Testing to predict the financial failure of investment companies using logistical analysis: an applied study in the Iraqi stock market for the period (2005-2019)

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Abstract

The study objective to clarify the most important factors that lead to financial default and determine how to predict financial default, as well as making a comparison between the quantitative methods represented by the method of discriminant analysis and the method of logistic regression to know the work of each model in forecasting under the influence of the different characteristics and characteristics of the data used. The study population and sample consist of all the ongoing financial investment companies listed in the Iraqi Stock Exchange from (1/1/2005 to 31/12/2019) (4) investment companies. To test the hypotheses of the study, the (spss, excel) programs was used to build functions to predict financial failure and extract results. The study resulted in several conclusions, the most important of which are: The results of the logistic analysis showed that they matched the actual situation of all the studied investment companies and that the prediction error was implicitly stated, "that is, the model error in the prediction was in the years of study for some banks and investment companies. Either the condition of the bank or the company as a whole was identical with In light of these conclusions, a set of recommendations was reached, the most important of which are: After the positive results shown by the method of logistic analysis, we suggest that investment companies use it and adapt the conditions of its work to suit the work of banks and investment companies in Iraq.

Introduction:

One of the most prominent benefits of financial analysis and indicators is their use to predict the financial failure of investment companies, by building a mathematical model or using a statistical analysis, through which it gives us an early alert about companies that are in the stage of financial failure that leads to financial failure and bankruptcy, allowing the parties Interested and regulatory authorities to intervene to take appropriate measures before reaching the stage of financial failure. There are many attempts to use financial ratios in designing mathematical models to predict the financial failure of companies. Financial ratios are an indicator of the strength or weakness of the company's financial position, and the behavior of And the trends of some financial ratios of a group of companies before they falter and knowing the characteristics of the financial ratios of troubled companies, which makes them useful in distinguishing between troubled and non-stumbling companies, and thus it is possible to predict the failure of these companies and alert them early before they reach the stage of financial failure.

The first topic
Research Methodology

First: the research problem:

According to the concept of discriminatory analysis in predicting the financial failure of banking companies and investment companies, we can ask the following questions to represent the problem of the study as follows:

1- The first main question is a statement of whether the financial investment sector is not threatened by the risks of default for the duration of the study according to the discriminatory analysis.

2- The second main question is a statement on whether there are investment companies that are not threatened by the risks of financial default according to the discriminatory analysis during the study period.

Second: The importance of the study:

1- It helps decision-makers, including dealers, to make the right decisions related to investment and financing, which contributes to supporting the national economy and market stability.

2- The importance of this study is an attempt to identify the dangers associated with the failure of investment companies in the Iraqi market.

3- This study is one of the important topics in financial thought, by trying to sense the upcoming financial problems in advance.

Third: The objectives of the study:

1- Identifying the theoretical framework for the problem of the banking and investment sector faltering in terms of concept, stages, and causes.

2- Helping the relevant authorities represented in the investment sector in knowing the weaknesses and thus taking the appropriate measures on their part to mitigate the stumbling expected to hit them.

3- Determine the most important factors that lead to financial failure.

Fourth: the hypothesis of the study:

Consistent with the questions raised by the study problem, the following hypotheses can be :

1- The first main hypothesis: The financial investment sector is not threatened by the risks of failure for the duration of the study, according to the discriminatory analysis.

2- The second main hypothesis: There are investment companies that are not threatened by the risks of financial failure, according to the discriminatory analysis during the study period.

Fifth Study method:

1- The theoretical side: the researcher relied on books, magazines, letters, Arab and foreign periodicals that serve the study, as well as financial standards and the Internet.

2- The practical aspect: the researcher relied on the financial statements that are published in the Iraqi Stock Exchange for banks and financial investment companies, the sample of the study, and for the period (2005-2019).

Sixth Community and sample research:

The study population and sample consist of the financial investment companies listed in the Iraqi Stock Exchange from (1/1/2005 to 31/12/2019), which are (12) banks and (4) investment companies, and Al-Amin Financial Investment Company was excluded because Its fixed assets (zero) for some years of study.

Some previous studies:

1-	Al Kubaisi 2011
Title	The role of financial analysis in evaluating performance and predicting failure.
object	Presenting the recent trends of financial analysis methods in the early detection of financial and non-financial deviations.
Community and sample research	The study population was represented in the industrial companies listed in the Iraq Stock Exchange, while the study sample was represented by the United Company for Cement Industry.
method	It depend on modern discriminatory models and studied the relationship between financial ratios.
The most important conclusions	There is no relationship between the levels of financial default and the market value of the companies, which led to bankruptcy and the announcement of liquidation.
The most important recommendations	Studying the indicators of financial failure by the financial analyst for the purpose of not being exposed to bankruptcy and liquidation.
2	Al-Hasnawi 2014
Title	Predicting the financial failure of investment companies using the financial ratios of the KIDA model and its impact on EPS
object	the predictive ability of the KIDA model and the explanatory ability of the different hypotheses of the variation in earnings per share in the Iraqi Stock
Community and	The study population is represented by all companies

sample research	listed in the Iraq Stock Exchange, consisting of (84) companies While the study sample was represented in all the companies of the investment sector listed in the Iraqi financial market
method	Mathematical and statistical equations were used through the (SPSS V14) program.
The most important conclusions	The profitability ratio represented by (return on investment) and the activity ratio represented by (asset turnover rate) are the two main factors in explaining earnings per share, as the return on investment appeared with a positive and significant relationship, while the relationship of the asset turnover rate appeared negative and significant.
The most important recommendations	The study suggested paying attention to advanced quantitative models as an effective scientific tool for measuring and predicting default, and working on developing financial analysis through quantitative data analysis so that companies can know their current status and predict the future.
3	Al Murshidi 2018
Title	Using the Sherrod model to predict the financial failure of private commercial banks in Iraq.
object	Identifying the subject of financial failure of banks, its causes, stages, importance, and predicting the risks of bankruptcy.
Community and sample research	The study population consisted of private commercial banks listed in the Iraqi financial market, while the study sample consisted of (11) banks who were randomly selected for the period from 2013 to 2014.
method	Financial analysis of the data of a sample of banks listed in the Iraqi financial market to extract the financial ratios that make up the model and calculate the Sherrod coefficient
The most important conclusions	It is possible to predict the financial failure of banks using the model used in the research in order to reach preliminary results that help the bank's management in diagnosing strengths and weaknesses in performance and taking appropriate corrective measures.
The most important recommendations	The requirement of using discriminatory models of financial failure consisting of financial ratios, analytical applications, and determining the required procedures

The second topic

Expect financial failure, its causes, and importance

First: what prediction:

1- **The concept of Prediction**:

Prediction is the formation of a picture or idea of what a phenomenon will lead to in the future, so prediction is a process of estimating and estimating based on the nature of the situation or phenomenon and its growth in the current situation and the amount of growth and its trends after subjecting them to the appropriate measuring tools. The normal situation, that is, without taking into account any exceptional things that may cause side effects at some time.

(Al-Sarraj,2012:2) Prediction is defined as a package of methods and procedures specifically designed for the purpose of predicting future events and realizing the results that will be achieved. Achieving deviations

between what is expected and actual, that is, forecasting is the process of evaluating and evaluating the expected results for each of the specified alternatives and in the ways that contribute to the process of correcting decisions.

And (Ramo&Al-Watar,2010:15) mentioned in the book "Administrative Thought" the concept of prediction and its extremism for several aspects of it, where (Buffa) explained that prediction means revealing and guessing the future using the scientific method, while (Robbins) believes that prediction is based on the assumptions that it makes Management, which would determine the relationship between the company's external environment factors (political, economic, technological, social, market) and the internal (human resources, expenses, revenues).

For the researcher, Prediction is the art and science that specializes in estimating future events. It is the art of having experience in forecasting and intuition that has a great and clear role in determining the appropriate method for the prediction process, and it is a science that uses statistical and mathematical methods and methods that lead to increasing the degree of accuracy and reducing discrimination. in the Prediction process.

2- The importance of Prediction:

The topic of Prediction has a special importance that results from making financial Prediction and using them by many parties, including them (Al-Sarraj, 2012, 3) (Foster, 2011, 146):

A- **Investors**: one of the main parties that carry out the financial Prediction process through the role it plays in determining the number of risks in a way that helps the investor in identifying alternative types of investment that enhances his ability to make the best investment decision. By predicting investment alternatives, the investor can identify the positives And the disadvantages of each investment alternative on the basis that the investor makes his investment decision according to the elements of return and risk related to that investment, and then choose the investments that are consistent with his capabilities and available resources.

B - **Securities analysts**: Their role is highlighted by forecasting profits, and these predictions range between the short and long term.

C- Lending Institutions: The loan procedures adopted by many financial institutions have forecasts of the borrower's profits and cash flows based on the life of the loan.

D- **Management**: Strategic analysis is the most important management activities as a tool for forecasting cash flows or profits through a variety of financing, investment, and operational alternatives as an integral part of it, and the other important activity of management is the disclosure of the company, which has decisions regarding the announcement of profit forecasts. Observation

3- steps of Prediction

One of the most important steps of the Prediction process is (Stevenson, 2007:70)

A- Clarify the purpose of the Prediction.

b- Determining the time frame for the Prediction process.

c- Choosing a Prediction method.

d- Determining the appropriate data to obtain an accurate Prediction .

C - Monitoring the Prediction, as the benefit of the monitoring process is to clarify the quality of performance.

Second - financial failure:

1- The concept of financial failure: Several definitions were given to clarify the concept of financial failure. (Dahmash, 1995:13) defined financial failure as the shortage or cessation of stock returns, as well as the failure to meet financial obligations on time.

(Outecheva, 2007: 14) explained the financial failure of the event, the separation between the state of the company when it suffers from financial distress, and the period in which the company is in a good financial condition, so it is necessary to follow the important corrective steps to overcome the current situation.

(Atiya, previous reference: 52) also defined financial failure as the terrifying financial imbalances that the company has reached that make it close to declaring its bankruptcy, i.e. low returns or stoppages in a way that makes the company unable to fulfill its obligations.

The researcher believes that financial failure is the emergency and unexpected situation facing the economic establishments, which results in the realization of losses for three successive years, resulting in a shortfall in the economic return that leads to the weakness of the establishments' ability to fulfill the obligations in the short term.

2- Reasons for financial failure: Financial failure is many reasons, some of which fall within the internal causes, and others fall within the external and other reasons, these reasons may share or be unique when this situation appears, which can take the establishments for what is not good, which is failure and liquidation. These reasons can be clarified in Table (1) as follows:

Table (1) Reasons for Financial Failure

internal reasons	External causes	other reasons
*** Financial reasons: These are:** **(1) Poor financial management.** **(2) The rise in indebtedness.** **(3) Expand the distribution of profits.** **(4) Delay in collecting debts.** **(5) Unjustified increase in expenses.** **(6) The severe drop in sales.** **(7) The confusion of fiscal policy in financing.** **(8) Inefficiency of working capital.** *** Non-financial reasons:** **(1) Weak management.** **(2) Promotions are unwise.** **(3) Excessive expansion.** **(4) Presentation of appearance over profitability.** **(4) Obsolescence in facility technology.** **(5) Inefficiency of production and procurement management.** **(6) The increase in production capacity..**	**(1) Prevailing inflationary trends.** **(2) sharp fluctuations in exchange rates.** **(3) Rapid technological developments.** **(4) Problems of dealing with government administration.**	**(1) International competition.** **(2) Depression.** **(3) Natural disasters.** **(4) Continuous changes in laws and legislation.** **(5) the instability of economic policies.** **(6) Pessimistic expectations.** **(7) The increase in interest rates.** **(8) The high cost of credit and the difficulty of its availability.** **(9) The continuous depreciation of the currency.**

Source: Al-Khudairi, Mohsen Ahmed, "Naked Debt – Apparent – Reasons – Remedy", Itrak for Publishing and Distribution, Cairo, Egypt, 1997.

3- Stages of financial failure and ways to treat it: The financial failure of the facility does not come suddenly overnight without preceding indications of that failure. Every failed company must have gone through this stage. (Al-Khudairi, 1997: 39-40) mentioned that the process of financial failure passes through six stages as follows:

A- Deficit statement: It is the starting point for financial failure unless the company rectifies its situation and amends its financial policy. At this stage, the company enters into commitments that constitute a "heavy" burden on it, without directing these funds into areas that achieve desired returns, since the commitment will become a threat to the company's cash flow. The occurrence of major embezzlement cases in the company, and the treatment for this stage is to re-plan more realistically and effectively and to follow up on the implementation of what was planned by the management.

b- The stage of overlooking the current situation: At this stage, the management does not care about the dangerous situation that surrounds it, resulting from the accident that emerged in the previous stage, and its failure to find solutions that are in the interest of the company and get it out of the predicament it is going through. And one of the ways of treatment is to resort to borrowing money to a greater extent to be sufficient to meet the immediate cash needs.

C- The stage of realizing the danger: In this stage, the risk is steadily increasing, while the administration does not move in the direction of the danger surrounding it, and it may continue to proceed in the light of its inappropriate spending policy, which leads to the accumulation of losses and appears clearly, and the remedy for this lies The stage

is by following corrective steps for financial policies, assigning a new administration, or by offering new shares and bonds.

d- Harmony with danger: It is the most difficult stage for the company to reach, in which stumbling is part of its daily activities, and then the production lines that need maintenance at high amounts are closed, and therefore the labor force begins to move to other companies, meaning that the company is on its way to the end of bankruptcy or liquidation.

C - The occurrence of the crisis: at this stage, the company will not be able to fulfill the obligations it owes, because its assets are not sufficient to cover the debts it owes, and this is known as real financial hardship, as well as "transmission of default information to creditors and stockholders, in which claims for their entitlements begin and follow-up Legal steps to guarantee their rights.

H- The final stage: in which the crisis or liquidation is faced, or the crisis is resolved or the company is liquidated by appointing a new commissioner who will be responsible for the reform operations after the dismissal of the board of directors of the existing company, and this is treated either through merger or reinstatement Debt scheduling or company liquidation.

4- The effects of financial failure on companies: It can be clarified by the following points:

A- The severe impact of the failure on the investment climate, which in turn leads to the failure to promote new investment projects, and at this point, failure occurs in the implementation of the plans set by the companies.

b- Loss of liquidity and capital flight due to low investment returns in a way that negatively affects the state's trade balance and its general budget.

H - It hurts society as a result of the aggravation of unemployment and the loss of job opportunities in companies.

B - The sharp decrease in capital is an inevitable result of successive losses, and due to the existence of intertwined relations between companies and economic sectors, the default may transfer from one company to another.

C - The emergence of judicial disputes as a result of companies' failure to pay their debts.

D- The decline in the national income resulting from the decline in the added value of the company, as well as the decrease in tax revenues, which in turn leads to depriving the budget of an important resource from its sovereign resources.

5- Application of the logistic regression model to predict the financial distress of companies.

To use the logistic regression model on the data of the research sample, it is necessary first to divide the companies into troubled companies and non-performing companies, and secondly, the stepwise method is used to determine the best model capable of representing the studied data.

5-1 Classification of companies:

To classify companies into troubled companies and non-performing companies, the researcher relied on the financial ratios used for the research sample companies and the following table shows the values of the arithmetic means of the financial ratios for each company in addition to the sectoral mean:

Table (2)

The arithmetic means for the financial ratios of companies in addition to the sectoral arithmetic mean

Company	السنة	X1	X2	X3	X4	X5	X6
Al Khair Company	2005	0.93555551	0.14124813	0.99778329	0.006335992	451.118004	16.0343729
	2006	0.99170487	0.02367764	0.9996232	0.016537784	2653.89877	126.241711
	2007	0.99221471	0.04033194	0.99693706	0.022148777	326.483598	211.110218
	2008	0.98787538	0.00681749	0.99135275	0.079868701	115.64372	285.086465
	2009	0.98358513	0.03426993	0.98657086	0.010970977	74.4649152	330.428908
	2010	0.97342562	0.00117485	0.97576191	0.010959908	41.2573681	417.655764
	2011	0.93459679	0	0.95106666	0.030348139	20.4359662	57.7458352
	2012	0.94743553	0.0009048	0.962404	0.047329831	26.5985732	64.2954055
	2013	0.97372419	0.07530053	0.98751146	0.050005851	80.0734335	71.6248386
	2014	0.97540798	0.01776788	0.98736309	0.019127108	79.1332434	82.5892193
	2015	0.98706813	0.0072798	0.99741069	0.004868045	77.3283616	96.4375316
	2016	0.96692019	0.01066392	0.98004916	0.554006364	50.1231931	74.647875
	2017	0.9062757	0.01187721	0.91777762	-0.17377714	12.1621388	79.7934564
	2018	0.88875229	0.01286005	0.89782711	-0.09589645	9.78733205	98.9360486
	2019	0.9028698	0.01986427	0.89846149	-0.54635801	9.84847975	102.668393
mean		0.95649412	0.0269359	0.96852669	0.002431725	268.55714	141.019736
Al-Zawra Company	2005	0.78315051	0.46004736	0.78673183	-0.21156829	4.68893231	219.676048
	2006	0.88626663	0.10803804	0.88934125	0.032408796	9.03679119	289.25219
	2007	0.92311684	0.05169611	0.92530844	0.007842087	13.3883941	422.206647
	2008	0.91346594	0.01928091	0.91477328	0.039419802	11.7334095	699.719004
	2009	0.90913091	0.16663763	0.91419985	0.018909513	11.6549917	424.349328
	2010	0.91488896	0.09302072	0.91670597	0.043890337	12.005662	504.513043
	2011	0.91664631	0.08677798	0.91984486	0.070906545	12.4758063	287.581644
	2012	0.91424103	0.08567677	0.91754417	0.006107862	12.1277058	277.778915
	2013	0.92828394	0.08226109	0.93231049	0.023786889	14.7733371	231.541198
	2014	0.91226526	0.04367289	0.91633134	0.013337664	11.9519068	225.359939
	2015	0.91948528	0.05133129	0.92035617	-0.05307672	12.5559002	1056.79586
	2016	0.93369658	0.01155087	0.93373823	-0.03834655	15.0916585	22415.9368
	2017	0.93184172	0.0072393	0.93187384	-0.02813678	14.6786485	29011.5698
	2018	0.93021055	0.00025177	0.93023248	-0.02409292	14.3333171	42417.6437
	2019	0.92670409	0.00063639	0.92671561	-0.05040845	13.6454702	80452.661
mean		0.90955964	0.08454128	0.91173385	-0.00993468	12.2761288	11929.1057
Al-Nahrain Company	2005	0.60502006	0.27050939	0.60706461	0.020398295	2.54494767	296.918217
	2006	0.60034844	0.15433648	0.60034845	-0.04432073	2.5021797	47412115.1
	2007	0.74639728	0.06673382	0.74688364	-0.01112872	3.95075208	1535.68686
	2008	0.75157173	0.04733042	0.75176592	0.006561338	4.02845579	3871.12012
	2009	0.74653899	0.05951958	0.74673046	0.005882896	3.94836267	3900.08168
	2010	0.72819198	0.22261897	0.72839572	-0.66198839	3.68182712	3575.15999
	2011	0.39094672	0.14284433	0.39079654	0.008271831	1.64148771	3642.78573
	2012	0.04184364	0.03923188	0.04185549	0.012425071	1.0436839	3530.30373
	2013	0.036459	0.08580326	0.03660534	0.000201864	1.0379962	250.140774
	2014	0.03256329	0.11220025	0.0326728	-0.00172447	1.03377637	298.366012
	2015	0.03389689	0.07517826	0.03516865	0.000856757	1.03645057	27.6534722
	2016	0.02927446	0.03548022	0.03025666	-0.00665429	1.03120069	30.8050167
	2017	0.02471162	0.01435069	0.02537549	-0.00652684	1.02603617	38.2231913
	2018	0.52430928	0.25193442	0.53153521	-0.07943717	2.13463216	73.5594039
	2019	0.4857429	0.17529112	0.48574294	-0.00940655	1.94455279	11321868.7
mean		0.38518775	0.11689087	0.38607986	-0.05110594	2.17242277	3917003.64
Al-Waam Company	2005	0.93385646	0.62450899	0.9491738	0.251131009	19.6748903	61.9672865
	2006	0.97146962	0.14173595	0.98495827	0.008692983	66.4817014	73.0212372
	2007	0.97154044	0.13004348	0.98266952	0.024317057	57.7018198	88.2974317
	2008	0.97195502	0.1640097	0.98203495	-0.02474396	55.6636343	97.4247782
	2009	0.89888739	0.37412073	0.90560796	0.236006798	10.5941141	134.751572
	2010	0.89732742	0.21224998	0.90375682	0.007303816	10.3903466	140.566258
	2011	0.94109963	0.28778734	0.94495204	0.075260993	18.1659779	245.288278
	2012	0.94052402	0.46402039	0.94323822	0.017455379	17.6174878	347.519604
	2013	0.91418029	0.60908425	0.91587057	0.047563349	11.8864467	541.845385
	2014	0.74506186	0.62233306	0.74506187	-0.14468424	3.92252027	914623815
	2015	0.70943957	0.57670779	-0.01785338	-0.01785338	3.50967058	892344463
	2016	0.96566456	0.63091132	-0.00070164	-0.00070164	3.50720978	144.836613
	2017	0.71484046	0.63898402	0.71676271	0.013924494	3.5306085	372.87718
	2018	0.69824005	0.65299794	0.69867278	0.009186629	3.31865137	1614.57197
	2019	0.7042988	0.66051345	0.7042988	0.019904682	3.38179216	945228415
mean		0.86522571	0.45266723	0.75723355	0.034850932	19.2897914	183480037
total mean		**0.7791168**	**0.17025882**	**0.75589349**	**-0.00593949**	**75.5738707**	**46852277.7**

The researcher obtained the following table, which includes the two types of companies, based on the above table:

Table (3)

Classification of companies into two parts (defaulted and non-performing) depending on the financial ratios

s	Company's	Indicators (negative = 0, positive = 1)						total ratios		result
		X1	X2	X3	X4	X5	X6	negative	positive	
1	Al Khair Company	1	0	1	1	1	0	2	4	non-performing
2	Al-Zawra Company	1	0	1	0	0	0	4	2	defaulted
3	Al-Nahrain Company	0	0	0	0	0	0	6	0	defaulted
4	Al-waam company	1	1	1	1	0	1	1	5	non-performing

Source: Prepared by the researcher based on the financial indicators of the research sample companies

The classification of companies was carried out based on the financial ratios according to two steps, the first is the researcher's financial analysis of the ratios of the research sample for the years (2005-2019), and then the arithmetic mean of those ratios is calculated, then the sectoral arithmetic mean of the ratios is calculated for each ratio group, and then the comparison is made based on The average ratio of the companies to the sectoral mean and for all variables, and the second step is to divide the companies into faltering and non-performing based on the percentage specified in the first step so that the company will be in default if the sum of the arithmetic mean values of the company's ratio is less than the sectoral arithmetic mean (total of negative values) and vice versa. The company is not defaulted (the sum of the positive values).

After the researcher has classified the companies into troubled companies and non-failed companies, and as shown in the previous table, we must determine the existence of a complete inverse or direct correlation between the financial ratios used, since the correlation between ratios leads to inaccurate results, and the following table includes the correlation between the financial ratios used in the search:

Table (4)

Correlations between the financial ratios of the research sample companies

Correlations						
	x1	x2	x3	x4	x5	x6
x1	1	.005	.873**	.087	.152	-.052
x2	.005	1	-.186	.024	-.123	.498**
x3	.873**	-.186	1	.085	.160	-.200
x4	.087	.024	.085	1	.041	-.065
x5	.152	-.123	.160	.041	1	-.049
x6	-.052	.498**	-.200	-.065	-.049	1
**. Correlation is significant at the 0.01 level (2-tailed).						

Source: Prepared by the researcher based on the financial data and SPSS program outputs.

The sign (*) indicates the significant correlation at the 5% level and the sign (**) at the 1% level.

The above table indicates that there is no complete linear correlation (overlap) between the financial ratios used, and the perfect correlation occurs when the values (1) equal the correct one, in other words, there is a value of financial ratios equal to (1) and corresponding to the value of another ratio also equal to (1) And there is an incomplete correlation between the ratios that occurs when there is a value or values that are close to the right one, whether they are positive or negative (1,-1).

The following chart shows the values of the correlations between the six financial ratios shown in the previous table:

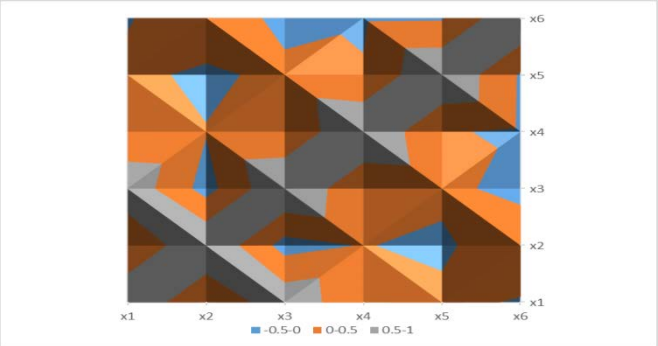

Figure (1)
Correlations between the six financial ratios

6- General statistics for the ratios used:

The researcher used a set of six financial ratios to determine a model capable of predicting the financial failure of the companies used in this research, where some general statistics for these variables were found and included in the following table, which contains the lowest and highest value, arithmetic mean and standard deviation for each variable and for both groups In addition to companies in general:

Table (5)
Some general statistics for the financial ratios of the research sample companies

		x1	x2	x3	x4	x5	x6
Troubled companies	N	30	30	30	30	30	30
	Minimum	.0247	.0003	.0254	-.6620	1.0260	27.6535
	Maximum	.9337	.4600	.9337	.0709	15.0917	47412115.1000
	Mean	.647374	.100716	.648907	-.030520	7.224276	1964466.37200
	Std. Deviation	.3455251	.0991055	.3460693	.1290948	5.5159977	8828498.55400
Non-Troubled Companies	N	30	30	30	30	30	30
	Minimum	.6982	.0000	-.0179	-.5464	3.3187	16.0344
	Maximum	.9922	.6605	.9996	.5540	2653.8988	945228415.000
	Mean	.910860	.239802	.862880	.018641	143.923466	91740089.0400
	Std. Deviation	.0946050	.2627470	.2535716	.1658969	483.7861710	280011379.200
All companies	N	60	60	60	60	60	60
	Minimum	.0247	.0000	-.0179	-.6620	1.0260	16.0344
	Maximum	.9922	.6605	.9996	.5540	2653.8988	945228415.000
	Mean	.779117	.170259	.755893	-.005939	75.573871	46852277.7100
	Std. Deviation	.2841332	.2089948	.3195490	.1494443	346.1312847	201559179.500

Source: Prepared by the researcher based on the annual reports of companies and the outputs of the SPSS program.

The above results indicate that there is a disparity between the two groups of troubled and non-faltering companies in some ratios and their convergence in other ratios, as it is clear that the ratios X4, X5, and X6 gave a greater dispersion among the non-performing companies, while there is convergence in the ratios of X1, X2, and X3 between the two types of companies and this It was identical to what was stated in the study (Al-Sharabi, 2018: 11).

7- General statistics of the non-performing group of companies

As for the following table, it contains the lowest and highest value, mean and standard deviation for each variable and for all companies:

Table (6):
Some general statistics for the financial ratios of the research sample companies

company		x1	x2	x3	x4	x5	x6
Al Khair	N	15	15	15	15	15	15
	Minimum	.8888	.0000	.8978	-.5464	9.7873	16.0344
	Maximum	.9922	.1412	.9996	.5540	2653.8988	417.6558
	Mean	.956494	.026936	.968527	.002432	268.557140	141.019736
	Std. Deviation	.0350567	.0371598	.0358934	.2168296	671.6018133	115.9880581
Al-Zawra	N	15	15	15	15	15	15
	Minimum	.7832	.0003	.7867	-.2116	4.6889	219.6760
	Maximum	.9337	.4600	.9337	.0709	15.0917	80452.6610
	Mean	.909560	.084541	.911734	-.009935	12.276129	11929.105670
	Std. Deviation	.0369145	.1139984	.0362788	.0666761	2.6232106	23120.9469100

company		x1	x2	x3	x4	x5	x6
Al-Nahrain	N	15	15	15	15	15	15
	Minimum	.0247	.0144	.0254	-.6620	1.0260	27.6535
	Maximum	.7516	.2705	.7518	.0204	4.0285	47412115.1000
	Mean	.385188	.116891	.386080	-.051106	2.172423	3917003.639000
	Std. Deviation	.3140654	.0823960	.3142324	.1707851	1.2067326	12380715.6400000
Al-waam	N	15	15	15	15	15	15
	Minimum	.6982	.1300	-.0179	-.1447	3.3187	61.9673
	Maximum	.9720	.6605	.9850	.2511	66.4817	945228415.0000
	Mean	.865226	.452667	.757234	.034851	19.289791	183480037.100000
	Std. Deviation	.1133493	.2110108	.3286102	.0971148	21.9255196	379971639.9000000
All companies	N	60	60	60	60	60	60
	Minimum	.0247	.0000	-.0179	-.6620	1.0260	16.0344
	Maximum	.9922	.6605	.9996	.5540	2653.8988	945228415.0000
	Mean	.779117	.170259	.755893	-.005939	75.573871	46852277.710000
	Std. Deviation	.2841332	.2089948	.3195490	.1494443	346.1312847	201559179.5000000

Source: Prepared by the researcher based on the financial indicators of the research sample companies

The following figure shows a graphic of the general statistics values for the financial ratio X1 and X2, which is the ratio that appeared to have significance and morality in determining the financial failure of troubled and non-performing companies, in addition to companies in general:

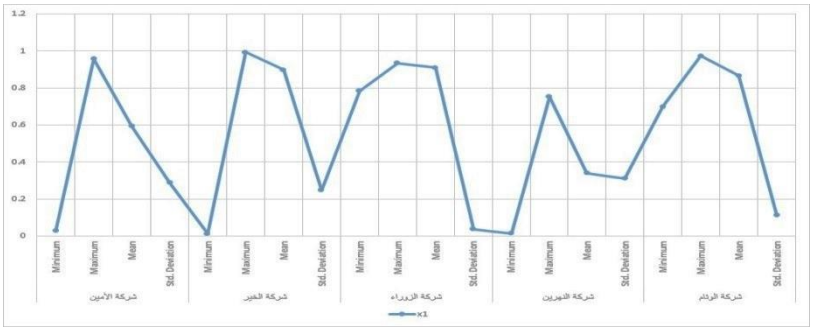

Figure (2)
General statistics for the financial ratio X1 for all companies

8- Stepwise selection method:

The researcher has previously shown that there are no complete correlations between the six financial ratios, so models can now be generated by applying the stepwise method. The researcher obtained only one financial ratio, depending on the method used in the logistic regression model, and this ratio is the most important among the remaining ratios, which will be relied upon in predicting bank failure. The access to the optimal model came after one step in the stepwise method, as shown in the following table:

Table (7)
Model Parameters Test

Variables in the Equation							
		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	x1	7.001	2.564	7.453	1	.006	1097.357
	Constant	-5.854	2.273	6.629	1	.010	.003
Step 2[b]	x1	34.135	12.695	7.231	1	.007	668023237800000.000
	x2	15.188	5.110	8.832	1	.003	3943614.822
	Constant	-32.459	12.094	7.203	1	.007	.000
a. Variable(s) entered on step 1: x1.							
b. Variable(s) entered on step 2: x2.							

It is clear from the results in the table above that the variable x1 was chosen in addition to the constant in the first step as variables with significant statistical significance. The biggest financial stumble, as the researcher will rely on the second model in the analysis, and based on the results in the above table, the following estimated model has been formulated:

P_i^* = -32.459 + 34.135 X1 +15.188X2

The above form can also be written in the form of an exponential and proxy function:

P_i^*= Exp (-32.459 + 34.135 X1 + 15.188 X2)

Based on the basic equation mentioned earlier, the researcher wrote the logistic model as in the following formula:

$$P_i^* = P(y=1) = = \frac{Exp\,(-32.459+34.135X1+15.188X2\ )}{1+Exp(-32.459+34.135X1+15.188X2\ )}$$

X1 represents working capital/total assets.

X2 represents cash assets/total assets.

9- The mathematical model of logistic regression that the researcher deduced using the stepwise selection method:

Through the previous results, the researcher obtained, through the sample of the studied companies, a Logistic Regression Model to predict the financial failure of these companies, as it included containing only one financial ratio and excluding five others as they are ineffective. Wald Statistics) and its significant values.

In addition, the table includes the values of the coefficients of the independent variables and their statistical significance (Ross, 2002, 59):

Table (8)

Stepwise choice and logistic regression model statistics, coefficient values of independent variables and their statistical significance Wald Method Stepwise

Variables in the Equation							
		B	S.E.	Wald	df	Sig.	Exp (B)
Step 1[a]	x1	7.001	2.564	7.453	1	.006	1097.357
	Constant	-5.854	2.273	6.629	1	.010	.003
Step 2[b]	x1	34.135	12.695	7.231	1	.007	668023237800000.000
	x2	15.188	5.110	8.832	1	.003	3943614.822
	Constant	-32.459	12.094	7.203	1	.007	.000
a. Variable(s) entered on step 1: x1.							
b. Variable(s) entered on step 2: x2.							

Source: Prepared by the researcher based on the outputs of the SPSS program**.**

As it becomes clear the significance of this ratio coefficient and its statistical significance (p-value < 0.05) for the ratio coefficient x1 and x2 in addition to the fixed limit of the model. Financial companies such as the -2Log Likelihood test, Chi-square test, Cox & Snell-R2 coefficient of determination and Nagelkerke-R2. The results are presented in the following table:

Table (9)

The results of the quality of reconciling logistic models using the stepwise method/ Wald

Classification Table[a]					
Observed			Predicted		
			y		Percentage Correct
			0	1	
Step 1	y	0	16	14	53.3
		1	5	25	83.3
	Overall Percentage				68.3
Step 2	y	0	24	6	80.0
		1	5	25	83.3
	Overall Percentage				81.7
a. The cut value is .500					

Source: Prepared by the researcher based on the outputs of the SPSS program**.**

Table (10) includes two tables for classification according to the first and second models that were reached. The first table categorizes observations based on the first model, which includes the existence of a fixed

limit and the variable x1 only, assuming the occurrence of a default event with a probability of 50%, where the classification accuracy reached 68%. X2 Assuming a case of financial default with a probability of 50%, where the prediction accuracy increased compared to the previous model to reach 81%, which is the highest rating ratio that can be reached. Each group of companies and according to the proposed model:

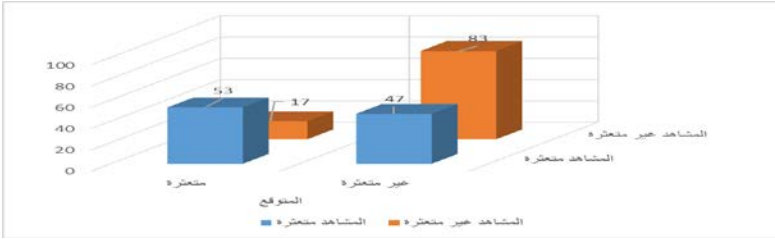

Figure (3)

Classification of the first model that includes the fixed and variable term X1

It is clear from the above figure that the first logistic regression model, which included the fixed and variable limit x1, was able to correctly classify the troubled companies as actually troubled companies by 53%, and the error of the troubled companies was classified as non-performing companies by 47%, and the non-stumbling companies were non-performing companies by 83%, and the error of non-performing companies was classified as troubled companies by 17%.

As for the second model of logistic analysis, which includes the fixed limit and the variables X1 and X2, it was able to correctly classify the stumbling companies as faltering by 80%, and the stumbling companies error was classified as not faltering by 20%, and the non-stumbling companies were non-performing companies by 83 % The error of non-performing companies was classified as troubled companies by 17%, which means that the correct classification has increased in this model and its accuracy has also increased**.**

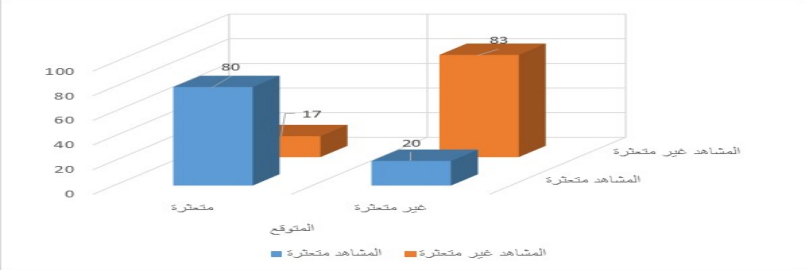

Figure (4)

Classification of the first model that includes the fixed and variable term X1

Testing the first main hypothesis (there is a financial failure for the investment companies sector for the duration of the study according to the logistical analysis)

$$P_i^* = P(y=1) = \frac{\text{Exp}\,(-32.459+34.135*0.7791168+15.188*0.17025882\ )}{1+\text{Exp}(-32.459+34.135*0.7791168+15.188*0.17025882\ )} = 0$$

The result of the second step of the logistic analysis model for the investment sector proved to be equal to (0), meaning that the investment sector as a whole stumbled during the study period, and this came in line with the fourth main hypothesis.

- Testing the second main hypothesis (there is a financial default for each bank separately for the duration of the study according to the logistic analysis)

Table (11)

classification of banks according to the method of logistic analysis

$$P_i^* = P(y=1) = = \frac{\text{Exp}\,(-32.459+34.135X1+15.188X2\ )}{1+\text{Exp}(-32.459+34.135X1+15.188X2\ )}$$

company	year	Real state of the company		state of the company
Al Khair Company	2005	1	0.83503	1
	2006	1	0.8523	1
	2007	1	0.8832	1
	2008	1	0.79673	1
	2009	1	0.83706	1
	2010	1	0.6872	1

	2011	1	0.36442	0
	2012	1	0.47396	0
	2013	1	0.87248	1
	2014	1	0.75152	1
	2015	1	0.79339	1
	2016	1	0.6702	1
	2017	1	0.20708	0
	2018	1	0.12721	0
	2019	1	0.20791	0
	المعدل	1	0.645663	1
Al-Zawra Company	2005	0	0.77922	1
	2006	0	0.36235	0
	2007	0	0.45935	0
	2008	0	0.27196	0
	2009	0	0.75125	1
	2010	0	0.54582	1
	2011	0	0.53717	1
	2012	0	0.51253	1
	2013	0	0.61719	1
	2014	0	0.34181	0
	2015	0	0.4274	0
	2016	0	0.39854	0
	2017	0	0.36811	0
	2018	0	0.33134	0
	2019	0	0.30662	0
	المعدل	0	0.468251	0
Al-Nahrain Company	2005	0	0.00045	0
	2006	0	0.00007	0
	2007	0	0.00256	0
	2008	0	0.00227	0
	2009	0	0.0023	0
	2010	0	0.01447	0
	2011	0	0	0
	2012	0	0	0
	2013	0	0	0
	2014	0	0	0
	2015	0	0	0
	2016	0	0	0
	2017	0	0	0
	2018	0	0.00002	0
	2019	0	0	0
	المعدل	0	0.38281	0
Al-waam company	2005	1	0.99986	1
	2006	1	0.94558	1
	2007	1	0.93583	1
	2008	1	0.96121	1
	2009	1	0.98029	1
	2010	1	0.80141	1
	2011	1	0.98265	1
	2012	1	0.99876	1

	2013	1	0.99966	1
	2014	1	0.91876	1
	2015	1	0.62639	1
	2016	1	0.99996	1
	2017	1	0.83848	1
	2018	1	0.78468	1
	2019	1	0.83398	1
	المعدل	1	0.98112	1

Table (11) shows that the results of the logistic analysis of the investment companies, the study sample, classified Al-Khair Company as faltering in the years (2011, 2012, 2017, 2018, 2018, and 2019). The study and that the stumbling was only implicit, and this came under the sub-hypothesis**.**

Conclusions

Through the previous results, the researcher reached a set of conclusions, including:

1- The researcher used six financial ratios in order to determine a model capable of predicting the financial failure of the companies used in this research, and the companies were classified into troubled companies and non-performing companies depending on the financial ratios used for the research sample companies.

2- The classification related to companies being (defaulted, non-performing) was based on comparing the average of the company's financial ratios with the sectoral average of companies (the research sample).

3- There is no complete linear correlation (overlap) between the financial ratios used.

4- Reaching the optimal model came after two steps in the stepwise method.

5- The variables x1 were chosen in addition to the constant as variables with statistical significance. In other words, it is these variables that determine the bank's default.

6- The tests used indicated the ability of the logistic regression model in explaining banking default and its changes.

Recommendations

1- Building a local model capable of predicting the risks of financial default for each of the investment sectors as well as from the rest of the other sectors in a manner that is consistent with the economic environment of the Iraqi reality by relying on quantitative methods.

2- Providing human resources and working on holding seminars, conferences, and specialized courses on the risks of financial default according to advanced scientific methods.

3- Banks and investment companies must develop their organizational structures and create specialized divisions and units for the risks of financial default, and work to find quick solutions and ways to avoid them in the future.

4- After the positive results shown by the logistical analysis method, we suggest that investment companies use it and adapt the terms of their work in line with the work of banks and investment companies in Iraq.

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