
The current research aims to highlight the importance of using the Altman's Z-score model in predicting the performance failure of economic institutions, the research also aims to enhance the efficiency of work within Iraqi economic institutions based on the model from global quantitative models, this research follows the descriptive research model to assess the levels of financial failure by looking at the annual financial reports published for the sample banks, and how this assessment will affect the performance of banks when making financing and investment decisions in the near future. Ten banks were selected (Sumar Commercial Bank, Iraqi National Bank, Iraqi Commercial Bank, Gulf Commercial Bank, Iraqi Investment Bank, Middle East Investment Bank, Mosul Development and Investment Bank, Iraqi Union Bank, Basra International Bank, and Al-Warka Bank). For the period (2018-2020), the analytical descriptive method was adopted to reach the research outputs, where the research adopted statistical methods to analyze the data in the statistical program JASP (weighted arithmetic mean, standard deviation and ANOVA to test the F statistic to know the quality of the standard model, and finally the research variables were tested by means of the P-value test). The research found that out of ten selected banks, two commercial banks are located below the failure zone, three banks are located in the financial failure zone and the remaining five banks are located outside the financial failure zone. This research also found that Altman's Z-Score model helps economic institutions in stabilizing and sustaining within the markets, and helps them in making strategic decisions. The research recommends the need to review policies within economic institutions to increase the forecasting horizon of the financial failure model to more than one year, as most forecasting models fail to accurately predict the occurrence of failure after more than one year, and the accuracy of the model tends to decrease as the forecasting curve steepens.

Keywords: financial failure, financial failure models, modified Altman model, financial failure prediction, economic institutions.

Introduction

Research Methodology

Research Problem

The research issue is embodied in determining the importance of predicting financial failure and exploring the challenges facing banking by identifying the most important strengths and weaknesses of economic institutions that can be shown in the annual financial reports and the extent of the impact on making investment decisions in achieving the targeted profitability, which can be reflected in stock prices, troubled institutions generate heavy economic losses not only for the company's shareholders and creditors, but also burden the state with enormous economic and social costs. Therefore, the research issue can be summarized by answering the following questions:

1. Does financial failure exist in the sample banks and what are the reasons for its occurrence?
2. Is there a relationship between the indicators of financial failure and financing and investment decisions in the economic organizations in the research sample?
3. How does the management of assets and liabilities affect the detection of financial failure in economic organizations?
4. Do the components of the modified Altman index have a role in recognizing some factors beyond the control of management, and can they be anticipated or prevented before the occurrence of financial failure?
5. How effective is the Modified Altman Index in determining the levels of financial failure in economic organizations in the short and medium term?
6. What are the future directions to find out whether the financial failure model can accurately predict financial failure or not?

Importance of research

The importance of the research comes from the importance of published annual financial reports as one of the financial reporting tools that help investors in making deposit decisions or financing investments based on these financial reports. The importance of the research lies in the importance of the role played by the financial failure model in analyzing the financial situation of economic institutions if it is sound and does not have financial issues in a way that ensures their survival in the labor market, or these institutions may need some adjustments to avoid unexpected changes in the accrual management between assets and liabilities.

Research Objectives

The current research aims to identify the main theoretical and practical limitations of the bankruptcy forecasting literature and develop guidelines for future research. The research objective is illustrated by the following:

1. To find out whether or not financial failure exists in the economic organizations in the research sample, and what are the reasons that lead to the occurrence of financial failure in those organizations.
2. The aim of the research is to clarify the relationship between the indicators of financial failure when making financing and investment decisions in private commercial banks listed on the Iraqi Stock Exchange.
3. Clarify how the management of assets and liabilities affects the detection of financial failure in economic institutions.
4. Explain the role of the weighted ratios included in the financial failure index in the early detection and prevention of factors beyond the control of management before the occurrence of financial failure.
5. Determine the extent to which these banks benefit from financial analysis processes to predict the performance of economic institutions in the short and medium term.

Research hypotheses

This research is based on three main hypotheses:
1. "The financial failure of a sample of private commercial banks listed on the Iraq Stock Exchange cannot be predicted using Altman's Z-Score financial failure model"
2. "The value of the financial failure model cannot be used to determine the levels of financial condition of the sample banks in a meaningful way in the near term"
3. "There is no statistically significant difference between the value of the financial failure index of private commercial banks listed on the Iraq Stock Exchange and the standardized value of the Altman model during the research years"

Statistical methods and techniques used in the research

The current research relied on the descriptive-analytical approach to reach the research outputs where the research adopted statistical methods to analyze the data of the annual financial reports published in the Securities Commission according to the statistical program JASP (weighted arithmetic mean, standard deviation and ANOVA to test the F statistic to know the quality of the standard model, and finally the research variables were tested by the P-value test).

Research population and sample

The research population consists of private commercial banks listed on the Iraq Stock Exchange and a sample of ten banks was adopted for the period (2018-2022).

The first research paper: Financial failure and the importance of predicting it and studying its most important models

Financial failure is a very broad and complex concept, as failure begins to appear gradually from the inability of the economic institution to pay the short-term debts incurred by its customers and owners in the agreed period, up to the stage of bankruptcy. When organizations face a set of imbalances that, if not addressed the moment they are discovered, may cause a lot of issues that lead to catastrophic mistakes that will affect the desire of customers to continue dealing with the economic institution. Liquidity, high interest rates, loan defaults,

stringent government regulations, and recessions all contribute to the failure of banking activities. Therefore, it is necessary for the management of economic institutions to be fully aware of their sustainability risk in order to employ the necessary measures to obtain better business stability, as sustainability risk, if it occurs, can cause a real or potential material negative impact on the value of the investment. In light of the economic conditions experienced by banks within the country and the consequent increase in exposure to financial failure, it has become necessary to activate some statistical models for financial analysis that allow predicting the likelihood of continuity and survival in the market or exposure to bankruptcy and liquidation.

Table 1: The most important indicators for the sample banks

Bank name	Bank code	Date of incorporation	Capital at incorporation	Listing date	Capital at Listing	Current Capital
Sumar Commercial Bank	BSUC	7/8/1999	400,000,000	4/9/2004	6,000,000,000	250,000,000,000
National Bank of Iraq	BNOI	2/1/1995	400,000,000	8/7/2004	1,143,000,000	270,000,000,000
Commercial Bank of Iraq	BCOI	11/2/1992	150,000,000	25/07/2004	4,000,000,000	250,000,000
Gulf Commercial Bank	BGUC	20/10/1999	600,000,000	25/07/2004	4,120,000,000	300,000,000,000
Iraq Investment Bank	BIBI	13/07/1993	100,000,000	15/06/2004	5,760,000,000	250,000,000,000
Middle East Investment Bank	BIME	7/7/1993	400,000,000	8/7/2004	7,500,000,000	250,000,000,000
Mosul Bank for Development and Investment	BMFI	23/08/2001	1,000,000,000	1/9/2005	10,000,000,000	252,500,000,000
Iraqi Union Bank	BUOI	23/09/2002	2,000,000,000	30/10/2006	4,000,000,000	250,000,000,000
Basra International Bank	BBII	10/7/1993	10,500,000,000	4/9/2004	55,000,000,000	55,000,000,000
Al-Warka Bank	BWAI	20/11/1999	250,000,000,000	15/06/2004	75,000,000,000	75,000,000,000

Source: Table prepared by the researcher based on published financial reports

The concept of financial failure and the reasons for its occurrence

Regardless of the complexity of the topic of financial failure in different fields of research, there is still no comprehensive theory to explain how companies fail and how their failure should be conceptualized. Financial failure is the most important threats facing many companies today, regardless of their size and the nature of their operations (Rees, 1995, p. 29), financial failure is defined as the inability of an organization to pay its current obligations, and failure is not a momentary occurrence but may result from many factors that combine over time and lead to the inability of the organization to meet its financial, cash or operational obligations (Matar & Shahin, 2011, p. 584). Financial failure is defined as an unfortunate circumstance that prevents a company's ability to survive in the market. Financial failure occurs when the total liabilities exceed the total assets of the organization (Megginson & Smart., 2006).

There are many reasons for financial failure. Sometimes these factors are beyond management's control, but other times they can be anticipated and prevented (Venter, 2008,

p. 62). (Saedi, 2016, p. 3) stated that two reasons for the occurrence of financial failure can be attributed to economic failure and financial distress, where the cause of economic failure is when the institution is unable to achieve acceptable returns on its investments, or when the net assets are negative when the book value of the institution's liabilities is more than the book value of its assets, while the cause of financial failure is that the institution cannot meet its current obligations towards creditors at maturity date or at sudden withdrawals, while the cause of the occurrence of financial failure is due to the inability of the institution to meet its current obligations to creditors (Matar & Shahin, 2011, p. 589).

Financial failure in economic institutions is due to many reasons, including administrative reasons such as the lack of specialized administrative and technical elements that suit the nature of the activity and technical reasons such as poor planning to finance current investments or a mistake in preparing feasibility studies and other technical defects that may be revealed during operating experiences and delayed implementation (Ghassane , 2010, p. 8). As well as financial reasons such as not achieving an appropriate balance between working capital and loans granted. Marketing reasons may not have a solid marketing system within economic institutions, which ultimately leads to the inability to face changes in the market, and finally legal failure when the organization's liabilities are greater than its assets, which forces the organization to abandon part of the assets and sell them to cover the outstanding liabilities (Kumar & Ravi , 2007, pp. 1-3).

The importance of predicting financial failure in economic organizations

Forecasting financial failure is of great importance in the field of financial management of all economic institutions in particular because of the need to know the consequences of the great damage that may affect the parties interested in the performance of those institutions, and the prediction of failure can achieve many positive advantages for those who anticipate it in time, as they can take the necessary measures to address the failure in its early stages and avoid reaching bankruptcy and liquidation (Ramo & Al-Wattar, 2010, p. 9). The importance of predicting financial failure stems from the interest of many parties related to the future of economic institutions, including the following: (Theeb, 2012, p. 103)

1. **Investors**: Investors are interested in the financial failure behavior of an economic institution and how to predict it, in order to make financing and investment decisions and trade-offs between all available alternatives with the possibility of avoiding some risky investments.

2. Creditors and lenders: Creditors are interested in credit analysis with the aim of information about potential risks and evaluating the performance of borrowing economic institutions in order to be assured of meeting the principal and interest payments at the present time or in the near future (Abu Nassar Mohammed and Hamidat, 2008, p. 4).

3. Management: Management is increasingly interested in the indicators of predicting the failure of companies when making appropriate and necessary decisions at the right time.

4. Government agencies: The interest of government agencies in financial failure prediction indicators is due to their supervisory function over institutions operating in the economy and their concern for the safety of these institutions, such as the Financial Control Bureau.

5. Auditors: Auditors bear a great responsibility when auditing the financial statements of these economic institutions, as the work of the auditor is considered the starting point in understanding and interpreting the financial situation of economic institutions (Al-Dughaji, 2008, p. 7).

Stages of Financial Failure

The manifestations of financial failure may come in several stages, including: (Faisal&Batal, 2022, p. 11)

1. **The stage before the appearance of financial failure:** This stage is associated with many negative phenomena, including lack of demand for products, poor production efficiency, a decline in the competitive position, and high costs.

2. **Declining cash flows:** This stage is associated with the organization's inability to pay liabilities from net operating cash flows.

3. **Temporary financial distress:** This stage is critical for the organization as it is unable to use its operating policies and procedures to raise the cash required to meet immediately outstanding liabilities.

4. **Permanent financial distress:** The organization finds itself in a state of complete financial insolvency, which means it is unable to meet its ongoing obligations to customers and shareholders.

Types of financial failure

There are two types of financial failure to which the financial institution is exposed (Muhammad & Fleifel, 2015, p. 32) the first type is called creeping financial failure, the reason for this name is due to several internal reasons, such as management inefficiency and increased reliance in managing each of the following independent factors: liquidity, profitability, debt recovery capacity, leverage and credit capacity, as this management is a weak management due to its inability to focus on strategic objectives. As for the second type called "sudden failure", medium and large companies that are characterized by an excellent level or even higher than that may be exposed to financial failure that occurs suddenly as a result of political, economic, legal or social changes (Altman E. , 1968, pp. 589-609), hence the different types of financial failure that economic institutions may be exposed to through the path followed by these institutions, some institutions survive for long periods before being exposed to failure, and some do not survive more than the first five years of the institution's life (Al-Barifkani, 2017, p. 272). Economic institutions that fall within the zone of financial failure can also be divided into two parts: troubled institutions that are subject to voluntary

liquidation and troubled institutions that are subject to compulsory liquidation (Sharma, & Iselin, , 2003, p. 16).

Financial Failure Models

There are many models used in predicting the financial failure of industrial and non-industrial organizations are (Sherrod Kida, Altman, Springate,), Altman is the first to use the multiple discrimination analysis method to predict financial failure in 1968, where Altman combined a number of ratios with a specific weight for each ratio. (Dimitras & C, 1996, p. 490), where (Abu Orabi, 2014, p. 32) found that Altman's model is 72% accurate in predicting bankruptcy two years before the event, with a Type II error weighting (false positives) of 6%. However, when Altman conducted a series of subsequent tests covering three different time periods over the next thirty-one years until 1999, Altman found that the model is accurate up to 80-90%, which is high for the purpose of predicting bankruptcy one year before the event (Altman, 1984, p. 173), but with the possibility of a Type II error when categorizing bankruptcy, which is explained by the fact that a company may be vulnerable to financial failure but not to bankruptcy or liquidation with an accuracy of 15-20%. Hence, the Altman Index has gained wide acceptance by auditors, management accountants, and those interested in the financial statements used to evaluate loans (Eidleman, 2007, p. 168). Thus, it can be seen that the modified Altman model misleads the difficulties faced by financial analysts in economic institutions listed on the stock exchange due to the difficulty of measuring the market value of shareholders as the model relies on the book value of equity (Al-Sheikh, 2008, p. 82).

Section three: The practical framework of the research

First: Describing and characterizing the research variables

The research aims, through hypothesis testing, to predict the financial condition of the economic institutions in the research sample through the use of models for predicting financial failure within economic institutions, but the Altman model modified according to banking is the one that was used in the current research. Through this model, Altman was able to distinguish between the sound or unsound financial situation of economic institutions in the services sector, and this model consists of four financial ratios with a weight for each ratio that he was able to reach through his development of thirty financial ratios. As in the following equation: (Altman E. l., 2017, p. 22)

$$\textbf{Z Score} = 6.56X_1 + 3.26\,X_2 + 6.72\,X_3 + 1.05\,X_4$$

Wherein:

Z Score: Financial Failure Index
X1: Net working capital/total assets (activity indicator)
X2: Retained Earnings/Total Assets (Management Performance Index)
X3: Operating profit before interest and taxes/total assets (profitability indicator)
X4: Book value of equity/total liabilities (Leverage Index)

Second: Presentation and analysis of research results and measurement tools

The financial failure index is a variable that describes the way in which the financial risk that economic institutions are likely to be exposed to in the near term can be detected, as the modified Altman index works in providing assistance to the bank's management to address the defects in financial management to avoid the occurrence of the issue in the near future. The index works by identifying the financial situation of the economic institutions in the research sample and then measuring and analyzing it by testing the following main hypotheses according to the annual financial reports published for each institution:

The first main hypothesis "Financial failure cannot be predicted for a sample of private commercial banks listed on the Iraqi Stock Exchange using Altman's Z-Score financial failure model" where the Altman's modified bank-specific model was used in applying the model equation and conducting the vertical analysis of the annual financial statements published for all banks in the research sample and the following results were reached:

Table 2: The Altman model for the sample banks in 2018

نموذج التمان للمصارف عينة البحث في سنة 2018											
وضع المصرف	قيمةZ Score	مؤشر الرافعة المالية		مؤشر الربحية		مؤشر الأداء الإداري		مؤشر النشاط		اسم المصرف	ت
		X4	W	X3	W	X2	W	X1	W		
آمن	3.3854	1.04	1.05	-0.84	6.72	1.61	3.3	0.41	6.56	مصرف سومر التجاري	1
معرض لمخاطرة مالية	2.0025	0.79	1.05	1.014	6.72	0.302	3.3	-1.01	6.56	المصرف الأهلي العراقي	2
آمن	3.99276	1.3	1.05	0.239	6.72	0.084	3.3	0.114	6.56	المصرف التجاري العراقي	3
آمن	3.7788	0.012	1.05	-0.77	6.72	0.69	3.3	1.02	6.56	مصرف الخليج التجاري	4
معرض لمخاطرة مالية	2.90762	0.71	1.05	0.006	6.72	0.0673	3.3	0.29	6.56	مصرف الاستثمار العراقي	5
آمن	3.1258	0.08	1.05	0.41	6.72	0.43	3.3	-0.17	6.56	مصرف الشرق الأوسط للاستثمار	6
آمن	6.7227	0.032	1.05	0.008	6.72	0.005	3.3	1.009	6.56	مصرف الموصل للتنمية والاستثمار	7
آمن	4.50492	1.38	1.05	0.046	6.72	0.42	3.3	0.21	6.56	مصرف الاتحاد العراقي	8
آمن	3.41278	0.034	1.05	0.052	6.72	0.81	3.3	0.059	6.56	مصرف البصرة الدولي	9
معرض للفشل المالي	1.44709	0.161	1.05	-0.993	6.72	0.97	3.3	0.73	6.56	مصرف الوركاء	10

The results of Table 2 for 2018 indicate that Mosul Bank for Development and Investment, Union Bank of Iraq, Commercial Bank, Gulf Commercial Bank, Basra International Bank, Sumar Commercial Bank, and Middle East Investment Bank. These banks enjoy a good and safe financial situation for depositors and investors, as the financial situation of these banks is very safe, as the value of the index was (6.7), (4.5), (3.9), (3.7), (3.7), (3.4), (3.3) and (3.3), respectively, which are higher than (3.1). 1) respectively, which is higher than the standard value of the Altman Index, which is (2.9). These high ratios indicate that these institutions enjoy good banking activity, which makes them highly capable of increasing the volume of profits, which may reflect positively on the financial performance indicators of each of them. In terms of the components of the index, both the Iraqi Investment Bank and the Iraqi National Bank fall within the foggy area that makes it difficult to determine their financial situation accurately, as the index value reached (2.9) and (2.0), respectively, indicating that the bank is exposed to significant financial risk. As for Al-Warka Bank, it is in the red zone, where the index values reached (1.4), which is lower than the standard value of the modified Altman

index of (1.8), and this decrease reflects the decline in the levels of activity of this bank within the financial markets in the research year.

Table 3: The Altman model for the sample banks in 2019

نموذج التمان للمصارف عينة البحث في سنة 2019											
ت	اسم المصرف	مؤشر النشاط		مؤشر الأداء الإداري		مؤشر الربحية		مؤشر الرافعة المالية		قيمة Z Score	وضع المصرف
		W	X1	W	X2	W	X3	W	X4		
1	مصرف سومر التجاري	6.560	0.064	3.260	0.120	6.720	0.010	1.050	0.250	1.141	معرض للفشل المالي
2	المصرف الأهلي العراقي	6.560	0.050	3.260	0.207	6.720	0.098	1.050	0.040	1.703	معرض للفشل المالي
3	المصرف التجاري العراقي	6.560	0.030	3.260	0.124	6.720	0.610	1.050	0.007	4.708	آمن
4	مصرف الخليج التجاري	6.560	0.042	3.260	0.087	6.720	0.221	1.050	0.073	2.121	معرض لمخاطرة مالية
5	مصرف الاستثمار العراقي	6.560	0.314	3.260	0.024	6.720	0.212	1.050	0.190	3.762	آمن
6	مصرف الشرق الأوسط للاستثمار	6.560	0.034	3.260	0.209	6.720	0.130	1.050	-0.08	1.694	معرض للفشل المالي
7	مصرف الموصل للتنمية الاستثمار	6.560	0.080	3.260	1.006	6.720	0.014	1.050	0.031	3.932	آمن
8	مصرف الاتحاد العراقي	6.560	0.063	3.260	0.150	6.720	0.371	1.050	0.355	3.832	آمن
9	مصرف البصرة الدولي	6.560	0.017	3.260	0.360	6.720	0.156	1.050	1.140	3.530	آمن
10	مصرف الوركاء	6.560	0.030	3.260	0.038	6.720	0.110	1.050	0.890	1.994	معرض لمخاطرة مالية

The results of Table 3 indicate that all components of the Altman Index for 2019 recorded high values for (Commercial Bank of Iraq, Mosul Bank for Development and Investment, Iraq Investment Bank, Union Bank of Iraq, and Basra International Bank), where the index value for each bank amounted to (4.7), (3.9), (3.8), (3.7), (3.8), (3.7), and (3. 5) respectively, and these banks are located within the green zone where the efficiency of banking management can be predicted in activating the role of working assets in parallel with the growth of investments and the payment of current obligations according to their due dates, and thus the ability of these economic institutions to overcome the challenges they face in order to support growth by relying on deposits in financing their assets and managing borrowing operations, which reflects positively on the position of these banks within the Iraqi Stock Exchange. Both (Gulf Commercial Bank and Al-Warka Bank) fall within the foggy area where the index values reached (2.1) and (1.99) which were less than 2.9 and greater than 1.9, which are the standard values of the modified Altman Index, through this value it is difficult to predict in determining the management performance of that institution but it is exposed to financial, regulatory or legal risk, and this risk may be significant if the bank does not take decisions to accept or mitigate it in a way that does not affect the integrity of its financial position and ensure its survival within the financial markets. While it can be noted that the value of the financial failure index for (Al Ahli Bank of Iraq, Middle East Investment and Sarmar Investment) amounted to (1.7), (1.6) and (1.1) respectively, all of which are lower than the value of the standard Altman index of (1.8), The value of this indicator reflects the decline in the ability of the last three banks to accurately manage assets and liabilities in financing banking activities, and this decline leads to a decrease in the contribution of the Shat Index, Management Performance Index, Profitability Index, Leverage Index, and Asset Turnover Index for these banks compared to the previous year.

Table 4: The Altman model for the sample banks in 2020

نموذج التمان للمصارف عينة البحث في سنة 2020										
ت	اسم المصرف	مؤشر النشاط		مؤشر الأداء الإداري		مؤشر الربحية		مؤشر الرافعة المالية		قيمة Z Score	وضع المصرف
		W	X1	W	X2	W	X3	W	X4		
1	مصرف سومر التجاري	6.56	0.179	3.26	0.21	6.72	0.07	1.050	0.037	2.36809	معرض لمخاطرة مالية
2	المصرف الأهلي العراقي	6.56	0.096	3.26	0.099	6.72	0.033	1.050	1.091	2.31981	معرض لمخاطرة مالية
3	المصرف التجاري العراقي	6.56	0.83	3.26	0.19	6.72	0.085	1.050	0.084	6.7236	آمن
4	مصرف الخليج التجاري	6.56	0.255	3.26	0.025	6.72	0.148	1.050	0.193	2.95151	معرض لمخاطرة مالية
5	مصرف الاستثمار العراقي	6.56	0.08	3.26	0.064	6.72	0.077	1.050	0.202	1.46298	معرض للفشل المالي
6	مصرف الشرق الأوسط للاستثمار	6.56	0.67	3.26	-0.48	6.72	-0.222	1.050	0.113	1.46373	معرض للفشل المالي
7	مصرف الموصل للتنمية	6.56	0.830	3.26	0.409	6.72	0.025	1.050	0.062	7.01124	آمن
8	مصرف الاتحاد العراقي	6.56	0.15	3.26	0.013	6.72	0.004	1.050	0.58	1.66226	معرض للفشل المالي
9	مصرف البصرة الدولي	6.56	0.072	3.26	0.086	6.72	0.063	1.050	1.089	2.31949	معرض لمخاطرة مالية
10	مصرف الوركاء	6.56	0.078	3.26	0.203	6.72	0.015	1.050	0.017	1.29211	معرض للفشل المالي

The results of Table (4) obtained for 2020 indicate that only (Mosul Bank for Development and Investment and the Iraqi Commercial Bank) are located within the green zone, as both of them enjoy a good and safe financial situation with a very high percentage, as the value of the financial failure index exceeded the upper value of the modified Altman index (2.9) and reached (7.01) and (6. These high percentages indicate that the ability of these banks to manage their assets and liabilities and employ them in the most appropriate way towards safety, as the banks' contribution to good banking activities is due to achieving a balance between liquidity and profitability, and thus the preservation of the integrity of the financial position of these sample banks can be achieved. However, it can be noted that Gulf Bank, Sumar Bank, Al Ahli Bank of Iraq and Basrah International Bank fall within the fuzzy zone where the index values reached (2.9) and (2.36), respectively, where Al Ahli Bank and Basrah Bank share the index value of (2.31). The financial failure index for each bank (Investment Bank and Middle East Bank) reached (1.4), while the index values for Union Bank (1.6) and Al-Warka Commercial Bank (1.2) are all lower than the standard value of the modified Altman Index (1.8). The risk of financial failure for these four banks can be predicted as they fall within the red zone where the financial situation is expected to be insecure.

Table 5: The Altman model for the sample banks in 2021

نموذج التمان للمصارف عينة البحث في سنة 2021										
ت	اسم المصرف	مؤشر النشاط		مؤشر الأداء الإداري		مؤشر الربحية		مؤشر الرافعة المالية		قيمة Z Score	وضع المصرف
		W	X1	W	X2	W	X3	W	X4		
1	مصرف سومر التجاري	6.56	0.105	3.26	0.039	6.72	0.044	1.05	1.091	2.25717	معرض لمخاطرة مالية
2	المصرف الأهلي العراقي	6.56	0.028	3.26	0.712	6.72	0.074	1.05	1.043	4.09723	آمن
3	المصرف التجاري العراقي	6.56	0.021	3.26	1.35	6.72	0.05	1.05	0.19	5.07426	آمن
4	مصرف الخليج التجاري	6.56	0.023	3.26	0.72	6.72	0.092	1.05	0.046	3.16462	آمن
5	مصرف الاستثمار العراقي	6.56	0.41	3.26	0.0908	6.72	0.01	1.05	0.031	3.0854	آمن
6	مصرف الشرق الأوسط للاستثمار	6.56	-0.35	3.26	0.52	6.72	0.19	1.05	1.47	2.2195	معرض لمخاطرة مالية
7	مصرف الموصل للتنمية والاستثمار	6.56	0.41	3.26	0.79	6.72	0.081	1.05	0.054	5.86602	آمن
8	مصرف الاتحاد العراقي	6.56	0.047	3.26	0.008	6.72	0.26	1.05	0.02	2.1026	معرض لمخاطرة مالية
9	مصرف البصرة الدولي	6.56	1.021	3.26	0.0108	6.72	0.013	1.05	0.011	6.831878	آمن
10	مصرف الوركاء	6.56	0.019	3.26	0.089	6.72	0.199	1.05	0.179	1.94001	معرض للفشل المالي

The results of Table (5) obtained for 2021 show that (Basrah International Bank, Mosul Development Bank, Commercial Bank, Iraqi National Bank, Gulf Commercial Bank, and Iraqi Investment Bank) are located within the green zone where good financial positions can be predicted, as the financial situation was good and they are far from the risk of financial failure, and the value of the financial failure index reached high ratios as it exceeded the standard value of the modified Altman index and these ratios are (6.8), (5.8), (5.8), (5.07), (4.09) and (3.1). These high ratios indicate that these banks are able to continue and remain in the market in the future and are not prone to financial failure (or not prone to bankruptcy in the near term), where the higher these ratios are, the better for the economic institutions. Sumar Bank, Middle East Bank and Union Bank of Iraq are located in the foggy zone where the index values reached (2.99), (2.80) and (2.23) respectively. This shows that the financial situation of these banks is difficult to determine clearly according to the modified Altman index, the modified Altman index cannot accurately judge the possibility of failure of these institutions or not. While the value of the modified Altman Index for Al-Warka Bank was (1.66), which falls within the red zone as it is lower than the standard value of the standard Altman Index (1.8), this indicates that the institution is not in a good financial position and may face the risk of financial failure, including bankruptcy and liquidation in the near term.

Table 6: The Altman model for the sample banks in 2022

نموذج التمان للمصارف عينة البحث في سنة 2022										
ت	اسم المصرف	مؤشر النشاط		مؤشر الأداء الإداري		مؤشر الربحية		مؤشر الرافعة المالية		قيمة Z Score	وضع المصرف
		W	X1	W	X2	W	X3	W	X4		
1	مصرف سومر التجاري	6.56	0.0318	3.26	0.714	6.72	0.062	1.05	0.02	2.973888	معرض لمخاطرة مالية
2	المصرف الأهلي العراقي	6.56	1.029	3.26	0.0071	6.72	0.002	1.05	0.0414	6.830296	آمن
3	المصرف التجاري العراقي	6.56	0.089	3.26	1.0156	6.72	0.086	1.05	0.0085	4.481541	آمن
4	مصرف الخليج التجاري	6.56	0.19	3.26	0.003	6.72	0.114	1.05	1.76	3.87026	آمن
5	مصرف الاستثمار العراقي	6.56	0.331	3.26	0.062	6.72	0.017	1.05	0.293	2.79537	معرض لمخاطرة مالية
6	مصرف الشرق الأوسط	6.56	0.062	3.26	0.501	6.72	0.041	1.05	0.52	2.8615	معرض لمخاطرة مالية
7	مصرف الموصل للتنمية	6.56	0.54	3.26	0.27	6.72	0.02	1.05	1.11	5.7225	آمن
8	مصرف الاتحاد العراقي	6.56	0.093	3.26	0.0030	6.72	0.006	1.05	1.062	1.77528	معرض للفشل المالي
9	مصرف البصرة الدولي	6.56	1.0025	3.26	0.0113	6.72	0.0512	1.05	0.0095	6.967277	آمن
10	مصرف الوركاء	6.56	0.006	3.26	0.0121	6.72	0.319	1.05	0.0039	2.226581	معرض لمخاطرة مالية

The results of Table 6 for the year 2022 indicate that Basrah International Bank, Al Ahli Bank of Iraq, Mosul Bank for Development and Investment, Commercial Bank of Iraq, and Gulf Commercial Bank The value of the index for each bank reached (6.9), (6.8), (5.7), (4.4) and (3.8) respectively, these high ratios indicate that these institutions enjoy high efficiency and balance between the management of assets and liabilities. While the value of the modified Altman Index for Misfrommer, Middle East Bank, Iraq Investment Bank and Al-Warka Bank falls within the fuzzy zone where it is difficult to clearly identify the financial status of each of these four banks, and cannot be judged as being at risk of financial failure. The value of the financial failure index of the Union Bank of Iraq (1.7) is lower than the minimum value

of the modified Altman index (1.8), and this decrease in 2022 expresses that the Union Bank is exposed to the risk of bankruptcy.

The above results show that the value of the financial failure index for most of the banks was within the acceptable limits of the modified Altman index and some banks had values greater than 2. 9 In both cases, the financial condition of these banks can be interpreted as being able to continue and remain in the markets in the future and not exposed to financial failure (or not exposed to bankruptcy in the near term) as some of the banks that achieved values lower than the standard values of the modified Altman index, where the model assumes that these banks exit the markets in the near term, but the real picture of these banks is that they are facing difficult times and may suffer from defaults without being bankrupt companies. Other institutions may fail technically or suffer heavy losses, but they are not exposed to bankruptcy or liquidation. Hence, the decision can be made to reject the null hypothesis that states "Financial failure cannot be predicted for a sample of private commercial banks listed on the Iraq Stock Exchange using Altman's Z-Score financial failure model"

Table (7) shows the results of the statistical tests conducted to test the second main hypothesis, which states that "the value of the financial failure model cannot be used to determine the levels of financial condition of the sample banks in a significant way".

Table 7: Calculation of the mean and standard deviation of the modified Altman Index values for the sample banks

الانحراف المعياري	الوسط الحسابي	Z Score 2022	Z Score 2021	Z Score 2020	Z Score 2019	Z Score 2018	اسم المصرف	ت
0.852111	2.425058	2.974	2.2572	2.368	1.141	3.385	مصرف سومر التجاري	1
2.136057	3.390643	6.83	4.0972	2.32	1.703	2.003	المصرف الأهلي العراقي	2
1.042241	4.99595	4.482	5.0743	6.724	4.708	3.993	المصرف التجاري العراقي	3
0.708713	3.17722	3.87	3.1646	2.952	2.121	3.779	مصرف الخليج التجاري	4
0.837628	2.802709	2.795	3.0854	1.463	3.762	2.908	مصرف الاستثمار العراقي	5
0.718791	2.272902	2.862	2.2195	1.464	1.694	3.126	مصرف الشرق الأوسط للاستثمار	6
1.204586	5.850955	5.723	5.866	7.011	3.932	6.723	مصرف الموصل للتنمية والاستثمار	7
1.304159	2.775762	1.775	2.1026	1.662	3.834	4.505	مصرف الاتحاد العراقي	8
2.141185	4.612373	6.967	6.8319	2.319	3.530	3.413	مصرف البصرة الدولي	9
0.393657	1.780034	2.227	1.94	1.292	1.994	1.447	مصرف الوركاء	10
3.40836062		4.05045	3.6639	2.9575	2.84197	3.52804	الوسط الحسابي	
		1.88268	1.7359	2.1264	1.23471	1.44056	الانحراف المعياري	

The results of Table 7 show that when comparing the average bankruptcy index of banks in each year of the research with the general average (3.408) as shown in Table 7, we find that there are three banks that exceeded the general average (Mosul Bank for Development and Investment, Iraqi Commercial Bank and Basrah International Bank), where it reached (5.8), (4.9) and (4.6) respectively. (8), (4.9) and (4.6) respectively, and that the highest arithmetic average during the research years was for the Mosul Bank for Development and Investment,

these high ratios for the three banks indicate the soundness of the financial situation of each bank and not exposed to the risk of financial failure and its ability to pay its current liabilities during the research period. While the average bankruptcy index for both Ahli Bank of Iraq and Gulf Commercial Bank reached ratios close to the general average, reaching (3.3) and (3.1) respectively, these ratios indicate that the bank's financial situation is good and secure during the research period. On the other hand, Investment and Union Bank, Sumar Iraqi Bank and Middle East Investment Bank achieved lower ratios than the overall average (3.408) as follows: (2.8), (2.7), (2.4) and (2.2) respectively. These low ratios indicate that these banks may be exposed to the risk of financial failure and need to introduce some amendments to the policies and procedures adopted during the research period

Through the results of the statistical tests, the highest arithmetic mean for the period (2018-2022) was for the Mosul Bank for Development and Investment (5.8). This high ratio indicates the soundness of the bank's financial position and its ability to fulfil its obligations during the research period. While the lowest arithmetic mean for Al-Warka Bank was (1.7), this ratio is lower than the overall average by a large margin, as this low value indicates that Al-Warka Bank is facing financial risks in the near term, and this low ratio indicates the possibility of financial failure if the bank continues with the same financial policies and if the Central Bank does not intervene in amending some of these policies and procedures. The rest of the other banks enjoyed a sound and secure financial position during the research period. These results indicate that the modified Altman model can be used to determine the levels of financial condition of the sample banks, thus rejecting the null hypothesis that "the value of the financial failure model cannot be used to determine the levels of financial condition of the sample banks in a meaningful way in the near term", which is a Type I error.

ANOVA was used to test the third main hypothesis which states that "there is no statistically significant difference between the value of the financial failure index of private commercial banks listed on the Iraq Stock Exchange and the standard value of the Altman model during the research years"

Table 8: Univariate analysis of variance for the average bankruptcy index of the sample banks for the period (2018-2022)

ANOVA						
Source of Variation	***SS***	***df***	***MS***	***F***	***P-value***	***Sig***
Between Groups	**24.90187**	**4**	**6.225468**	**2.031619**	**0.000216**	**1.064147**
Within Groups	**107.2501**	**35**	**3.064289**			
Total	**132.15197**	**39**				

Table (8) shows that the results of ANOVA for the average financial failure index of the economic institutions in the research sample during the period (2018-2022), the calculated F-value (2.03) is greater than the value of the significance level of (1.06) at 5% significance level, and the p-value (0. 002) is statistically significant, which confirms the results of this test on the significance of the averages of the financial failure index, which calls for the rejection of the null hypothesis stating that "there is no significant statistical difference

between the value of the financial failure index of private commercial banks listed on the Iraq Stock Exchange and the standard value of the Altman model during the years of the research" Through the value of the Altman Index for the research years, we note that some banks fall within the green zone and the Altman Index expects this bank to remain in the labour market as it is characterised by a good financial situation, but what happened is that the bank entered the foggy zone or the red zone. Or some banks may fall in the foggy area or the red area and the modified Altman Index expects these banks to exit the labour market in the near term as they are exposed to bankruptcy or liquidation, but it happens contrary to what the modified Altman Index predicted where the bank returns to the green area and work within the markets due to its good financial situation in the year following the year of the modified Altman Index prediction. As happened with both Iraqi Sumar Bank and Middle East Bank in 2018, where each bank falls in the green zone and then enters the foggy zone in 2020 and remains within this zone during the research period after each bank passes through the red zone. The Ahli Bank of Iraq in 2018 is located in the foggy zone where the Altman Index predicts the exit of this bank to the red zone in the near term and we observe that this prediction is correct in 2019 followed by 2020 where the bank remains within the foggy zone, but the modified Altman Index did not succeed in predicting the financial failure of the bank where we observe the bank entering the green zone at a significant rate exceeding the standard Altman ratio in 2021 and continuing the good financial situation in 2022. It can also be noted that Gulf Commercial Bank in 2018 was within the green zone and it is assumed that the Altman Index ensures that the bank's financial situation remains good and safe, but what happened in a year is that the bank entered the foggy zone where it is difficult to determine the financial situation of the bank and this is contrary to the expectation of the modified Altman Index for 2019 and 2020, while we find that the value of the modified Altman Index has exceeded the standard value and the bank returned to the green zone, which is also not in accordance with what the financial failure prediction index predicted. Similarly, the Iraqi Investment Bank moved from the foggy zone to the green zone and then to the red zone during the first three years of the research years, and after 2020, the Altman Index assumes the exit of the Investment Bank from the financial markets in the near term, but this expectation did not actually happen, as the bank moved from the foggy zone directly to the green zone and then to the red zone.The modified Altman Index for 2018 predicted the safety of the financial situation of the Union Bank of Iraq in the near term, as the index proved correct in 2019, while the three subsequent years did not match what the index predicted in 2019, as the bank entered the red zone in 2020, then the bank entered the foggy zone and the bank returned to the foggy zone again in 2023. We find that the Basra International Bank was within the safe zone during the research period, except for the year 2020, where the modified Altman Index did not succeed in predicting the good financial situation of the bank in the two years after 2020, while we find that both the Commercial Bank of Iraq and the Mosul Development and Investment Bank are within the green zone throughout the research years due to the good and safe financial situation of each bank, unlike Al-Warka Bank, where the bank remained within the green and red zones during the research period. The reasons for the fluctuation in the financial situation of the banks between the three zones according to the modified Altman Index can be attributed to many reasons, including security, political and economic reasons from which the country

has not recovered after the control of ISIS terrorist organisation on most Iraqi cities and the destruction of most economic institutions. As well as what happened in Iraq in 2019 with what is known as the October Revolution and the beginning of the COVID-19 pandemic, the impact of which extended for the year 2020 until the beginning of 2022, when the threat of the pandemic was officially declared over only, as what caused these events in the economic conditions of Iraq was not small and some institutions are still suffering from the losses they incurred as a result of these conditions.

In this research, the descriptive data was analyzed to determine which indicators have a significant impact on the current financial condition of the institution, and which indicators have a minor impact on the financial condition of the bank. The research aimed to provide a clearer insight into the causes of failure of economic institutions for each year of the research sample without the possibility of predicting the actual failure in the medium term. Especially in light of the lack of a unified general theory explaining the empirical reasons for the occurrence of the expected financial failure in economic institutions, despite the pressures that these institutions are still able to survive and continue in the financial markets. This confirms that there is not necessarily a direct causal relationship between the closure of economic institutions and financial failure according to the modified Altman model. This requires distinguishing between economic and managerial factors that cause these cases.

Conclusions and Recommendations

Conclusions

1. Through the theoretical and empirical study of most of the literature on the financial failure index, it can be seen that financial failure models contribute significantly to determining the financial performance of economic institutions.
2. Some economic institutions may show strong financial positions by misrepresenting the data published in financial reports in an attempt to attract new depositors and investors.
3. The imposition of continuity in the market places great pressure on management, which may lead some economic organizations to control the preparation of financial statements that include misleading data in order to improve the image of the financial situation of these economic organizations.
4. Economic institutions operate in a complex environment characterized by intense competition and may face many risks, the most important of which is the risk of financial failure due to the inadequacy of internal control systems, which usually appears in complex organizational structures.
5. Economic institutions suffer from long-term solvency issues that may be represented by excessive debt and short-term financial crises such as low liquidity, as well as low levels of activity indicators that may cause potential financial risk such as a decrease in working capital. The consequent inability to achieve positive results leads to a continuous series of losses that may extend to the capital and reserves of these institutions.
6. During the research period, economic institutions suffer from a weakness in maintaining the stability of the market value of their shares, which reflects negatively on the management performance indicator of how retained earnings or what is known as reserves are utilized.

7. The results of the research showed that the profitability index of most economic institutions during the research period was positive, as the higher the ratio of EBIT to total assets, the greater the profitability of the institution, but the profitability index was negative for other institutions.
8. The results of the modified Altman index obtained showed a low percentage of the first hypothesis in some economic organizations, but the overall financial situation of the rest of the sample organizations is such that the null hypothesis should be rejected as financial failure cannot be predicted using the Altman model optimally.
9. The results showed the rejection of the second null hypothesis (Type I error), which proves that the modified Altman model cannot be used in predicting the financial failure of economic institutions optimally at all times.
10. From the results obtained, the Adjusted Altman Index did not show accurate predictions about what the financial situation of most of the economic organizations in the research sample will be in the short and medium term.
11. The research findings indicate that the indicators influencing the current financial condition of economic organizations vary in importance, with some playing a prominent role while others have limited influence. However, accurate predictions of actual financial failure in the medium term are not possible due to the absence of a unified theory to explain such failure. The research reinforces the idea that financial failure is not necessarily a direct consequence of institutional closure, but rather a complex interplay between economic and managerial factors.

Recommendations

1. Economic organizations should pay attention to the components of the Financial Failure Index, as it helps management to determine financial performance and make appropriate financial decisions before any short-term issues occur.
2. The research recommends the necessity of transparency of annual financial reports as it is the direct tool in presenting and analyzing the financial performance and through it the financial failure of economic institutions can be detected.
3. Auditors must convince the management of the need to prepare real financial statements and clarify the appropriate opinion in his report issued on the financial statements, otherwise it leads to losses that directly reflect on the future of the organization and the sector in which it operates.
4. The research recommends the need to pay attention to risk management, which starts from the stage of providing solid information systems that have the ability to give early warnings about the possibility of financial failure, to internal control systems that usually appear in complex organizational structures and poor risk management, which leads to the existence of gaps in information systems in economic institutions.
5. The research recommends strengthening the financial solvency of economic institutions by paying attention to some of the ratios constituting the modified Altman index to benefit from them in the field of predicting the financial situation if it is sound and has a balanced financial structure such as working capital management in the activity index that ensures higher profits in the near term.

6. The need for economic institutions to pay attention to growth and distribution by making appropriate scheduling for projects that rely on internal financing with retained earnings, as it is the lowest cost among other financing alternatives available in economic institutions.
7. The need to pay attention to operating profit as it represents the actual performance of the organization as measured by the profitability index of economic institutions.
8. As indicated in Conclusion No. 8 and based on the results of the modified Altman Index, which showed some differences in predicting financial failure among economic institutions in the study sample, the research recommends seeking to improve predictive models to keep pace with changes in the financial situation of economic institutions and adapt them according to changes in the surrounding economic environment.
9. The research recommends optimizing predictive models based on additional indicators besides Altman's model. It is important to incorporate other analytical techniques such as big data analysis, advanced economic models, and dynamic structural models, to provide a more accurate and flexible assessment of the financial condition of economic institutions.
10. The research recommends the need to develop comprehensive analytical models that take into account additional factors such as global and local economic changes while incorporating internal pressures and additional factors reflecting market pressures that may affect financial performance
11. The research recommends that the complex relationship between the multiple economic and managerial factors that contribute to financial failure should be better understood in order to accurately identify the most influential indicators.

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