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Benchmarking Methodology of Banks Based on Financial Sustainability Using CRITIC and RAFSI Techniques

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ABSTRACT

This study aims to determine the influence of financial risks on the financial sustainability of Iraq banks, in contrast considering the moderator role of financial expertise and the risk of directors' riskiest directorships. Moreover, the investment attractiveness has also been accounted for specifying the mediating impact between the moderator variables and financial sustainability. Robust random effect model was employed to investigate the determinants of financial sustainability for the listed banks on the Iraqi stock trade and the Iraqi financial marketplace. In addition, multicriteria decision-making techniques were utilized to rank the banks from the best to worst based on financial sustainability. This study has examined 19 Iraqi banks over 14 years from 2007 to 2020 (266 observations), during the development of the Iraqi corporate governance cod. The findings indicate that financial risk has a negative influence on the financial sustainability of Iraq. Furthermore, the link between financial risks and financial sustainability is fully mediated by investment attractiveness. In this context, financial expertise and the relinquishing of directors' riskiest directorships have an interactive role in the link among investment attractiveness and financial sustainability indicators. Multi-criteria decision making (MCDM) results revealed that the best bank in terms of financial sustainability is BTRI and the worst bank is BNOR. The findings enable managers to develop strategies to mitigate financial risk in phases and prepare for future unpredicted risks. Hence, the results provided an insight to practitioners regarding the best banks in terms of financial sustainability in order to invest and deal with them.

1. Introduction

In the recent years, financial sustainability has become the sole measure for assessing banks' long-term funding despite the higher interest rates. In this regard, financial sustainability helps banks to develop internal financing and reduce reliance on external financing for their financial needs and accomplishments. It also facilitates lower financing costs and adequate access to financial sources

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and enforces effective financial policies. Financial sustainability is the ability to pay off financial and operational obligations, mitigate risks, provide long-term resources, and retain profits to finance expansion, increase growth, and reduce financial distress [1]. As [2] reported, an ideal financial sustainability system during COVID-19 lacks several requirements because of many reasons. First, the financial risk of massive loan repayment has negatively affected liquidity, increased the risk of bankruptcy, and weakened capital structures. Second, management was unable to deal with crises such as COVID-19 pandemic. Third, the banking capacity in terms of soft knowledge at the midst of crisis was lacking, while directors handle crisis and have proper tools to intervene speedily in the case of distress. Furthermore, financial risk is the consequence of the interaction of many complex indicators. Companies with large assets are exposed to low risk, while companies with small assets are exposed to high risks [3, 4]. In this context, world stock markets have touched their lowest indexes point since the 2008 economic crisis [5, 6]. In addition, the pandemic has seriously harmed investment and financial sustainability [7]. However, the influence of financial risks on financial sustainability through the mediating role of investment attractiveness and the moderating roles of financial expertise and relinquish authoritarian leadership of directors is still unknown. Investigating the effect of financial expertise and relinquishing directors on the relationship between investment attractiveness and financial sustainability will help companies assess financial health, forecast business phenomena, improve investment decisions, enhance performance, increase long-term returns, improve sustainable growth, and mitigate financial risk, that will lead to growth liquidity, profitability, and financial efficiency [1].

Earlier papers tested the direct relations amongst corporate environmental disclosures, corporate governance, performance, and the influence of managerial perception on the adoption of sustainability reporting [8, 2]. Previous literature also revealed contradictory results by claiming that governance is not significantly related to performance. However, these studies have only focused on the direct effect of corporate governance factors (e.g., financial expertise and relinquish directors' riskiest directorships). Furthermore, [9] have studied the influence of opportunities of investment on performance through the moderator role of governance quality. Thus, it is noteworthy that researchers have focused on the risk factors of financial sustainability [10, 11]. In the context of MCDM, the literature has made clear efforts to address complex issues in business and finance research. For example, [12] determined the criteria for selecting university location sites using the Analytic Hierarchy Process (AHP) method, weights were given to the criteria and the TOPSIS method was adopted to classify the location sites. [13] used the AHP approach to record a weight for the standards for determining restaurant locations and performed the TOPSIS technique to classify restaurant locations from best to worst. [14] benefited from applying MCDM techniques to identify symptoms of illness and discover potential disease by identifying a number of diseases such as fever, influenza, and so on. [15] adopted MCDM techniques to determine the weight of empowerment in India criteria and also provided a classification of six alternatives in the field of empowerment of women such as journalism, sports, technical, social, administrative, and political services.

Historically, the financial sector and banks are the two economic bodies that play a key role in absorbing the shocks that are caused by various crises, especially for resource-rich countries such as Iraq. In line with this, financial sustainability was previously studied by analyzing the financial analysis measures, corporate social responsibility, and corporate governance during crises. Incorrect identification of financial sustainability factors can propel banks into a significant financial risk. Similar to the above discussion, the conceptual frameworks for financial sustainability have not presented a suitable solution. Thus, providing a full solution to address such issues is still necessary [2]. In this context, a robust and validated financial sustainability model is necessary in the stock markets. This

research fulfils the gap in the writings by analyzing the effects of financial risks on financial sustainability of banking sector in Iraq. It struggles to solution the subsequent investigation question: How do top management level directors of banks in Iraq mitigate financial instability? This question is among the most important questions financial experts and academics will try to answer in the coming years [16].

There are relatively few studies on financial sustainability during the COVID-19 crisis. Thus, the novelty of the conceptual framework proposed by this research is to examine the financial sustainability of banks by considering the financial risk. In this connection, this research will examine the fluctuations in the financial sustainability of banks by exploring the interactive role of the board of directors and the opportunities for investment. In doing so, this study underwrites to the academic and industry in two fields of study: (a) studies that examine the relations between financial risk and financial sustainability, delinquency, financial distress, default, and bankruptcy, and (b) studies that deal with the impact of such factors on financial sustainability. Additionally, this study provides evidence that financial risk will lead to bankruptcy if banks do not take relevant preventive measures while encountering several risk factors [17, 18].

In the globalized world, the financial sector needs advanced technologies for ensuring financial safety and assuring banks' capacity in avoiding bankruptcy at the midst of crises. Traditional financial sustainability models, which focus on the same factors during various crises, are inappropriate for banks because banks are more concerned with finance. This study presents a new methodological aspect based on organizational factors related to financial risks, personal factors related to high-level administrative structure, and external factors associated with investment attractiveness. Thus, this study proposes a new financial sustainability model for banks during the current crisis. In addition to developing and testing this model, the researchers of this study also realized and observed the ways how the managers acted during 2008 financial crises, comparing it with the COVID-19 crisis. Iraq was the chosen country for this study since it is considered as a developing market. However, international reports indicate that the lack of financial sustainability was a significant collapse aftermath crisis [9]. While recognizing the spillovers of COVID-19 on investment attractiveness, investors' interests and concerns were the main factors during COVID-19. Due to the pressures imposed by COVID-19, the volatile market conditions throughout February and March 2020 sparked a fight to safety and liquidity among investors. The developing economies as a group are expected to have a sharp decline in Foreign Direct Investment (FDI) as they are more vulnerable to COVID-19 crisis as compared to 2008 global financial crisis. Besides, the production and investment footprints of developing economies are less diversified. Thus, developing economies are more exposed to systemic risks. Based on Global Investment Competitiveness Report 2019/2020, FDI declined before the pandemic. This worrisome global trend in the recent decades has a couple of factors such as economic factors, like declining rates of return. Furthermore, business confidence fell sharply during 2019, and investment in industrial sectors and financial sectors has also declined due to the decline in global demand versus supply. Likewise, firms globally have become reluctant to invest due to volatility and uncertainty, thus productivity growth has continued to decelerate. In addition, determining the best banks based on sustainability and financial stability is a crucial issue for investors. Robust random effect analysis provides evidence about the causal and linear relationships between the variables. However, regression analysis does not have the ability to employ benchmarking between banks. Therefore, the current study benefited from MCDM methods in order to overcome the weakness of regression analysis and to identify the best banks on the basis of financial sustainability by ranking banks from best to worst based on mathematical models for MCDM analysis. This research highlight on the impact of financial expertise and relinquishing directors on

the relationship between investment attractiveness and financial sustainability in the Iraq Stock Exchange. In addition, this study also ranks the banks from the best to worst based on the latest advanced MCDM methods. The current study is exceptional because it investigates banks' financial sustainability to determine the determinants of long-term internal financing. Therefore, this study is distinguished from previous literature by investigating the determinants of sustainability and ranking banks from best to worst by using MCDM methods in order to provide accurate information to investors and stakeholders about the safest and most stable banks in the financial aspect. This study is the foremost investigation that conducts benchmarking methodology to rank banks based on financial sustainability.

1.1 Motivation of this Study

Practically, by combining regression analysis and MCDM for the banking sector. Governments will identify companies with superior financial sustainability. In addition, policymakers will guide investors to deal with such banks that achieve customer satisfaction. The research produced a framework that the banking industry can use to improve long-term internal financing. As we mentioned previously, the banking sector in Iraq is the most important, especially in light of the difficult economic conditions faced by this developing country [19]. Despite the strenuous efforts of previous literature in the field of investigating the banking sector, previous research lacks decisive evidence about ranking banks from best to worst based on long-term internal financing. Investigating financial risks, maintaining financial expertise, and increasing investment effectiveness contribute to stimulating the financial sustainability of banks. This investigation is considered exceptional for addressing the issue of long-term internal financing of banks and ranking banks according to financial sustainability [20, 1]. Many reports indicate that the decline in the performance of Iraqi banks and reliance on external sources for financing is due to weak attention to risks, especially since the reports indicate an increase in the rates of delayed payment restrictions. In addition, providing a benchmark comparison of banks would identify the best banks that could be used as a more reliable model and suitable place for investors. However, for banks that are at the bottom of the ranking based on financial sustainability, governments can put in place strict procedures and laws in order to recognize such banks to be more worthy. The findings of this paper support the development of economic and financial policies to improve financial sustainability by understanding the fundamental determinants of long-term internal financing barriers. Through the proposed benchmarking methodology, the decisions of companies and banks regarding the development of long-term internal financing will be accurate and based on the systematic technique that will be established and tested according to sound scientific foundations.

2. Literature Review and Hypotheses Development

This study considered both contracting theory and agency theory in dealing with financial sustainability. The agency theory of economic resources underlines that shareholders and managers are the principals and agents, respectively, and that the latter controls the company's resources [9]. Since managers have more significant influence over business operations, they have more information about their finances [21]. The amount of given information enables the agents and managers to increase their chances of benefiting themselves while sacrificing the interests of their principal. The relations between financial risks and financial sustainability have been postulated according to agency theory [9, 22], which is considered as an extension of the agency views that expect management to take care of the shareholders' interests. Therefore, the agency theory supposes financial sustainability, which leads to effective use of the resources. However, the agency

theory considers financial sustainability as a successful way to manage stakeholder relationships. Agency theory's main target is to look after all stakeholders' welfare and protect the property rights and obligations with contracts [23]. It encourages managerial innovation and efficiency, enabling the company's management to identify its financial interests more carefully, thereby stimulating management's creativity and improving financial sustainability. In general, we aim to identify financial sustainability in finance organizations of a developing country, which is Iraq, a country that is characterized by high financial risk [24, 25].

Moreover, the agency theory motivates the manager to combine stakeholders' inefficient methods to achieve financial targets. In this regard, the agency theory indicated that monitoring could improve the interests of the management and stakeholders and lessen opportunistic behaviors resulting from conflict of interests [26]. Therefore, agency theory expects financial specialists for riskiest directorships to be successful [27, 28]. Applying contracting theory, [29] argue that investment attractiveness may substantially affect financial sustainability. Contract theory is related to the development of legal agreements between individuals and organizations. According to contract theory, conflicting interests are analyzed by constructing formal and informal contracts [26]. Contracting theory is a mix of models, studies, and the way businesses typically draft contracts together with an analysis of how corporations approach factors like investment attractiveness [9]. Furthermore, investment attractiveness and performance are negatively related via contracting theory. In this context, the mediating role of investment attractiveness was assumed according to the investment attractiveness because investors consider different types of risks in choosing a portfolio according to the difference in financial sustainability [24].

2.1 Financial Risk and Financial Sustainability

The recent crisis has caused a substantial financial risk due to its widespread financial effects for all economies around the world. International donors and governments worldwide have committed considerable funds to mitigate the effects of COVID-19 and reduce economic and human costs especially in the developing world. As a result, economic and financial crises caused by the COVID-19 pandemic have received comparatively less attention [27, 30]. Financial risk is an essential component of banking operations, and during recent crises, this component needs special attention. Banks must meet multiple and opposing needs. For example, they need to maintain sufficient liquidity to meet the withdrawal requirements of depositors and loan requirements of borrowers. According to [31], banks typically retain capital as a safety net against bankruptcy (Cash and securities) to cover unforeseen financial needs of depositors and borrowers. Banks utilize two main strategies to limit their exposure to risk: first, hedging their positions in the capital market, and second, changing their investment strategies if hedging is not a practical strategy to reduce risk. [32, 33]. Regarding crises, uncertainty and risk are the two main components of financial markets.

Many countries have experienced numerous financial and economic crises caused by internal factors at various times. In contrast, the world is currently suffering from the spread of a dangerous and deadly virus (COVID-19) which has brought various consequences, especially financial and economic risks which are probably the most dangerous problems that could cause significant damage due to the reduction of specific activities. According to [34], sustainability performance has impacted stock returns and volatility [35]. These findings support the first hypothesis. The investment behavior concerning COVID-19 is particularly vital. [36] confirmed that investors are the backbone of the capital market for a country. It is presumed that COVID-19 has a severe effect on companies [37]. In this context, [38] had considered the paths of raising the investment and performance. Therefore, the companies must build a viable investment climate through state regulatory mechanisms

furnished by tax, budget, depreciation, monetary, and custom policy. Investment attractiveness is increasingly going down under the financial risk [39].

H1: Capital structure risk, insolvency risk, liquidity risk, and credit risk are negatively correlated with financial sustainability indicators.

2.2 Moderator Roles

The result of the 2008 economic crisis led to financial market disasters worldwide. After 2008 global financial meltdown, the investors were expected to implement the best corporate governance practices to better manage financial risks during and after crises [40]. Effective implementation of corporate governance practices requires sufficient independence of boards for transparent review and audit of financial information. The board members must be equipped with sufficient financial knowledge and expertise to make a fair judgement of financial affairs [41]. The relations between financial expertise are investigated by scientists, such as [42, 43]. It is arguably evident because independent boards may limit managers to focus more accurately on producing financial results than exploiting other investment opportunities. Board's committees may also directly resist exploring new investment avenues if they fear the stock market will fail to properly value such investments [44]. Therefore, it is necessary to combine financial expertise with the investment attractiveness assessment process [45]. Since dealing with investment and financial sustainability issues requires long-term planning, the board of directors must have sufficient experience to encourage investors, which will lead to an increase in long-term financing [46]. Hence, based on the previous studies, the relations between investment attractiveness and financial sustainability will be stronger when financial expertise is competitive enough to deal with crises and the economic spillovers.

The policy decisions may also be affected by financial experts, mainly when managers provide advice instead of monitoring, thereby causing a significant risk to shareholders [43]. These managers have significant financial expertise that may harm a firm and shareholders in the event of their withdrawal from the firm. Recently, directorship risk has emerged as a significant predictor that may significantly impact financial sustainability because of the directors' preferences and choices throughout their directorship portfolio [45]. In addition, managers who leave their riskiest management positions are more experienced and have more education than others in the field. Relinquishing directors' riskiest directorships has material consequences by reducing investment attractiveness [46]. Nevertheless, managers exhibit a strong tendency to resign during and after crises, as revealed in previous studies [47].

The assessment of the enterprise's investment attractiveness plays a vital role in choosing an initiative as an investment intention. Investment attractiveness contributes to stimulating the internal context of companies to invest financial resources to expand the enterprise's economic activity and create better conditions for succeeding in the competition. Some procedural issues in evaluating the enterprises' financial sustainability and investment had been discussed by some researchers. Building investment attractiveness and developing a clear investment strategy are critical to achieving financial sustainability. It is essential to develop financial expertise through continuous training that encourages investment and ensures financial sustainability [38]. In this context, financial expertise is possessed by the independent directors of banks [47]. The characteristics of the CEO are vital in increasing the quality of reports. According to [48] the CEO's narcissism and excessive confidence in the CFO are linked to reducing losses and increasing profits. These findings support the following hypotheses:

H2: Investment attractiveness (relinquished directors' riskiest directorships) is negatively correlated with financial sustainability indicators.

H3: Investment attractiveness (board's financial expertise) is positively correlated with financial sustainability indicators.

2.3 Mediating the Role of Investment Attractiveness

The financial crisis of 2008 was exhibited by the uncertainties of financial markets and the consequent effects of the crisis on them [49]. Investment contributes to a firm's development and increases banks' willingness to provide long-term financing. The greater feasibility of investment indicates a set of benefits that helps investors evaluate an organization and make rational decisions to protect their income sources efficiently [50]. These benefits include technology, infrastructure, and reputation of a firm [51]. The process of attracting investments is dynamic, and it includes a firm's ability to manage and sustain attractiveness, especially during crises, because it involves a considerable level of risk [52]. Based on the abovementioned literature, the researchers of this study conclude that investment attractiveness is measured as non-cash asset growth scaled by total assets. Firms that increase their investment or their assets earn fewer returns because of risks. This negative relation is described as an asset anomaly. Although evidence for investment anomalies has been found, no agreement has been reached on the common causes of such anomalies [53, 54, 55, 56]. Notably, high asset growth firms subsequently earn substantially lower average returns than small asset growth firms. In the current economic scenario, achieving the necessary level of financial sustainability of enterprises is a precondition for ensuring their sustainable operation and the formation of competitive development indicators at the internal and external market environments. Investment attractiveness assumes a new role as an indicator of increasing financial sustainability [57]. There is a direct relation between financial sustainability and investment attractiveness.

H4: Investment attractiveness will mediate the effect of capital structure risk, insolvency risk, liquidity risk, and credit risk on financial sustainability indicators.

3. Research Methodology

This section exhibits the study methodology. The study sample was described in the first subsection, and the second subsection included the statistical methods used. Stata software was used to detect causal relationships between study variables or criteria. In addition, MCDM methods were employed to establish the importance of criteria and rank banks from best to worst on the basis of financial sustainability, and Figure 1 shows the steps of the methodology.

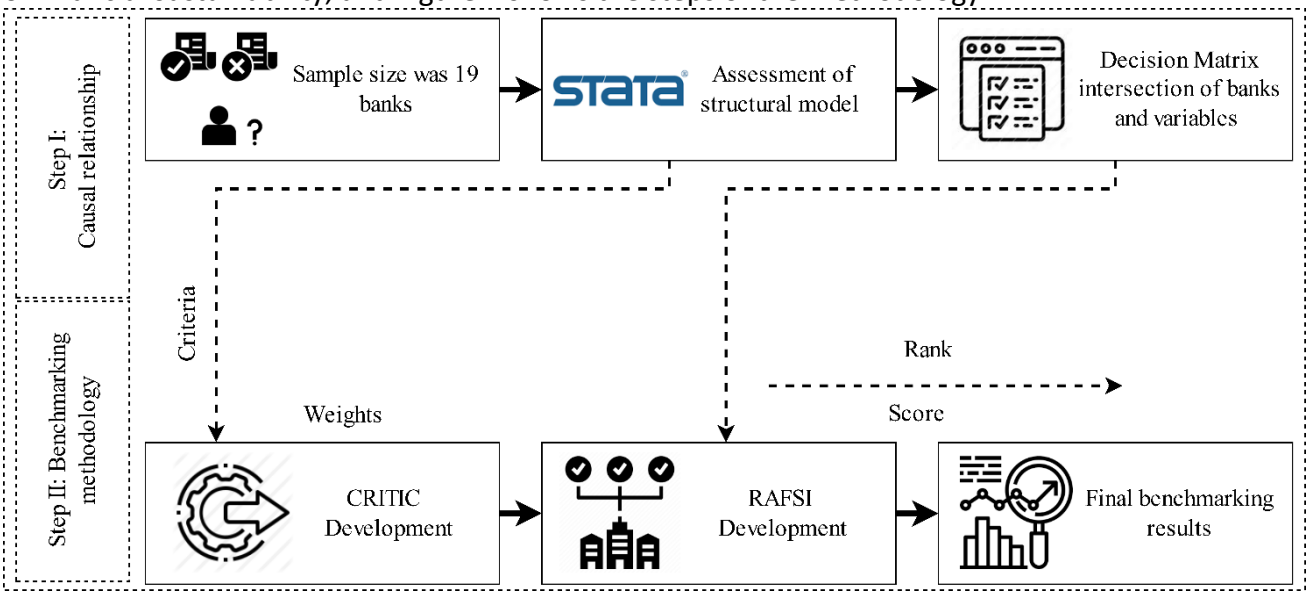

Fig. 1. Methodology steps

3.1 Sample and Model

The data of this study were accumulated from the DataStream and the Iraqi Securities Commission (ISC) considering the period from 2007 to 2020. The ISC consists of two markets: (1) a stock market, which lists the well-established companies wherein investors invest to earn a return, and (2) the secondary market, which include entities under special supervision that ISC considers unreliable and advises investors not to invest in. There are 19 banks listed under ISC and trading in the stock market, whereas there are 23 banks in the secondary market overall. The quantitative studies should have a sample size of between 30 and 500. Hence, 19 banks make up the sample size for this study. First, the excluded banks were money transferring companies before 2016; second, they did not follow international governance standards. Therefore, there was a significant lack of data because the banks did not regularly apply governance and disclosure principles until 2007. The researchers of this study examined 266 bank-year observations. Financial sustainability has been examined over time by looking at annual fluctuations (%) between banks in each year of the sample period to determine whether banks' financial risks increase during and after a crisis. Iraq was slowly coming out of economic stress following the end of the war in 2011. The said war caused a large development deficit that affected the possibility of long-term financing by the banks, owing to their budgetary constraints [58]. The following equations were presented to consider the effect of independent variables, which are indicators of financial risks, on indicators of financial sustainability.

$$ROA, SGR, Z\ score = \beta 0 + \beta 1\ (FE) + \beta 2\ (RDRD) + \beta 3\ (IA+D/E*FE) + \beta 4\ (IA+D/A*FE) + \beta 5\ (IA+E/A*FE) + \beta 6\ (IA+CUR*FE) + \beta 7\ (IA+CR*FE) + \beta 8\ (IA+E/F*FE) + \beta 9\ (IA+C/F*FE) + \beta 10\ (IA+CDR*FE) + \beta 3\ (IA+D/E*RDRD) + \beta 3\ (IA+D/A*RDRD) + \beta 4\ (IA+E/A*RDRD) + \beta 5\ (IA+CUR*RDRD) + \beta 6\ (IA+CR*RDRD) + \beta 7\ (IA+E/F*RDRD) + \beta 8\ (IA+C/F*RDRD) + \beta 9\ (IA+CDR*RDRD) + \beta 10\ (BS) + \beta 11\ (BLEV) + \mathcal{E}it \quad (1)$$

where IA= Investment Attractiveness, D/E = Debt/Equity Ratio, D/A= Debt/Asset Ratio, E/A= Equity/Asset Ratio, CUR= Current Ratio, CR= Cash Ratio, E/F= Equity/Fixed Asset, C/F= Capital / Fixed Asset, BS= Bank Size, BLEV= Bank Leverage, FE= Evaluation of Board Financial Expertise, RDRD= Relinquish Directors Riskiest Directorships, ROA= Return on Asset, SGR= Sustainable Growth Rate, Z score= Altman Z-score, $\mathcal{E}$ = error terms, i,t = firm i and year t, respectively. The analysis section explains the comparison between regression models in order to adopt the applicable one for hypothesis testing. Furthermore, the robust random effect model was identified as the preferable model. Consequently, this study adopted a robust random effect model (see Regression Model section).

3.2 Measurement of Criteria

The index created by [59], [26], and [3] was utilized by the researchers to calculate financial risks. This is a comprehensive index to evaluate the financial risks developed for the use in Iraq context. Capital structure risk, liquidity risk, insolvency risk, and credit risk are the four different categories of financial hazards that are included in the index. The directors claimed there were significant hazards for the bank. According to earlier studies, the debt/equity ratio (D/E), debt/asset ratio (D/A), and equity/asset ratio (E/A) were used to quantify capital structure risk [60]. According to [61], liquidity risk was calculated using the current ratio (current assets/current liabilities) and the cash ratio (cash/current liabilities). Equity/fixed asset (E/F) and capital/fixed asset (C/F) ratios were used to calculate insolvency risk [62]. Finally, the ratio of non-performing loans to total loans was used to calculate credit risk [3, 63].

These risks relate to relinquish directors' riskiest directorships, which previous studies have confirmed as causes of short-term financing if director I departs from directorship j in year t and zero otherwise [64, 46]. The previous studies have indicated that financial experience as under holding

the knowledge of skill is marked as 0 when the manager has no financial experience; management education is marked as 1 for management education only or financial expertise alone; and 2 for both financial knowledge and executive education [41, 65].

Investment attractiveness was measured as suggested by previous studies [66]. Investment attractiveness is defined as non-cash asset growth. Because the company's size may influence investment attractiveness and firm performance [9], this mediating variable was measured as non-cash asset growth scaled by total assets (i.e., (Noncash assets, t - Noncash assets, t − 1) / Total assets, t, for every firm i and every year t). Finally, to measure private banks' financial sustainability, the researchers focused on three fundamental measures [67, 1]. These measures include return on the asset measured as profit before interest and tax/total asset, sustainable growth rate measured as profit after tax-preference dividend and Altman Z-score was measured as Z-score = 1.2 (working capital to total assets ratio) + 1.4 (retained earnings to total assets ratio) + 3.3 (profit before interest and tax to total assets) + 0.6 (market value of equity to book value of total liabilities) + 1.0 (revenue to total assets) [68]. The literature provides evidence that these three financial sustainability indicators are more accurate in predicting the risk of bankruptcy and sustainability. Thus, a higher Z degree is related to the rise in financial sustainability. For example, if the degree of Z is more significant than 2.7, the firm is booming, and if it is less than or equal to 1.8, it indicates a failure [69, 70]. The variable definitions are listed in Table 1.

Table 1
Variable definitions

Criteria	Measurement	Author
	Independent Variable	
Financial Risks	Measurement	
Capital Structure Risk	Debt/Equity Ratio (D/E), Debt/Asset Ratio (D/A), Equity/Asset Ratio (E/A)	[3]
Liquidity Risk	Current Ratio = Current Asset/Liability (CuR) Cash Ratio = Cash/Liability (CaR)	[3]
Insolvency Risk	Equity/Fixed Asset (E/F) Capital / Fixed Asset (C/F)	[3]
Credit Risk	The ratio of non-performing loans to total loans is used as an indicator of credit risk.	[63]
	Moderating Variable	
Evaluation of Board Financial Expertise	Variable coded 0 for no financial experience or management education, 1 for management education only or financial expertise alone, and 2 for both financial expertise and management education (per-firm average).	[41]
	Moderating Variable	
Relinquish Directors Riskiest Directorships	That equals one if the director departs from that directorship in that year, and zero otherwise.	[64]
	Mediating Variable	
Investment Attractiveness	Measured as non-cash asset growth scaled by total assets	[66]
	Dependent Variable	
Financial Sustainability	Measurement	
Return on Asset	Profit before interest & tax/Total asset	[68]
Sustainable Growth Rate	([Profit After Tax—preference dividend]/Total equity) × (1-dividend Pay-out ratio)	[68]
Altman Z-score	Z-score = 1.2R1 + 1.4R2 + 3.3R3 + 0.6R4 + 1.0R5 R1 = working capital to total assets ratio R2 = retained earnings to total assets ratio	[68]

Criteria	Measurement	Author
	Independent Variable	
Financial Risks	Measurement	
	R3 = profit before interest & tax to total assets R4 = market value of equity to book value of total liabilities R5 = revenue to total assets	

3.3 Statistical Analysis

Decision-making techniques are gaining fast increasing acceptance, with the MCDM method being particularly essential [71, 72, 73]. To improve the value of decisions, researchers are increasingly adopting this approach. Selecting the appropriate MCDM method is crucial [74]. The importance of criteria via the Inter-Criteria Correlation (CRITIC) method utilizes link technique to measure the weight of each criterion. The CRITIC method enables the exploration of potential connections among criteria during the weight estimation process [75]. Specialists have applied this method to various critical issues. For instance, [76] suggested the CRITIC approach as a confidence assessment tool for cloud-based service advancement. [75] dedicated a substantial portion of their manner to characteristic weight reassessment using the CRITIC method in their attribute-based stakeholder assessment. They considered the probability of relationships between attributes during the weight estimate. Lastly, [77] utilized CRITIC with FDOSM to estimate countermeasure techniques against Denial-of-Service Attacks (DoS A-CTs). The CRITIC technique, which enables the calculation of objective weights, involves six steps. The first step is to construct the decision matrix.

$$= \left[d_{ij}\right]_{m\times n} = \begin{bmatrix} d_{11} & d_{12} & \dots & d_{1m} \\ d_{21} & d_{22} & \dots & d_{2m} \\ \dots & \dots & \dots & \dots \\ d_{n1} & d_{n2} & \dots & d_{nm} \end{bmatrix} (i = 1,2, \dots \dots m; \text{ and } j = 1,2, \dots . n) \quad (2)$$

Second, Equation 3 is employed to normalize the given decision matrix within the range of [0,1]. This normalization step is crucial as it eliminates any numerical fluctuations in the output values of different quality parameters.

$$\overline{d_{\imath J}} = \frac{d_{ij} - d_j^{\text{worst}}}{d_j^{\text{best}} - d_j^{\text{worst}}} \quad (3)$$

Third, the standard deviation of columnar standardized criterion solutions is employed to estimate the contrast intensity criterion (d j). Applying Equation 4, the standard deviation for every standard can be calculated.

$$\sigma_j = \sqrt{\frac{\sum_{i=1}^{m} \left(\overline{d_{\imath J}} - \bar{d}_j\right)^2}{m}} \quad (4)$$

Fourth, the correlation factor (linear) linking the criteria is measured by using (Equation 5)

$$r_{jk} = \frac{\sum_{i=1}^{m} \left(\overline{d_{\imath J}} - \overline{d_J}\right)\left(\overline{d_{\imath k}} - \overline{d_k}\right)}{\sqrt{\sum_{i=1}^{m} \left(\overline{d_{\imath J}} - \overline{d_J}\right)^2 \sum_{i=1}^{m} \left(\overline{d_{\imath k}} - \overline{d_k}\right)^2}} \quad (5)$$

Fifth, the criteria values of cj are calculated by multiplying Equation 8 and Equation 6.

$$C_j = \sigma_j \sum_{k=1}^{m} 1 - r_{jk} \quad (6)$$

Sixth, normalizing approach is applied to verify the ultimate weights for every single criterion, as shown in Equation 7.

$$W_j = \frac{C_j}{\sum_{j=1}^{n} C_j} \quad (7)$$

A significant number of MCDM methods have been exploited, proving their efficacy in solving practical problems [78, 79, 80]. Among these methods, a new MCDM approach called Ranking of Alternatives through Functional Mapping of Criterion Sub-intervals into a Single Interval (RAFSI) has

emerged [81, 82, 83]. RAFSI approach is notable for its utilization of straightforward mathematical formulations, facilitating its practical implementation in intricate problem-solving contexts. The RAFSI method incorporates three essential components in order to ensure a coherent approach to decision-making: (1) the identification of referential criteria points, encompassing both ideal/anti-ideal values; (2) the establishment of connections between the alternatives under consideration and the ideal/anti-ideal values; and (3) the application of a novel data normalization technique that relies on the definition of criteria functions, which map sub-intervals of the criteria.

The RAFSI method involves the following steps:

Step 1: Define perfect and anti-perfect ideals. The decision maker (DM) sets two parameters, aIj and aNj, for each criterion, Cj (j = 1, 2,..., n), where aIj is the perfect value of criterion Cj and aNj is the anti-perfect value.

Step 2: Make a criterion interval map from the initial decision matrix. The criteria intervals [n_1, n_b] are mapped from the aggregated initial decision matrix (N) to the defined perfect and anti-perfect values via the functions f_(A_i) (C_j). Each criterion C_j (j = 1, 2,..., n) has a corresponding criterion function defined for it. The function for mapping is provided by:

$$\tilde{f}_{A_i}(C_j) = \frac{n_b - n_1}{n_{I_j} - n_{N_j}} n_{ij} + \frac{n_{I_j} \cdot n_1 - n_{N_j} \cdot n_b}{n_{I_j} - n_{N_j}} \quad (8)$$

Step 3: Use the following equations to get the arithmetic and harmonic means for the smallest and largest sequences of items, n1 and n2k, respectively.

$$A = \frac{n_1 + n_{2k}}{2} \quad (9)$$

$$H = \frac{2}{\frac{1}{n_1} + \frac{1}{n_{2k}}} \quad (10)$$

Step 4: Make a normalized decision matrix by writing S = [s _ij]_(mn) () (i=1,2,...,m,() j=1,2,...,n). Elements of matrix S are normalized and moved into the interval [0,1] using expressions (11) and (12), respectively: a) for the criteria C_j (j=1,2,...,n) max type:

$$\hat{s}_{ij} = \frac{s_{ij}}{2A} \quad (11)$$

b) for the criteria $C_j (j = 1,2, \dots, n)$ min type:

$$\hat{s}_{ij} = \frac{H}{2s_{ij}} \quad (12)$$

As follows, a newfound normalized DM is generated, as explained further down:

$$\hat{S} = \begin{bmatrix} \hat{s}_{11} & \hat{s}_{12} & \cdots & \hat{s}_{1n} \\ \hat{s}_{21} & \hat{s}_{22} & \cdots & \hat{s}_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ \hat{s}_{m1} & \hat{s}_{m2} & \cdots & \hat{s}_{mn} \end{bmatrix} \quad (13)$$

Determine the parameters of the alternative functions V(Ai). The criteria functions of the alternatives can be computed with expression (14). The alternatives are ranked from best to worst based on the calculated V(Ai).

$$V(A_i) = w_1 \hat{s}_{i1} + w_2 \hat{s}_{i2} + \cdots + w_n \hat{s}_{in} \quad (14)$$

We adopted CRITIC technique to evaluate financial sustainability criteria as displayed in the Measurement of Criteria section. The current study also used the RAFSI method to classify banks from best to worst based on long-term internal financing. DM is the intersection of financial sustainability criteria with alternatives, which are the 19 banks selected in this study. Table 2 shows the DM.

Table 2
DM

Criteria Alternatives	V1	V2	Vn
Bank 1	V1 / BA.1	V2/ BA.1	Vn/ BA.1
Bank 2	V1 / BA.2	V2/ BA.2	Vn/ BA.2
Bank 3	V1 / BA.3	V2/ BA.3	Vn/ BA.3
.	.	.	.
.	.	.	.
Bank 19	V1/ BA.19	V2/ BA.19	Vn/ BA.19

V= Variables, BA= Bank

4. Estimation and Results

4.1 Robust Random Effect Analysis

This section discusses the correlation matrix, descriptive statistics, and regression model consequences of financial sustainability. Table 3 illustrates the descriptive statistics of financial sustainability.

Table 3
Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Return on asset	588	0.033	0.076	0.000	0.898
Sustainable growth rate	588	0.565	0.661	0.000	7.751
Altman Z-score	588	0.238	0.201	0.000	0.881
D/E	588	1.609	1.183	0.250	9.986
D/A	588	0.551	0.299	0.000	2.450
E/A	588	0.531	0.607	0.000	7.550
Current ratio	588	1.357	1.181	0.000	9.736
Cash ratio	588	0.732	0.731	0.000	6.910
E/F	588	37.067	55.390	0.000	370.373
C/F	588	23.965	68.923	0.000	958.020
Credit risk	588	0.141	0.192	0.000	0.970
Size	588	11.704	0.230	10.872	12.262
Lev	588	0.549	0.213	0.099	1.840
Investment attractiveness	588	0.056	0.051	0.000	0.302
Financial expertise	588	0.433	0.149	0.000	1.000
Relinquish directors	588	0.925	0.264	0.000	1.000

Notice: D/E = Debt/Equity Ratio, D/A= Debt/Asset Ratio, E/A= Equity/Asset Ratio, E/F= Equity/Fixed Asset, C/F= Capital / Fixed Asset.

Sustainable growth rate had the highest average score among indicators of financial sustainability. For the maximum and minimum values. Table 3 reveals that the first measurement of financial sustainability, which is return on asset, had minimum and maximum values ranging from 0 to 0.898, with a standard deviation of 0.076. Since the return on asset proxy in this research has a mean value close to zero, the model well describes the data. As for the other measurements of financial sustainability, sustainable growth rate has a mean value of 0.565, minimum and maximum from 0 to 7.751, and standard deviation of 0.661. For Altman Z-score, the minimum and maximum range is from 0 to 0.881, the mean value is 0.238, and the standard deviation is 0.201. The mean

value of the investment attractiveness is 0.056, a relatively low number. Hence, investment attractiveness in Iraq is still in early stages. For financial risk measurements. Table 3 shows that the mean value of credit risk is 0.141, the minimum and maximum values range from 0 to 0.970. The mean values of current ratio and cash ratio are 1.357 and 0.732, respectively. Furthermore, most of the listed Iraqi banks are suffering from financial risks. Therefore, policymakers and practitioners in Iraqi banks should strive to maintain ideal levels of financial sustainability in order to sustain long-term internal financing.

The main issue that might skew the model findings is the collinearity between the variables. The multicollinearity issue must be tested and the correlations between the explanatory variables must be examined before performing the regression. We have considered Pearson's correlations. Pearson's correlations between the explanatory variables. When correlations between the independent variables are more than 0.80, multicollinearity is a major issue. Pearson's correlation coefficient values are not very high. In addition, the relationships between the explanatory variables were less than 0.85 and 0.90. Consequently, the concern of multicollinearity issue has vanished.

For hypothesis testing, Random Effects Model (REM), Pooled Ordinary Least Square (POLS), and Fixed Effects Model (FEM) regression are performed to test the hypotheses. Table 4 presents the direct link amongst financial risks and financial sustainability in Iraqi banks. This study applied three steps to test regression analysis. First, the Poolability test stage. The comparison between the POLS model and the FEM model was made based on a fixed effect estimate. Second, the REM model, the Breusch test, and pagan LM were examined to compare the POLS model and REM model. Third, the comparison between the FEM and REM models was made based on the Hausman test. This stage is accomplished if the FEM model is selected to the POLS model in the Poolability test, and the REM model is preferred to the POLS model in the second stage. The Poolability test confirmed that the FEM model is better than the POLS model. The Breusch Pagan LM test also indicated that the REM model is better than the POLS model. However, the Hausman test showed that the REM model is the best FEM model because the Hausman test was insignificant. Moreover, the REM model was suitable for testing the hypotheses of the current study. Heteroskedasticity, multicollinearity, and serial correlation tests were performed. As mentioned previously, the results showed that there is no obstacle to the issue of multicollinearity. With the heteroskedasticity test, the results revealed that there was an obstacle of heteroskedasticity in the model (Chi2 = 1463.760, prob. = 0.000; Chi2 = 116.980, prob. = 0.031; Chi2 = 75.120, prob. = 0.000). In this context, this study adopted a robust REM model that aggregates all models due to problems with heteroskedasticity and serial correlation.

The results revealed that the ratio of debt to equity, ratio of debt to assets, current ratio, cash ratio, ratio of equity to fixed assets, capital ratio on fixed assets, credit risk, and bank size have significant influence on the return on assets, sustainable growth, and Z score. However, the ratio of equity on assets and bank leverage does not have a significant influence on the sustainable growth and return on assets, but it has a significant effect on Z score. To test indirect effect, the mediating role of investment attractiveness is illustrated in Table 5.

Table 4
The direct relationship between financial risks and financial sustainability

Indicators	Return on asset Model	Sustainable growth Model	Altman Z score Model
	Robust Model	Robust Model	Robust Model
D/E	-0.062** -0.047	-0.013* -0.105	-0.074* -0.105
D/A	-0.113** -0.162	-0.190** -0.029	-0.021** -0.050
E/A	0.005 -0.601	-0.042 -0.138	-0.059* -0.061
Current ratio	-0.093* -0.081	-0.087*** (-1.884)	-0.075*** 0.000
Cash ratio	-0.081*** (-1.736)	-0.029* -0.081	-0.021* -0.073
E/F	-0.310** -0.029	-0.041*** -0.002	-0.305*** (-1.532)
C/F	-0.025* -0.067	-0.275*** (-5.128)	-0.220** -0.049
Credit risk	-0.031*** 0.000	-1.303*** (-8.443)	-0.103*** 0.000
Size	0.007** -0.033	0.003** -0.038	0.037*** -0.008
Leverage	0.003 -0.597	0.413 -0.311	0.281** -0.038
Constant	0.478 -0.002	0.773 0.000	0.362 0.000
R Square	0.575	0.721	0.489
Years Effect	YES	YES	YES
Poolability test (POLS vs FEM)	3.470*** 0	5.720*** 0	10.370** -0.038
Breusch-Pagan LM test (POLS vs REM)	11.120*** 0.000	112.290*** 0.000	8.220*** 0.000
Hausman test (FEM vs REM)	12.770 -0.173 -0.002	9.597 -0.384 -0.039	22.650 -0.007 0.000
Heteroscedasticity	1463.760***	116.980**	75.120***

Notice: D/E = Debt/Equity Ratio, D/A= Debt/Asset Ratio, E/A= Equity/Asset Ratio, E/F= Equity/Fixed Asset, C/F= Capital / Fixed Asset, FE= Financial Expertise, RD= Relinquish Directors, IA= Investment Attractiveness.

Table 5
The relationship between financial risk and financial sustainability through the mediator role of investment attractiveness

(Robust model)			
Indicators	ROA	SGR	Z score
IA	0.329***	0.048*	4.927***
	-0.002	-0.108	0.000
D/E+IA	-0.242	-0.063*	-0.098**
	-0.133	-0.071	-0.020
D/A+IA	-0.137	-0.522	-0.018*
	-0.132	-0.193	-0.070
E/A+IA	-0.272**	-0.036**	-0.158
	-0.038	-0.051	-0.241
Current ratio +IA	-0.119*	-0.053**	-0.084**
	-0.077	-0.046	-0.031
Cash ratio +IA	-0.033***	-0.282	-0.403
	-0.009	-0.332	-0.218
E/F +IA	-0.160**	-0.032*	-0.282**
	-0.015	-0.081	-0.077
C/F+IA	-0.148*	-0.220	-0.182
	-0.062	-0.127	-0.138
Credit risk +IA	-0.037***	-8.019***	-0.061***
	0.000	(-5.782)	-0.003
Firm size	0.381**	0.270*	0.008
	-0.033	-0.072	-0.771
Firm leverage	0.201***	0.063	0.158**
	0.000	-0.142	-0.041

Notice: Notice: D/E = Debt/Equity Ratio, D/A= Debt/Asset Ratio, E/A= Equity/Asset Ratio, E/F= Equity/Fixed Asset, C/F= Capital / Fixed Asset, FE= Financial Expertise, RD= Relinquish Directors, IA= Investment Attractiveness, ROA= Return on asset, SGR= Sustainable Growth Rate, ZSCORE= Altman Z-score.
*** p<.01, ** p<.05, * p<.1

The results of the intermediary role test revealed that investment attractiveness has a fully mediating role on the association amongst financial risks (capital risks, liquidity risks, insolvency risk, and credit risks) and financial sustainability (return on assets, sustainable growth, and the Altman Z-score) in Iraqi banks. As for the controlling variables, which are the size of the bank and bank leverage, the size of the bank had a significant role in the return on assets and sustainable growth. However, bank leverage had a significant impact on return on assets and Altman Z-score. Hence, the moderating role of financial expertise and relinquishing directors on the link amongst financial risk and financial sustainability has been tested. Table 6 illustrates the link amongst financial risks and financial sustainability.

Table 6
The mediator and moderating functions in the relationship between financial risks and financial sustainability

Robust Model			
Indicators	ROA	SGR	Z score
	0.000	-0.029	-0.082
D/E+IA * FE	-0.351	-0.196*	-0.113*
	-0.260	-0.108	-0.081
D/A+IA * FE	-0.291	-0.028**	-0.108*
	-0.480	-0.048	-0.059
E/A+IA * FE	-0.081*	-0.148	-0.158
	-0.061	-0.118	-0.241
Current ratio +IA * FE	-0.283	0.093	-0.248*
	-0.201	-0.199	-0.090
Cash ratio +IA * FE	-0.180*	0.164	0.069
	-0.029	-0.136	-0.308
E/F +IA * FE	-0.122**	-0.106*	-0.099*
	-0.083	-0.071	-0.085
C/F+IA * FE	-0.110*	0.099	-0.190*
	-0.104	-0.280	-0.081
Credit risk +IA * FE	-0.122*	-0.082**	-0.152***
	-0.053	-0.039	-0.003
D/E+IA * RDRD	-0.881	-0.110*	-0.266
	-0.272	-0.091	-0.183
D/A+IA * RDRD	-0.096*	-0.167*	-0.196
	-0.095	-0.106	-0.140
E/A+IA * RDRD	-0.108*	-0.098**	-0.113*
	-0.090	-0.028	-0.057
Current ratio +IA * RDRD	-0.214	-0.452	-0.209
	-0.220	-0.331	-0.122
Cash ratio +IA * RDRD	-0.077**	-0.197*	-0.211
	-0.029	-0.065	-0.137
E/F +IA * RDRD	-0.118**	-0.120**	-0.179*
	-0.016	-0.046	-0.066
C/F+IA * RDRD	-0.331	-0.489	-0.521
	-0.370	-0.381	-0.384
Credit risk +IA * RDRD	-0.220	-0.102*	-0.117*
	-0.127	-0.082	-0.093

Notice: D/E = Debt/Equity Ratio, D/A= Debt/Asset Ratio, E/A= Equity/Asset Ratio, E/F= Equity/Fixed Asset, C/F= Capital/Fixed Asset, FE= Evaluation of Board Financial Expertise, RDRD= Relinquish Directors Riskiest Directorships, IA= Investment Attractiveness, ROA= Return on Asset, SGR= Sustainable Growth Rate, ZSCORE= Altman Z-score.

Table 6 shows the results of the interactive role test of financial experience and relinquish directors' riskiest directorships. The outcomes uncovered that the interaction of financial expertise with the debt-to-equity ratio, debt-to-asset ratio, equity-to-fixed assets ratio, and credit risk have a negative and important effect on sustainable growth and Z score. Additionally, the interaction of financial experience with the ratio of equity to assets, ratio of cash, ratio of equity to fixed assets, ratio of cash to fixed assets, and credit risk has a negative and significant impact on the return on assets. With regard to relinquish directors' riskiest directorships interaction, the results revealed that the interaction of relinquishing directors' riskiest directorships with the debt-to-assets ratio, the equity-to-assets ratio, the cash ratio, and the equity-to-fixed assets ratio has a negative and significant impact on the return on assets and sustainable growth. However, the results

demonstrated that the interaction of relinquishing directors' riskiest directorships with the equity-to-fixed assets ratio, equity-to-assets ratio, and credit risk has a negative impact on the Z score.

4.2 Benchmarking Analysis

The CRITIC method, which is utilized for weight determination, is a robust technique that considers the correlation between criteria. The CRITIC method offers a comprehensive comprehension of the relationships and the significance of various criteria in the decision-making process through the analysis of their correlations. By operating the Eq (1-6), the result of the weight of all criteria is obtained. Table 7 shows the result.

Table 7
The final weight

Criteria	Final Weight
D/E	0.094
D/A	0.095
E/A	0.073
Current Ratio	0.080
Cash Ratio	0.093
E/F	0.083
C/F	0.097
Credit Risk	0.095
Investment Attractiveness	0.094
Board Financial Expertise	0.080
Relinquish Directors Riskiest Directorships	0.111

Table 7 presents the conclusive weights assigned to various criteria within the decision-making process. The weights provided herein serve as a representation of the relative significance assigned to each criterion and they have been derived through the utilization of the CRITIC method during the analysis process. The first column of the table enumerates each criterion, while the second column presents the respective final weights assigned to each criterion. The weights exhibit a range spanning from 0.073 to 0.111. The magnitude of the weight allocated to a criterion directly influences its relative significance within the decision-making process. The final weights are derived from the CRITIC method, which incorporates the inter-criteria correlation to assess the importance of each criterion. The methodology takes into account the potential interconnections and interrelationships among criteria, thereby yielding a more precise and all-encompassing evaluation of their significance. The utilization of these weights can assist decision-makers in establishment of priorities, allocation of resources, and informed decision-making processes by considering the relative significance of each criterion. The ultimate weight will be utilized in conjunction with RAFSI to determine the ultimate ranking.

On the other hand, the RAFSI technique, employed for ranking the alternatives, offers a systematic approach for assessing and choosing the alternatives based on their efficacy across the defined criteria. By using the Eq (7-14), the final rank will be obtained. Table 8 shows the final result.

Table 8
Benchmarking analysis

Alternatives	Scour	Rank	Alternatives	Scour	Rank
BMNS	1.471	13	BGUC	5.192	6
BIME	1.933	12	BKUI	0.969	14
BASH	3.125	9	BUND	3.767	7
BBAY	0.424	15	BMFI	7.821	3
BBOB	2.703	10	BNOI	2.363	11
BCIH	0.155	17	BNAI	6.283	5
BCOI	0.285	16	BNOR	0.120	19
BELF	3.485	8	BSUC	0.145	18
BIBI	18.045	2	BTRI	30.215	1
BIIB	6.309	4			

Table 8 presents the scores and rankings assigned to various alternatives within the decision-making process. The various options are presented in pairs, organized in a tabular format with two columns. The initial column denotes the various alternatives, whereas the subsequent column denotes the respective scores associated with each alternative. The ranks assigned to each alternative based on their scores are displayed in the third column. The assigned scores for the alternatives exhibit a range spanning from 0.120 to 30.215. The aforementioned scores indicate the assessment of each alternative in accordance with the designated criteria. Higher scores are indicative of superior performance or a more positive evaluation, whereas lower scores are indicative of inferior performance or a less favorable evaluation. The assigned ranks to the alternatives denote their relative position or priority, which is determined by their respective scores. The alternative that receives the highest score is designated as the 1st rank, denoting its superiority or topmost position among all the alternatives. The ranks are assigned in ascending order, whereby the alternative with the lowest score is assigned the highest rank. As an illustration, when examining the initial set of options, BMNS obtains a score of 1.471 and is designated the 13th rank, whereas BTRI achieves a score of 30.215 and is assigned the 1st rank. This implies that, based on the provided options, BGUC exhibits superior performance (as evidenced by its lower score) and holds a higher ranking compared to BMNS. Table 8 offers a comprehensive summary of the scores and rankings assigned to each alternative, enabling decision-makers to effectively compare and prioritize the alternatives according to their respective performance. Ranks serve as a valuable tool for decision-makers in discerning the most advantageous alternatives and making well-informed choices by considering their respective positions within the ranking.

It is imperative to promptly take action in order to effectively address concerns pertaining to the applicability of the findings. This can be achieved by engaging in the process of validation. Validation techniques, such as sensitivity analysis and Spearman's rank correlation, are frequently utilized in research to establish the credibility and applicability of findings [84]. The subsequent phase of this study involved conducting a sensitivity analysis, which aims to evaluate the influence of modifying the weights assigned to the criteria on the ultimate ranking. Through manipulation of the relative significance assigned to the assessment criteria, the researchers of this study conducted an analysis to evaluate the resilience of the proposed outcome. The aim of this study is to examine the impact of varying the relative significance of criteria on the ultimate rankings of banks.

The researchers initially identified the most pertinent criterion. According to the data presented in Table 7, the weighting of criteria was examined, leading to the determination that "Relinquish Directors Riskiest Directorships" emerged as the most significant factor to be taken into account. In accordance with prior investigations, the researchers augmented its weight by 0.5, consistent with

previous scholarly inquiries. Based on the analysis of 11 criteria, Figure 2 illustrates ten potential outcomes. The weights assigned to the remaining criteria were determined by utilizing the following formula.

$$w_n: (1 - w_{z1}) = w_n^*: (1 - w_{z1}^*) \quad (15)$$

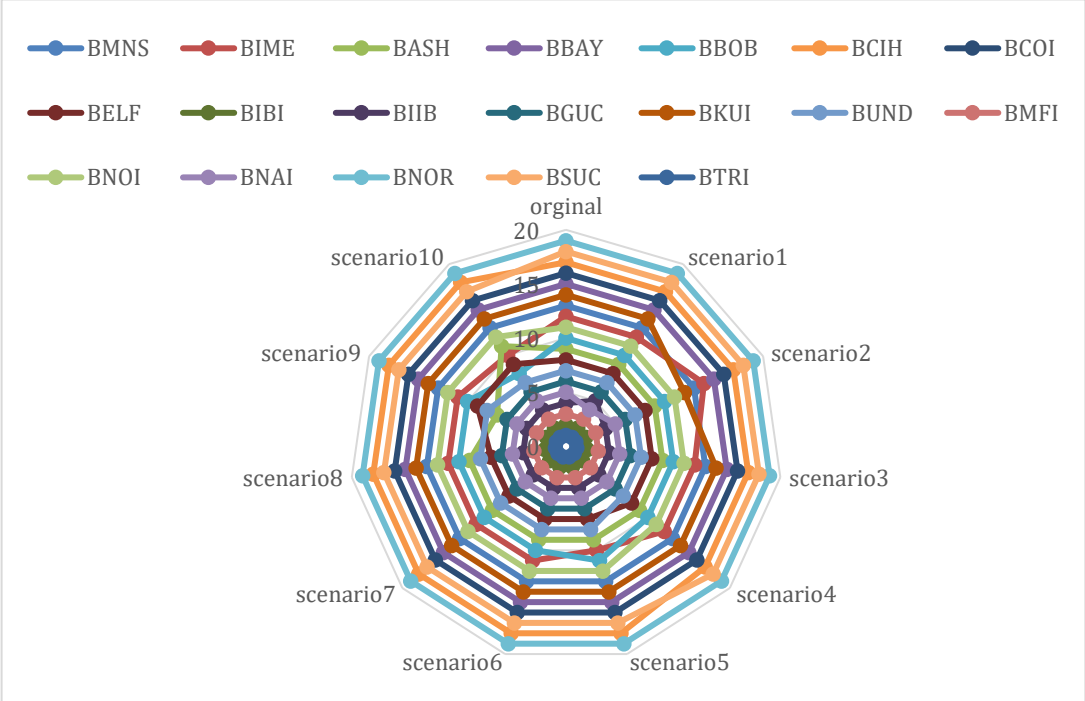

Fig. 2. Sensitivity analysis

Figure 2 illustrates the outcomes of the sensitivity analysis that was performed to assess the impact of altering the weights assigned to the criteria on the rankings of various alternatives. The analysis encompasses various scenarios, with each scenario being denoted by a separate column within the table. In the "original" column, the rankings are displayed based on the initial set of criteria weights. The rankings are presented in the following columns (scenario1 to scenario10), following the adjustment of weights based on various scenarios. The observation of the final rankings can be facilitated by conducting a comparison of the rankings in various scenarios, thereby enabling an assessment of the influence of altering the weights assigned to the criteria. The purpose of conducting a sensitivity analysis is to estimate the resilience and consistency of the rankings by investigating the impact of altering the weights on the relative standings of the alternatives. For example, in the second scenario, the weights have been modified in a manner distinct from the initial weights, leading to a modification in the rankings of certain alternatives. Table 8 facilitates a visual assessment of the rankings in different scenarios, thereby enabling researchers or decision-makers to comprehend the extent to which the rankings are induced by changes in the weights assigned to the criteria. The ultimate outcome reveals a minor alteration in the ultimate sequence, thereby indicating the efficacy of the weighting and ranking methodology employed [85].

In this study, the Spearman method is employed as the second method for validation in order to assess the correlation between the significance of pro and con factors. The relative significance of these factors is determined through the application of a specific equation, resulting in their ranking. The application of Spearman's rank correlation allows for the acquisition of valuable insights pertaining to the relative significance and impact of various factors being examined.

$$r_s = 1 - \frac{6\sum_i d_i^2}{n^3 - n} \quad (16)$$

For the ranking of banks, results are shown in Figure 3, where the lowest value was 97% and the highest value was 100%.

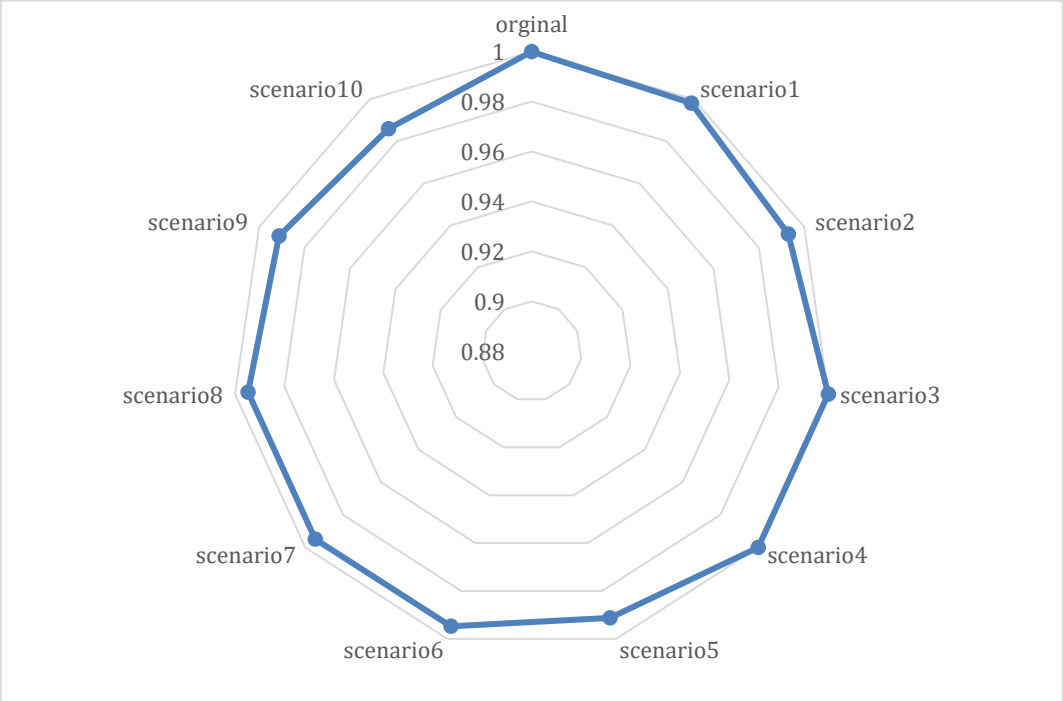

Fig. 3. Spearman's rank correlation

The study discovered that the association between financial risks and financial sustainability is moderated by assessing the financial expertise of the board and giving up directors' riskiest directorships. Additionally, the findings imply that investment risk does not significantly mediate the relationship between financial risk and financial sustainability. To reduce financial risks, particularly those related to liquidity and insolvency, high-level management of the banks should be kept on board during times of crisis. By reducing these risks, banks are better able to maintain a clear situation during crises. The results confirm that H2 and H3, and H4 are acceptable, indicating that investment attractiveness reduces financial sustainability and negatively affects board members' assignments. The attractiveness of investment also reduces financial sustainability by adversely affecting the directors' financial expertise.

This study contributes to developing policies to reduce financial distress while preserving profits to finance capital spending, adopting investment attractiveness to increase capital spending on new projects, and reducing risk by allocating more resources to the total investment activity and research and developing projects. Subsequently, the results confirm that H2 and H3 are supported, indicating that the financial risks reduce investment attractiveness, and investment attractiveness increases the level of financial sustainability. An excellent relation between financial sustainability and financial risks can be observed. Banks' financial sustainability is affected by credit risks caused by default in the repayment of loans, inadequate loan monitoring, and lack of financial sustainability awareness. Liquidity and financial solvency enhance control over periodic profits. This study revealed a dramatic increase in capital structure risk, liquidity risk, and insolvency risk during the pandemic because of the absence of appropriate investment strategies that eventually lead to the avoidance of the risk of bankruptcy. Hence, this study seeks to enable investors to make a broader assessment of private

banks' financial sustainability. Furthermore, this study encourages investors to make courageous decisions and allows banks to develop and formulate credit terms that enable banks to measure customers' financial position.

The use of MCDM methods to benchmark banks in terms of financial sustainability gave practitioners and academics an insight on the best firms and the banks with the most internal financial resources. Therefore, this study is considered as a guide for foreign investors in Iraq about the best, the safest, and the most financially sustainable banks. In addition, this study provides an insight for practitioners and policy makers in order to contract with the most sustainable banks, which are considered in the first place. The government can impose strict procedures and laws on banks that were the lowest in ranking based on financial sustainability in order to improve the sustainability of banks.

5. Conclusion

To fulfill the research gap, the researchers evaluated the financial sustainability of banks listed on Iraq's stock exchange and Iraq's financial market in order to explore the indirect influence of investment attractiveness on those banks' financial sustainability. A direct relation between financial risks and financial sustainability was discovered. The influence of investment attractiveness on financial sustainability was positively significant. Meanwhile, the relation between investment attractiveness and financial sustainability will be stronger when financial expertise is high and relinquish directors' riskiest directorships is low. This study aimed to examine financial sustainability by lowering financial risks. Therefore, it is feasible to assist banks in generating enough revenues to ensure their long-term viability. The outcomes explained a high link between financial risks and conditions and senior management's propensity to leave their positions. Senior management can anticipate financial hazards during prosperous times and make plans for them. Contrarily, while having extensive financial experience, their performance in forecasting risks during crises is low, forcing many to quit their positions. In times of ambiguity, it is crucial to have a high-level administrative framework [66, 86]. The findings of this study contained a necessary implication in terms of the financial sustainability of banks. There are fewer studies that consider financial risks and financial sustainability. The markets have become volatile because of the pandemic. This research examined whether the banks focus after and during crises on financial risks which affect financial sustainability by considering the investment attractiveness and high-level management rotation. The results showed that financial sustainability has a weak tendency during the recent pandemic because of the significant effects of the financial risks compared to 2008. The evidence also indicated that the increased number of changes of the high-level administrative structure during the 2020 crisis led to significant collapses in banks due to growing administrative costs, lack of expertise, and the desire of top-level management of companies to reduce finance especially liquidity insolvency risks. An increase in these risks will lead to a weakness in maintaining delicate situations in crises. The findings also showed that the high-level management structure, which deals with less valuable and stable finance sources, increases the stability of capital structure risks.

In summary, some recommendations for practitioners and policymakers are addressed. For policymakers, it is critical to consider supportive policies toward financial risk associated with health crises, differentiating from crises generated by economic triggers. The results of this study proved that the two crises were affecting financial risks differently. These policies implemented in periods of crises can reinforce the banks' financial sustainability. To practitioners, it is recommended to elaborate human resource strategies targeting the top-manager level in order to not lose experienced directors for passing through crises periods. Moreover, both policymakers and

practitioners need to consider recovery plans for future crises related to financial risks and not threaten the financial sustainability of banks. Lastly, the banks' board of directors need further training on how to deal with hazardous scenarios such as crisis. As a result, this study is an invaluable resource for scholars and practitioners in terms of offering guidelines and recommendations about financial stability in developing nations. The study's findings supported the notion that banks play a vital role in bolstering the world economy, particularly in developing nations with shaky economies like Iraq. These banks' businesses are greatly impacted by changes in the markets in which they compete. In this way, it is anticipated that the circumstances and macroeconomic environment in which banks operate will affect their ability to sustain their financial position. The recent study gave scholars and professionals insight into how financial risks affect the banking industry's ability to preserve its financial health. Furthermore, the study also determined the role of financial expertise and the investment attractiveness to robust sustainable growth and mitigate dependence on external sources of financing. In addition, the benchmark results identified banks with highly sustainable financial performance and banks with lowest financial sustainability. The weight of the criteria adopted for this study could represent interesting contributions for practitioners and academics. MCDM methods revealed that the relinquish directors' riskiest directorships and credit risk are considered the most impact factors on financial sustainability. Hence, banks may consider such factors to increase financial sustainability. Likewise, the ranking of banks from best to worst is a vital contribution in order to guide practitioners about dealing with the most secure and financially sustainable banks for the purpose of the success of projects and investments and the achievement of benefit and prosperity for the nation.

6. Avenues for Future Research

Like previous studies, this research has a few limitations. First, this study adopted a panel data approach. Hence, using a different method would enhance the contribution regarding financial sustainability in order to robust sustainable growth. Second, there are numerous aspects that affect the sustainability and financial performance in different sectors. Furthermore, investigating the effect of risk factors such as crisis proneness, decision-making, risk-taking, crisis knowledge, and crisis management in energy and industrial sectors will provide insightful implications and policy contributions to the practitioners in order to increase sustainable growth and achieve superior financial performance. Third, this study adopted the quantitative study method. However, the longitudinal study method can provide many insightful points for academics and practitioners to address financial problems in companies. Fourth, the issue of ambiguity and uncertainty in MCDM methods is sensitive. Addressing this issue is inevitable. Future literature can use neutrosophic trapezoidal fuzzy to expand MCDM methods. Fifth, this study classified banks based on financial sustainability, which relates to long-term internal financing. Moreover, classification of banks based on other contexts such as financial distress or financial performance is necessary using MCDM methods extended by fuzzy methods.

Author Contributions

Conceptualization, J.A. and K.N.H.; methodology, software, validation, writing—original draft preparation, A.A.; writing—review and editing, visualization, supervision, Y.R.M.; project administration, funding acquisition, A.G.A. All authors have agreed to the published edition of the paper.

Data Availability Statement

The data of the paper is available with the corresponding author based on request.

Conflicts of Interest

All the authors of this article declare presence of no mutual conflict of interests.

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