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A Proposed Model for Predicting Financial Distress in A Sample of Iraqi Private Investment and Financing Banks for the Period From 2010 To 2017

By

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Abstract

The aim of the research is to measure the role of financial analysis in predicting bank failures, with the aim of distinguishing between troubled and non-performing banks. Finance that can be used to build a model to predict financial failure.The study used a statistical method that relied on Multiple Linear Discriminant Analysis using the Stepwise method, which works to delete the financial ratios with low (non-significant) impact.A set of financial ratios for the study sample banks, which consisted of six banks, three of which are non-performing and the other non-performing, were calculated for the period (from 2010 to 2017), where the following model was reached:

$$Z = -0.001(x4) + 0.038(x12) + 0.002(x29) - 1.074$$

The model was applied to the study sample banks, and in light of the results, the banks were reclassified into two groups, troubled and non-performing, with a matching rate of 97.9%.Based on the foregoing, the study recommended the need to use the model and apply it in banks in order to predict financial failure before it occurs so that the banking administration can take measures and procedures that would address the imbalances before they escalate.

Introduction

The banking financial failure is one of the serious and intertwined economic problems, because the effects of this problem do not stop at the borders of the bank nor the borrowers with bad loans, but rather this problem can extend to other banks, which negatively affects the performance of the banking system as a whole.

The past period has witnessed difficult conditions for some Iraqi private banks due to the high credit and operational risks, and the low quality of the bank credit portfolio due to the high amount of non-performing loans as a result of the failure of a large number of borrowers and their inability or unwillingness to repay their loans. These risks and taking the necessary measures to reduce them, including setting early warning indicators of the risk of financial failure in the private Iraqi banks, and developing emergency plans to confront the sudden and dire situation in Iraq's financial centers.

Study Problem

There is no doubt that banks form the backbone of the financial system, and

therefore their stability and financial soundness and the confidence of depositors in them must be preserved. If a financial failure occurs in one of the Iraqi private banks, it is natural for the depositors to expect that most banks will be in a state of danger, which causes the emergence of a state of doubt and panic, and consequently the high withdrawals of depositors for their deposits from banks, where this turmoil can be exploited by some borrowers and their failure to pay their obligations and thus the increase in the number of non-performing loans in banks.

Accordingly, the research problem is crystallized in the possibility of building an indicator through which it is possible to predict the financial failure of the Iraqi private banks.

Study Importance

Bank financial failure occurs as a result of the inability of banks to fulfill their obligations on their specified dates, so maintaining a well-thought-out liquidity position appropriate to the size of the expected withdrawals, taking into account the investment profit rate requirements. And the strengthening of capital adequacy, is necessary to maintain banking financial stability in the long term.

From this point of view, the development of a standard model using the financial ratios extracted from the financial statements of private investment banks, so that it constitutes a tool for early prediction of the possibility of financial failure, will benefit all of its users in the Iraqi financial statements. And it will help to discover weaknesses in their financial positions to address them, and to try to identify their causes to avoid them, which will help boost confidence in the Iraqi private banking sector.

Study Objectives

The study seeks to achieve the following objectives:

1. Demonstrating the role of financial indicators and ratios related to banking performance in predicting the financial failure of private banks.
2. Building a standard index consisting of a set of financial ratios capable of distinguishing between troubled banks and non-performing banks.
3. Test the ability of this model in terms of predicting financial failure two years before the failure, during which banks can take all corrective measures and appropriate solutions during this period.

Study Hypothesis

This study examines the possibility of using a model to predict bank financial failure by testing the following hypothesis:

It is possible to develop a proposed model capable of predicting early the financial failure of the Iraqi private banks.

Study Limitations

First, the temporal limits include the study of the financial statements published for a group of Iraqi private banks for the period from 2011 to 2017.

secondly. Spatial boundaries: They include spatial boundaries in a sample of Iraqi private investment and financing banks, which are: (Economy Bank, North Bank, United Bank, Al-Mansour Bank, Ashur Bank, Investment Bank).

1. Theoretical framework

First: Financial Distress

The researchers differed in giving a unified definition of the financial imbalances that plague the institution, as there is a great overlap between some terms such as financial insolvency, financial hardship, financial failure and bankruptcy[1].

(Al-Hamdani, et al., 2013) defined financial stumbling as an imbalance facing the institution as a result of the lack of its resources and capabilities to fulfill its obligations in the short term. [2]

While (Al-Farra, 2017) defined financial failure as a financial imbalance facing the institution as a result of the failure of its resources to meet its short-term obligations[3].

(Assar, 2012) concluded that the financial failure is that stage in which the institution reached a state of lack of financial liquidity that limits its ability to pay its obligations as a result of achieving successive losses or wrong administrative policies[4].

(Haggag and others, 2020) believe that the financial failure is the financial shortcoming that the institution faces in the short term as a result of its failure to fulfill its obligations, and it can also reach the level of bankruptcy if the situation is not remedied.[5]

(Taleb, and others, 2021) added that the financial default is the situation in which the institution is unable to meet its financial obligations, despite the fact that the current assets are greater than the current liabilities, because the maturity date of obligations is faster than the maturity date of the institution's revenues[6].

Through the researcher's review of the previous definitions, he was able to give a procedural definition of the financial stumbling block as the situation in which the institution is unable to meet its emergency and short-term obligations.

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[1] Wahiba, Daman, (2020), Using the Modified Altman Model to Predict Financial Failure: An Applied Study on Industrial Institutions Listed in the Kuwait Stock Exchange, Journal of Financial, Accounting and Administrative Studies, Volume 7, Issue 2, Setif University, Algeria.

[2] Al-Hamdani, Rafaa Ibrahim, Taha, Yassin Al-Qattan, (2013), Using the Sherrod model to predict financial failure, College of Administration and Economics, University of Mosul, Vol. 5, No. 10, p. 451

[3] Al-Farra, Abd al-Rahman Musa Abd al-Shakour, (2017), The importance of financial statements in predicting the financial failure of the Saudi industrial joint stock companies for the cement industry: an analytical study on the published financial statements and reports of the Saudi industrial joint stock establishments for the cement industry using the Altman Z-Scor 2000 model and the 1978 Springate model. Financial, accounting and administrative studies. Fourth volume. number one. p 7

[4] Abdul Latif Asar Fakhri, (2017), Bank financial stumbling (causes and methods of treatment), a study issued by the Central Bank of Iraq, p. 7.

[5] Hajjaj Mustafa, Ben Amour Samir, (2020), Using models to predict financial failure in diagnosing the financial situation of the institution, The Arab Journal of Humanities and Social Sciences, Yahya Fares University of Medea, Algeria, p. 906.

[6] Taleb, Mohamed Amin Walid, Kaladi Nazira, (2021), Using the Altman and Springate models in predicting the financial failure of the industrial enterprises listed on the Algiers Stock Exchange, Journal of Financial, Accounting and Administrative Studies, Volume 8, No. 3, University of Larbi Ben Mhidi Oum El Bouaghi (Algeria), p. 286 .

second. Stages of financial failure

Some studies have confirmed that there are no specific stages of default that all institutions heading towards default go through, as these stages differ from one institution to another due to several factors, the most important of which is the cause of default and the way management deals with it, which plays a decisive role in determining the possibility of the facility reaching a state of default or No. As a result, the financial default passes through six stages, as follows ([7]):

1. The first stage: the stage of acquiring specific defects ([8]).

It is the real beginning of stumbling, and this stage is caused by defects, but it is still insufficient defects and did not result in corruption or a clear error in the management of the facility. tripping. Examples of these defects are those that are concentrated in the management of the facility, especially at the higher levels of it, and the most important of which is that the financial manager has absolute authority, which leads to the abolition of the role of executive managers, or that one person combines the positions of the general manager and the chairman of the board of directors, that is, combining the executive authority and oversight of the implementation or that the administration is unable to adapt to the developments in the circumstances surrounding it. Examples of the process at this stage include entering into unplanned obligations that do not give a quick return, or taking a loan without the need for it.

1. The second stage: the stage of disregard for the current situation.9

The management of the facility sometimes commits fundamental (catastrophic) mistakes, and these errors come as a result of those defects that the facility suffers from. At this stage, some experts of the facility may sound the alarm bell to warn those in charge of its management of the seriousness of the causes leading to the failure. If the administration meets this warning by underestimating and underestimating it, this prompts the warning not to continue sounding the alarm.

2. The third stage: the sense of stumbling.10

It is the stage in which the situation becomes more complicated, and it is a feeling that the institution or facility does not have sufficient liquidity to complete its operations or pay its obligations, while not taking the necessary action to improve the existing situation.

3. The fourth stage: the stage of coexistence with stumbling11

It is the most dangerous stage ever, as new investments stop completely, ie, the lack of production capacity, and the production process turns to just maintaining some of the existing production lines.

4. The fifth stage: the stage of the devastating crisis12

5. At this stage, information leaks to all parties in the external environment, and this negative information about the status of the facility pushes the public dealing with the facility, especially creditors, to claim their rights in a way that leads to the devastating

[7] Mohamed, Dalal Mohamed Ibrahim (2021), the joint effect of financial default and tax avoidance on both market value and stock returns: an empirical study on international companies registered in the Egyptian Stock Exchange, The Scientific Journal of Financial and Commercial Studies and Research, Faculty of Commerce, Damietta University, Issue 2, Part 2, p. 754.

[8] Soleimani, Intisar, (2016), Predicting financial failure using the Sherrod model, Batna University, p. 259.

[9] Salmani, Intisar, Abbas Najma, (2016), Using the Altman model to predict the failure of Algerian economic institutions, Journal of Industrial Economy, No. 10, pg. 494.

[10] Al-Rifai, Hashem Ahmed, (2017), Predicting the failure of institutions using the Altman model: a study on industrial institutions listed on the Amman Stock Exchange, Master's thesis, College of Business, Middle East University, p. 18.

[11] Mustafa Hajjaj, Ben Amour Samir, (2020), aforementioned reference, p. 908.

[12] Muhammad, Dalal Muhammad Ibrahim (2021), aforementioned reference, p. 754.

crisis of the facility.

6. ***The sixth stage: the stage of dealing with the crisis or liquidating the facility13***
7. At this stage, the management of the facility is searching for solutions that will help it overcome the crisis and address the existing situation through several alternatives, such as merger.

Figure (2). *The 7 stages of financial failure*
Source: Prepared by the researcher based on previous studies

Third. Reasons for financial failure

We can define financial default as the institution's arrival to a situation where it cannot meet its short-term obligations, as it is the result or outcome of a wide combination of factors, to determine the causes of default, they vary from one institution to another, which we summarize as follows[14]:

1. . Administrative reasons

No matter how many causes of failure, it is therefore due to mismanagement. Bad management is unable to achieve efficiency as well as effectiveness, which is an important part of its daily and future activity. Bad management may fail to achieve one of the following points:

1. Lack of control in general and cost control in particular.
2. The lack of a fit between the organizational structure and the needs of employees.
3. There is a defect in the leadership system, i.e. leadership overlap and overlapping of authorities within the institution, and this is what often happens in the family institution.

2. Financial reasons

It is considered one of the most important reasons that lead the institution to default and reach bankruptcy, foremost among which is the disproportion between capital and loans, which means a defect in the financing structure of the project and this leads to the accumulation of project debts in a way that negatively affects the results of its work and the emergence of major problems with a loss of cash liquidity and inability to pay. Fulfilling its debts in different directions to its creditors, the extravagance in most of the spending items in a way that is not

[13] Al-Rifai, Hashem Ahmed, (2017), aforementioned reference, p. 18.
[14] VAN DEVENTER, DONALD R., and others,(2013), **Advanced Financial Risk Management**, Second Edition, John Wiley & Sons, Singapore,P735-736.

commensurate with the revenues achieved, the burdens directed to assisting the project technically and administratively, the exorbitant expenses of the members of the board of directors and the presence of some of the many excesses in the investment cost of the project[15].

Among the most important reasons leading to the phenomenon of financial failure is financial mismanagement, and we highlight them in the following points:[16]

1. The weakness of the institution's ability to financially plan its resources and uses.
2. Non-payment of its due obligations by the institution on time.
3. The accumulation of debts on the institution.
4. Deliberate financial deviation, such as greatly increasing the volume of embezzlement and fraud with suppliers, customers and distributors, which leads to the loss of the rights of the institution.

3. Economic reasons

And reflects the environment of the bank and the surrounding environment, and the success of any bank depends on the safety and effectiveness of the decisions that are taken by the management, and despite the diversity and multiplicity of these decisions, it must be developed based on the foundations and economic principles, as the weakness of administrative capabilities to predict With future economic and environmental changes, it is considered a major cause of bankruptcy, and failure to keep pace with technological development and high inflation rates are among the economic reasons that contribute to the failure and failure of financial institutions.[17]

4. Political reasons

Politics and the economy are closely related. The internal and external political situation has an important role in the success or failure of any banking institution, as political instability, tension in the state's relationship with neighboring countries and the outbreak of war in neighboring countries are all among the political reasons that lead to the loss of those Institutions have their own markets and market shares, and consequently these institutions stumble and fail financially.[18]

5. Other reasons

It is represented in the presence of inflation at the level of the economy, which leads to an increase in the prices of raw materials, which leads to an increase in costs and a decrease in profits or an increase in losses. The successive technological changes and their impact on production, and the problems of dealing with government agencies may lead to delays in implementing their plans correctly.[19]

6-Legal reasons

Laws and legislation play an important role in the national economy, as whenever there

[15] Musa Shukairy, and others, (2012), aforementioned reference, pp. 131-132

[16] El-Amin, Sherby Mohamed, Elham Tabakh, (2018), The Role of Financial Ratios in Predicting Financial Insolvency" An Applied Study on a Sample of Algerian Small and Medium Enterprises, Journal of Administrative and Financial Sciences, El Wadi University, Algeria, Volume 02, Issue 1, p. 416.

[17] Apostolik Richard, Donohue Christopher,(2015), **Foundations of Financial Risk (An Overview of Financial Risk and Risk-Based Regulation),**first edition, y John Wiley & Sons, Inc,, New Jersey,p141

[18] Belazzouz Ben Ali, and others, (2013), Risk Management (Risk Management. Financial Derivatives. Financial Engineering), first edition, Al-Warraq Publishing, Amman, p. 34.

[19] Muallem Ruqayya, Best Pilot, (2019), Using the Altman Model to Predict the Financial Failure of Insurance Sector Institutions in Algeria, The Economist, Vol. 7, No. 11, p. 194.

are modern laws that protect the investor and institutions, there is better investment and the institutions are stronger. Therefore, the lack of appropriate laws to encourage investment, as well as the lack of clarity and accuracy in the laws currently in force in the institution are all of the reasons Legal that contribute to the failure of institutions.[20]

7. Technical reasons

It is represented in the inadequacy of the technical feasibility study, defects in raw materials, and the use of inappropriate technological methods, and consequently the emergence of producing units of low-quality goods, which in turn affect the sales volume.[21]

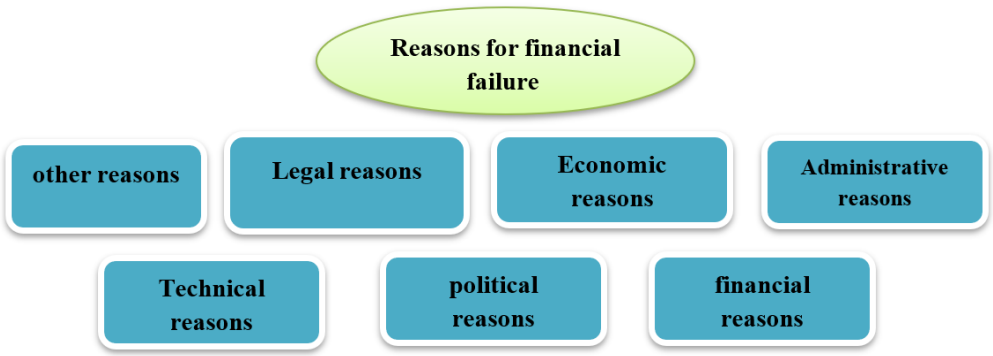

Figure (2) Reasons for financial default
Source: Prepared by the researcher based on previous studies

Fourth. Risks related to financial default:

First, the financial risks

Due to the importance of risks in the activity of banks, they have received wide attention on the part of professional and scientific organizations with the aim of identifying risks and how to manage them. Therefore, the concept of risks has become more closely aligned with the management of banking activity. Weaknesses or strengths in the internal environment of banks, and threats or opportunities in the external environment[22]

1. Credit risk: Credit risk can be defined as a potential loss resulting from the inability of the borrowing customer to repay the value of the borrowed amount, and its interests to the lending bank at the maturity date specified in the terms of the credit contract. These risks include items within the balance sheet such as loans and bonds, and items outside Budget such as letters of credit and letters of credit.[23]
2. Market risks: Market risks arise from sudden changes in market conditions, as banks are affected by that change. These risks are divided into:
3. Interest rate risk: Interest rate risk can be defined as the risks that negatively affect both the profits and capital of banking institutions as a result of changes in interest rates on assets and liabilities, up or down, which affects the value of the budget elements and their returns.[24]
4. Exchange rate risk: Exchange rate risk can be defined as the risk that arises as a result

[20] Belazzouz Ben Ali, and others, (2013), aforementioned reference, p. 35.
[21] Belazzouz Ben Ali, and others, (2013), aforementioned reference, p. 34.
[22] Apostolik Richard,and Donohue Christopher,(2015), Foundations of Financial Risk(An Overview of Financial Risk and Risk-Based Regulation),first edition, John Wiley & Sons, Inc,USA,
23 Roman M.Jan,(2017), Analytical Finance: Volume I (The Mathematics of Equity Derivatives, Markets, Risk and Valuation),first edition, David Tipling Photo Library,Sweden,p8.
[24] HULL C. JOHN,(2015) Risk Management and Financial Institutions,Fourth Edition, John C. Hull,USA,P175

of fluctuations in the market on foreign exchange rates, and banks usually keep part of their assets in foreign currencies to meet the needs of their customers, so any change in currency rates will be reflected in These assets are positive or negative.[25]

5. Liquidity risk: Liquidity in banks is one of the most important indicators that customers rely on in comparing banks, as liquidity represents the most important means of protecting the bank from the risk of bankruptcy through its ability to meet obligations that are characterized by cash payment, such as deposits that are due on demand. In which banks can postpone the payment of their dues, even for some time, the mere rumor that the bank does not have enough liquidity is enough to shake the confidence of depositors, and prompt them to withdraw their deposits suddenly, which may expose the bank to bankruptcy.[26]

Second: Non-financial risks

1. Operational risks: Operational risks are defined as the risks that arise as a result of internal factors when the bank exercises its various activities that result in different types of errors, including human ones, which are due to inefficiency and training in work methods, including errors related to operations that occur in specifications, or lack of Accuracy when executing operations or weakness of the applied system, and it may be due to external factors as a result of natural or human disasters by penetrating banking systems[27].
2. Legal risks: These are the risks that the bank may be exposed to as a result of deficiencies or deficiencies in its documents, which makes them not legally acceptable. imposed by central banks related to the ratios of liquidity, the legal reserve and the permissible credit ratios, and the legal risks are related to the lack of clarity in the financial contracts in place of implementation, the supervisory obligations and the obligations that you have[28].
2. Reputational risk: Reputational risk results from influencing negative public opinions that result in significant losses to customers or funds, as it includes actions practiced by the bank's management or employees that reflect a negative image of the bank and its business and its clients and other parties. Spreading negative rumors about the bank and its activities.[29]

[25] Choudhry Moorad,(2018), aforementioned reference,p215
[26] Apostolik Richard,and Donohue Christopher,(2015), aforementioned reference,P174
[27] Koch Timothy W., MacDonald S. Scott,(2015), Bank Management, Eighth Edition, Cengage Learning,USA,P111
[28] Shukri Nouri Musa and others, (2012), risk management, first edition, Dar Al Masira, Jordan, p. 226..
[29] Shaqri Nuri Musa and others, (2012), aforementioned reference, p. 227.

Figure (3). *Types of Banking Risks*
Source: Prepared by the researcher based on previous studies

2. Applied study

First: How to build a default prediction model

In order to develop and establish a model to predict the failure of banking institutions in Iraq, it is necessary to identify the financial indicators that make up the model and choose them appropriately, through the analysis and review of standard, non-standard and categorical discriminatory transactions.

1. Choose the year or years of analysis

To choose the year and/or years of analysis, it is necessary to study the state of banking institutions during the years studied, which are from 2010 to 2017 (Table 1).

It is clear from Table (1) that the three banking facilities, namely Al-Mansour Bank, Investment Bank, and Ashur Bank, were not in default in any of the years of study 2010-2017. As for the United Bank, it troubled in 2017 only, and the Economy Bank troubled during the years 2014 and 2017, while the North Bank was the most defaulting bank during the three years 2015, 2016 and 2017.

Table (1) shows that the total number of morphological cases reached 48, of which 6 are non-performing with a rate of 12.5% and 42 are non-performing at a rate of 87.5%.

Table (1). *The status of the studied banking establishments during the studied years 2010-2017.*
Prepared by the researcher based on the private data of each banking institution

Banking facility	Years							
	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Al-Mansour Bank	non-performing	non-performing	non-performing	non-performing	non-performing	non-performing	non-performing	non-performing
investment bank	non-performing	non-performing	non-performing	non-performing	non-performing	non-performing	non-performing	non-performing
Ashur Bank	non-performing	non-performing	non-performing	non-performing	non-performing	non-performing	non-performing	non-performing
United Bank	non-performing	non-performing	non-performing	non-performing	non-performing	non-performing	non-performing	Troubled
Economy Bank	non-performing	non-performing	non-performing	non-performing	Troubled	non-performing	non-performing	Troubled
North Bank	non-performing	non-performing	non-performing	non-performing	non-performing	Troubled	Troubled	Troubled
Number of troubled cases	6 (12.5%)							
The number of non-performing cases	42 (87.5 %)							
Total number of cases	48 (100%)							

In order to find out which year or years is better to build the forecast model, the available bank data for each bank during the study years of the 30 financial ratios were collected (Table 2).

Table (2). *The financial ratios for each bank and its symbol.*

Code	Financial ratio	Code	Financial ratio
x1	Current assets/total assets ratio	**x16**	Cash Credit Facility/ Equity
x2	Current Assets/Current Liabilities Ratio	**x17**	Debt/Equity Ratio
x3	Total credit facilities/total assets	**x18**	Equity/Total Assets
x4	total revenue/total assets	**x19**	Bad Debt/Total Debt
x5	Current accounts/cash credit facilities	**x20**	Current accounts/total deposits
x6	Total Deposits/Total Assets	**x21**	Total Liabilities/Total Assets
x7	Cash credit facilities / total customer deposits	**x22**	Return/Liabilities
x8	return/assets	**x23**	Provision for doubtful debts/debts ratio
x9	Operating profit/expenses	**x24**	net working capital/total assets
x10	Yield / Equity	**x25**	Shareholders' Equity/Total Liabilities
x11	Profit before tax / total assets	**x26**	Quick Cash / Current Liabilities
x12	net income/total revenue	**x27**	Change in financial position
x13	Debit interest/cash credit facilities	**x28**	Profit / Capital Ratio
x14	capital/total assets	**x29**	Net Profit / Operating Profit Ratio
x15	Total Liabilities / Equity	**x30**	capital adequacy standard

Prepared by the researcher

All data for the financial ratios of the banking establishments under study were entered into the program Spss v24 (IBM Crop, 2016), and to find out which year is better, a multivariate linear discriminant analysis was conducted using the Stepwise method, which eliminates the financial ratios with low impact (non-significant). And that on:

Table (3) shows the original banking cases and their conformity with the predicted data, in addition to the Wilks' Lambda index and statistical significance.

Table (3). *The original and forecast bank cases for all years.*

Year	Banking Status	Original cases	Predicted cases	Matching range	Wilkes Lambda	Statistical significance Sig.
All years	**Troubled**	6 (12.5%)	(14.6%) 7	97.9%	0.311	0.000
	non-performing	42 (87.5%)	(85.4 %) 41			
	Total	48 (100%)	48 (100%)			

The table was prepared by the researcher based on the outputs of the spss program

From Table No. (3) it is noted that:

The number of predicted non-performing banking cases reached seven (14.6%), while the predicted non-performing banking cases amounted to 41 cases, or 85.4%, and the percentage of conformity with the original banking cases was 97.9%, and the Lambda index recorded a value of (0.311) and is statistically significant. Sig. = 0.000 > 0.05.

2. The financial ratios that make up the discriminatory equation

Through the use of multivariate linear discriminatory analysis, the best financial ratios can be chosen in the discriminatory equation that distinguishes between troubled and non-performing banking establishments through a linear relationship of variables (the 30 financial ratios included in the analysis - Table (2) , managed to arrive at an equation that allows us to predict the failure of banking facilities.

The outputs of the spss program for multivariate linear discriminatory analysis, after entering all the variables (financial ratios) amounting to 30 ratios, and defining the banking status of each bank over the 2010-2017 study years, showed that the best financial ratios that achieve a matching ratio of 97.9% are:

1- x4: total revenues to total assets.
2- x12: net income to total revenue.
3- x29: the ratio of net profit to operating profit.

These three financial ratios were determined as the most suitable for the discriminatory equation through the value of (F) as it was greater than the tabular value of (F), which is 6.61 at the significance level of 0.05 and 16.26 at the significance level of 0.01, in addition to that these three financial ratios give the lowest value for the indicator lambda (Table 4).

Table (4). *the value of (F) and the lambda index of the appropriate financial ratios for the discriminatory equation.*

Code	Financial ratio	Value (F)	lambda indicator	Tabular (F) value
x4	Total revenue to total assets	42.826	0.344	$F_{0.05}(1,5) = 6.61$ $F_{0.01}(1,5) = 4.06$
x12	net income to total revenue	70.117	0.396	
x29	Ratio of net profit to operating profit	32.541	0.311	

Prepared by the researcher based on the outputs of the spss program.

3. Arranging the financial ratios in order of preference

The arrangement of the three financial ratios was conducted according to the standardized values of the Standardized Canonical Discriminant Function Coefficients. This arrangement reflects the importance of these ratios in building the discriminant equation or prediction model according to the following standard discriminant equation:

$$Y = r1A1 + r2A2 + \cdots + rnAn$$

Where:
1- Y = product of the discriminant equation.
2- R = Standard value of the variable (financial ratio).
3- A = the true value of the variable (financial ratio).
4- n = the number of variables (financial ratios) included in the discriminant equation.

The values of the normative variables play a role in the importance of the variable (financial ratio) in distinguishing between troubled and non-performing banking institutions. It directly affects the direction of the non-stumbling, and if it is negative, the variable plays a reverse role, i.e. goes towards the defaulting. Table (5) shows the discriminatory normative values of the financial ratios included in the discriminatory equation according to their preference.

Table (5). *discriminatory standard values of the standard ratios included in the discriminatory equation.*

code	**Financial ratio**	**Discriminative norm values**	**Arranging financial ratios**
x4	Total revenue to total assets	-0.487	3
x12	net income to total revenue	0.784	1
x29	Ratio of net profit to operating profit	0.402	2

Prepared by the researcher based on the outputs of the spss program.

secondly. Building a forecast model

This is done in three stages: the first is to determine the classification coefficients, the second is to determine the non-standard discriminatory coefficients, and the third is to determine the cut-off point, as follows:

1- Classification Transactions

Determining the Classification coefficients is the first step in building a forecasting model. It is useful in identifying the status of banking facilities, whether they are in default or not, and this is done by applying the following equation:

2- Y=x1A1+x2A2+⋯+xnAn+constant
3- Where:
4- Y = the product of the classification equation.
5- x = the rated value of the variable (financial ratio).
6- A = the true value of the variable (financial ratio).
7- n = the number of variables (financial ratios) included in the taxonomic equation.
8- constant = constant.

9- Non-standard discriminatory coefficients

The importance of the Unstandardized Canonical Discriminant Function Coefficients comes in measuring the degree of default for banking facilities. This is done by multiplying the non-standard discriminatory transactions (U) by the actual values of the preferred financial ratios, with the addition or subtraction of an accompanying constant, and the equation of the following model:

Z=u1A1+u2A2+⋯+ unAn + constant
Where:
z = product of the discriminant equation.
u = non-normative discriminative value of the variable (financial ratio).
A = the true value of the variable (financial ratio).
n = the number of variables (financial ratios) included in the discriminant equation.
constant = constant.

Table (6) shows the non-standard discriminatory coefficients for financial ratios that have a preference for discrimination and forecasting.

Table (6). *values of non-standard discrimination coefficients for preferred financial ratios*

0	Financial ratio	Non-standard discrimination coefficient
x4	Total revenue to total assets	-0.001
x12	net income to total revenue	0.038
x29	Ratio of net profit to operating profit	0.002
	Constant	-1.074

Prepared by the researcher based on the outputs of the spss program.

From Table (7), the discrimination equation, any prediction model, can be formulated as follows:
Z=-0.001(x4)+0.038(x12)+0.002(x29)-1.074
That is, as follows:
Label = Total Revenues to Total Assets x (-0.001) + Net Income to Total Revenues x (0.038) + Net Profit to Operating Profit Ratio x (0.002) – 1.074

10- cut-off point

In order to know the nature or condition of the banking establishments as defaulting or not, it is necessary to define the cut-off point which is useful in evaluating the condition of the banking establishment according to the distinguishing mark (Z).

The cut-off point is calculated based on the average positions of the two groups of troubled and non-performing banks, where the cut-off point represents the average of the two positions. Table (8) shows the average central value for each group, and it reached at the group of troubled banking institutions (-3858), and (0.511) at the group Non-performing banking establishments.

Table (7). *The value of the average position of the two groups of banks (defaulted - non-performing)*

banking group	Group center mean value
Troubled	-3.858
non-performing	0.551

Prepared by the researcher based on the outputs of the spss program.

Therefore, the value of the cut-off point is:

$$-1.6535 = \frac{-3.858 + 0.551}{2} = comma\ point$$

If the value of the distinguishing mark is greater than -1.6535, the banking establishment is not in default, but if it is less than -1.6535, the banking establishment is in default.

Third. Applying the model to the study sample banks and measuring the accuracy of the model

To measure the accuracy of the prediction model, the discriminant score was calculated in each year of the study (before or after default), and for each banking institution separately by applying the discriminant equation (paragraph 3-2-4-2 of the first topic) and compared it with the cut-off point (paragraph 3-2-4-3 from the first topic), and then with the actual (actual) banking establishment, and the prediction accuracy is calculated as follows:

$$100 \times \frac{prediction\ correct\ years\ number}{total\ study\ years\ number} = prediction\ accuracy$$

The results were as follows:

The accuracy of the model's prediction of the fates under study

the bank	the year	Realistic classification	Label	Classification by model	prediction correct	Prediction accuracy
Mansour	2010	non-performing	0.35169	non-performing	Right	100%
	2011	non-performing	0.70983	non-performing	Right	
	2012	non-performing	1.13997	non-performing	Right	
	2013	non-performing	1.63407	non-performing	Right	
	2014	non-performing	1.04291	non-performing	Right	
	2015	non-performing	1.09744	non-performing	Right	
	2016	non-performing	1.04373	non-performing	Right	
	2017	non-performing	1.0836	non-performing	Right	
investment	2010	non-performing	0.60671	non-performing	Right	87.5%
	2011	non-performing	0.50533	non-performing	Right	
	2012	non-performing	-0.88346	non-performing	Right	
	2013	non-performing	1.02877	non-performing	Right	
	2014	non-performing	0.82464	non-performing	Right	
	2015	non-performing	0.64942	non-performing	Right	
	2016	non-performing	0.45637	non-performing	Right	
	2017	non-performing	1.6585-	stumbled	Error	
Ashur	2010	non-performing	0.76968	non-performing	Right	100%

1. Al-Mansour Bank

The results of applying the prediction model to Al-Mansour Bank showed that the value

of the distinguishing mark for all years was greater than the value of the cut-off point (-1.6535), and therefore the classification of the bank according to the model is a non-performing bank for all years of study, and it is completely identical to the realistic classification of the bank, and accordingly the prediction accuracy 100% (table).

2. Investment Bank

The results of applying the prediction model to the investment bank showed that the value of the cut-off point for all years was greater than the value of the cut-off point (-1.6535), except for the year 2017, where the cut-off mark was less than the cut-off point. Therefore, the investment bank in 2017 appears to us as stumbling, which is not consistent with the situation Therefore, the classification of the bank according to the model is a non-faltering bank for all years of study except for the year 2017, when the model estimated a faltering year, and it is not completely identical to the realistic classification of the bank, and accordingly the prediction accuracy is 87.5% (Table)

3. Ashur Bank

The results of applying the prediction model to the Assyrian Bank showed that the value of the distinguishing mark for all years was greater than the value of the cut-off point (-1.6535), and therefore the classification of the bank according to the model is a non-performing bank for all years of study, which is completely identical to the realistic classification of the bank, and accordingly the prediction accuracy 100% (table).

4. United Bank

The results of applying the prediction model to the United Bank showed that the value of the discriminant for all years was greater than the value of the cut-off point (-1.6535), except for the year 2017, when the value of the discriminant was (-5.59223), which is smaller than the value of the cut-off point, and therefore the classification of the bank according to the model It is a non-performing bank and for all years of study except for 2017, it was a non-performing bank, and this is completely identical to the realistic classification of the bank, and accordingly the prediction accuracy is 100% (Table).

5. Economy Bank

The results of applying the prediction model to the Bank of Economy showed that the value of the discrimination score for all years was greater than the value of the cut-off point (-1.6535), except for the years 2014 and 2017, where the value of the discrimination score was (-1.73195) and (-1.86945), respectively, which is smaller than the value of The clincher point, and therefore the classification of the bank according to the model is a non-performing bank and for all years of study except for the years 2014 and 2017. 2014 and 2017, so the prediction accuracy is 100% (Table).

6. North Bank

The results of applying the forecast model to the North Bank showed that the value of the distinguishing mark for the years 2010, 2011, 2012, 2013, 2014 was greater than the value of the cut-off point (-1.6535), and smaller for the years 2015, 2016 and 2017, and therefore the classification of the bank according to the prediction model is correct for all Years of study and it matches with the realistic classification of the bank, and accordingly the prediction accuracy is 100% (Table).

Recommendations

1. Ensure that there are clear policies in the bank that work on forecasting, analyzing and

measuring the different types of banking risks that the bank faces, which would affect the bank's financial position and then the market value of the bank's shares traded on the stock exchange and its financial performance.

2. Developing early warning systems by developing computer programs that provide bank departments and concerned authorities with periodic statements that include the most important financial ratios extracted from the bank's periodic financial statements, with the aim of showing the results of applying the proposed model to predict default long before it occurs.
3. The importance of investors' reliance on the findings of the study in order to rationalize investment decisions and rely on scientific bases when making such decisions.
4. The necessity for the supervisory authority to conduct financial analyzes of the final statements of the banks and to apply the proposed model to predict the conditions of those banks at an early date in order to be able to take the necessary corrective decisions in this bank.
5. It is necessary to take into account the commitment of banks to transparency in the presentation of their financial statements, since in addition to their paramount importance in analyzing and measuring the risks to which each bank is exposed, and thus determining the extent of their impact on the performance of banks, many decisions by investors and stakeholders depend on them. Encouraging the flow of local and foreign investments.
6. Work on paying attention to the analysis of financial ratios because of its importance in setting important indicators about the state of companies and drawing the attention of those in charge of those companies to the feasibility of analyzing their financial ratios.

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