Journal of Shatt Al Arab University College for Administration and Legal Sciences

مجلة كلية شط العرب الجامعة للعلوم الادارية والقانونية

Vol. (4) No. (2) 2026 المجلد. (4) العدد. (2)

The role of banking governance in improving the financial performance of banks and the use of the artificial neural network (ANN) model / an applied study in Iraqi banks listed on the Iraq Stock Exchange

Prof. Dr. Jaber Hussein Ali Al-Mansoori
Sothern Technical University, Technical College of Management, Basra, Iraq
Jaber@stu.edu.iq

Asst. Lect. Zahraa Rajab Ali Al-Moussawi
Sothern Technical University, Technical College of Management, Basra, Iraq
zahraa.r.ali@stu.edu.iq

Abstract:

The aim of this study is to examine the impact of good bank governance on the financial performance of Iraqi financial companies. An analytical test was conducted on nine corporate governance indicators and eight financial performance indicators using the multiple regression methodology in the statistical program STATA and the Artificial Neural Network (ANN) model. The conclusions drawn from the test, which was conducted on 20 banks listed on the Iraq Stock Exchange for the period (2018-2022), indicate an influential relationship between governance indicators and financial performance. The results also confirmed that the ANN model enabled the ability to

identify nonlinear relationships between variables, which enhances the accuracy of prediction and sensitivity analysis. By understanding and distinguishing between the effects resulting from specific causes, the study demonstrates that the financial position of a bank can be improved by selecting the right corporate governance indicators and implementing sound practices. This study contributes to a comprehensive understanding of how governance impacts financial performance. The findings have implications for academics and policymakers' decisions about what can determine increased financial performance. It recommends the need to enhance governance indicators, particularly the most influential indicators, to improve banks' financial performance. It also highlights the importance of adopting artificial intelligence techniques, such as neural network models, for data analysis and strategic decision-making.

Keywords: Bank governance, financial performance, artificial neural network (ANN) model

1- Introduction:

Governance has emerged as a distinct and systematic field of study relatively recently in the academic literature. This field stands at the intersection of many areas of research, including accounting, finance, management, sociology, politics, microeconomics, and organizational economics, in addition to the general debate about governance requirements and the resulting regulatory changes, for example (the 1992 Cadbury Report, the 2002 Sarbanes-Oxley Act) (Pandey et al., 2023:128). Effective governance leads to efficient management of financial resources, while poor corporate decisions can negatively impact cash flows. Therefore, strong governance mechanisms will add value to the company and all stakeholders, facilitate access to finance, improve financial performance, and reduce the volatility of stock returns. Although the impact of

governance on corporate financial performance has been widely recognized in the existing literature (Naz et al., 2022:3), one factor that can form the basis for sound interaction between banks and customers is the need for banks to adhere to governance principles and their increasing sophistication. In recent years, we have witnessed significant changes in the establishment of governance systems within the financial structure of banks, a trend that has attracted significant attention from banks in developed countries in the past. Conversely, stakeholders and depositors have expressed interest in establishing a governance system in banks. Because governance and the absence of harmful associations can play a positive role in the optimal allocation of banking resources and the provision of means for economic prosperity (Zolfaghari et al., 2025:134), previous research has largely focused on the impact of governance on sustainable banking outcomes (Adu et al., 2024:2). Gold & Aifuwa (2022) noted that board meetings have an impact on bank sustainability reports and called for discussing sustainability-related issues in corporate board meetings. In the banking sector, there is a need for better governance disclosure to align the interests of managers and shareholders and reduce the agency problem. This will contribute to the link between governance and financial planning, as governance practices improve performance by increasing oversight and mitigating mismanagement (El Khoury et al., 2023:8). Given the critical importance of governance in the global economy, there are a number of gaps in the literature that will be addressed in the current study. From a theoretical perspective, the impact of governance on financial performance, although it has been widely explored in previous literature, has primarily focused on governance structures and traditional indicators that influence corporate financial performance. This study seeks to provide new insights through the use of accounting indicators of governance, through which corporate governance is studied and its importance is understood, as well as financial performance and the extent to which it is affected by governance. From a methodological perspective,

previous studies have achieved their results using traditional methods such as regression analysis. This gap will be addressed in our study using several statistical methods that contribute to capturing non-linear contributions, providing solutions for banks based on qualitative statistical methods, and providing solutions for industry and academics by predicting financial performance based on governance indicators using the artificial neural network (ANN) model. In this way, the gap in previous studies can be bridged, understanding the impact of bank governance on financial performance can be expanded, and the drivers influencing this relationship can be clarified.

More specifically, the primary objective of this study is to understand the relationship between bank governance and financial performance. The study aims to identify and evaluate the impact of governance (represented by nine indicators: board independence, board financial expertise, audit committees, risk management committees, foreign ownership, government ownership, management ownership, ownership concentration, and financial distress) on financial performance, measured by return on assets, return on equity, legal reserve ratio, earning power ratio, cash-to-total assets ratio, debt ratio, cash balance ratio, and equity multiplier.

The results of this study can contribute to understanding the relationship between governance indicators and financial performance, identifying the key factors that influence companies' financial success, and how to guide policies and make appropriate decisions to enhance and improve bank governance indicators and, consequently, improve their financial performance. It also contributes to guiding economic policies related to governance, which can impact the improvement of the economic and investment environment in Iraq. In general, studying the impact of bank governance on the financial performance of Iraqi banks is useful for understanding and improving corporate financial performance and enhancing the economic context in Iraq.

2- Study Methodology:

2-1 Study Problem:

In light of the economic changes and financial challenges facing banks, the practice of banking governance has become a key factor in enhancing financial performance and ensuring their sustainability. Banking governance is considered one of the foundations that helps improve transparency, enhance confidence in financial markets, and reduce risks. Therefore, the study problem focuses on the importance of the role of banking governance in improving financial performance. The study problem can be defined by the following question:

To what extent do banking governance indicators impact improving banks' financial performance?

From this question, the following sub-questions can be formulated:

1- What measures can be taken to enhance the role of banking governance in improving financial performance?

2- To what extent is banking governance implemented in the banks included in the research sample?

3- What is the percentage of contribution of banking governance indicators to improving financial performance?

2-2. Significance of the Study:

The importance of the study lies in the following:

1. It helps understand how banking governance indicators affect the sustainability of financial performance and strategic decision-making.

2. The study contributes to bridging the research gap by using the artificial neural

http://joshuc.edu.iq ISSN: 2079 -7486

network (ANN) model to analyze the relationship between banking governance and financial performance, a modern approach compared to traditional statistical methods.

3. The study tests the artificial neural network (ANN) model in accurately predicting bank financial performance based on banking governance indicators. This helps evaluate the effectiveness of this model in accounting and financial studies.

2-3 Study Objectives:

This study aims to demonstrate the importance of banking governance indicators in improving financial performance by achieving the following objectives:

1- Identifying banking governance indicators

2- Identifying the level of financial performance of the banks in the study sample for the years (2018-2022)

3- Analyzing the nature of the relationship between banking governance and financial performance using the Artificial Neural Network (ANN) model

4- Demonstrating the impact of the proper application of banking governance indicators on improving financial performance

2-4 Study Hypothesis:

Based on the problem, importance, and objectives of the study, the study hypotheses can be formulated as follows:

1- The first main hypothesis: There is a statistically significant impact of banking governance indicators on financial performance.

Several sub-hypotheses emerge from the second main hypothesis:

- There is a statistically significant impact of the independence of board members on financial performance.
- There is a statistically significant impact of the financial experience of board members

http://joshuc.edu.iq ISSN: 2079 -7486

on financial performance.

- There is a statistically significant impact of audit committees on financial performance.
- There is a statistically significant impact of risk management committees on financial performance.
- There is a statistically significant impact of government ownership on financial performance.
- There is a statistically significant impact of foreign ownership on financial performance.
- There is a statistically significant impact of managerial ownership on financial performance.
- There is a statistically significant impact of financial distress on financial performance.
- There is a statistically significant impact of ownership concentration on financial performance.

2- Second Main Hypothesis: The Artificial Neural Network (ANN) model can accurately predict bank financial performance based on banking governance indicators.

2-5 Measures of study variables:

Table (1): Measures of study variables

Banking governance	
Indicators	**References**
Board independence = total number of independent directors/total number of board members **Financial experience of the board of directors = number of board members with financial experience / total number of board members**	(Wahlen et al.,2015 :373) (Kyere&

http://joshuc.edu.iq ISSN: 2079 -7486

Audit committees (and measured as a dummy variable; if the bank has a committee, it is assigned 1; otherwise, it is 0). **Risk management committees (measured as a dummy variable; if the bank has a committee, it is assigned 1; otherwise, it is 0)** **Government ownership (measured by percentage of government ownership shares/total shares(** **Foreign ownership (measured by the percentage of foreign ownership shares/total shares)** **Administrative ownership (measured by the percentage of administrative ownership shares/total shares)** **Financial distress is measured based on Z-Score = 1.2 (Net working capital / Total assets) + 1.4(Retained earnings / Total assets)+3.3(Earnings before interest and taxes / Total assets) + 0.6 (Market value of equity / Book value for debt)+1.0(sales/total assets)** **Concentration of ownership (measured by the percentage owned by the five largest investors to the total shares)**	Ausloos, 2021:1872) (Ganesan et al., 2023:2-5) (Sadaa, 2023 :30-32)
Financial performance	
Indicators	**References**
Return on Equity = Net Income / Equity **Return on assets = net income / total assets** **Revenue power ratio = net income before interest and taxes / total assets**	(Ramadan, 2009 :71) (Mpofu ,

Cash balance ratio = (cash on hand + cash at the central bank + other liquid balances)/deposits **Legal reserve ratio = (balances with the central bank / deposits and the like)** **Ratio of cash to total assets = cash / total assets** **Debt ratio = total liabilities / total assets** **Equity multiplier = total assets / equity**	2019 :44) (El Ghonemy et al, 2023:5)

2-6 Study Methodology:

The study adopted the scientific approach, i.e., a mixed methodology that combines the theoretical aspect represented by the cognitive foundations of banking governance and financial performance, with the practical aspect to evaluate the impact of banking governance indicators on improving financial performance.

2-7 Study Limits:

1- **Spatial Limits:** Represented by a group of banks listed on the Iraq Stock Exchange.

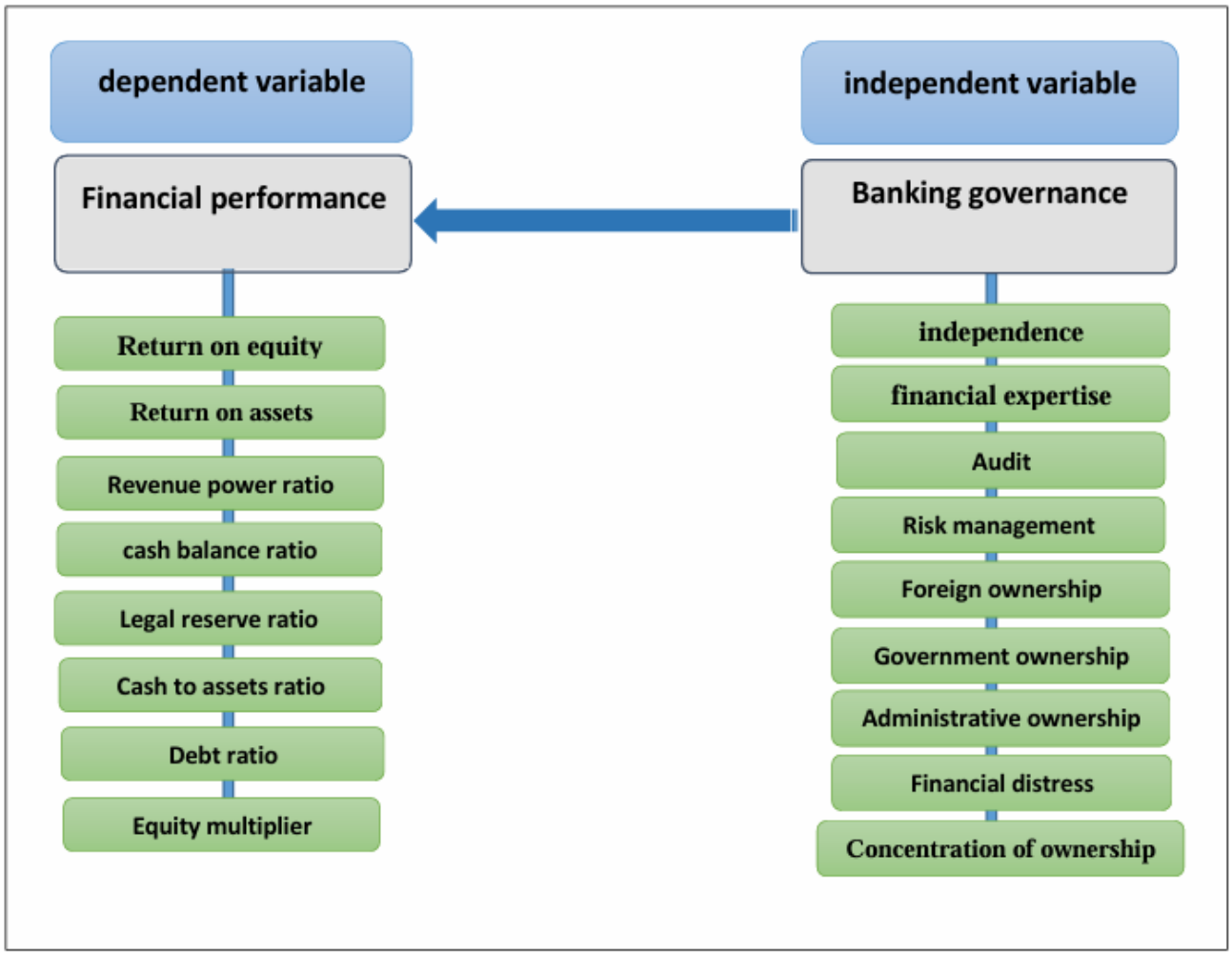
2- **Temporal Limits:** Represented by the financial statements of the study sample banks for the fiscal years (2018-2022).

2-8 Study Population and Sample:

The study population represents the banking sector listed on the Iraq Stock Exchange. The study sample consists of (20) banks within the regular market. This sample was selected based on a set of considerations, namely: the banks must be registered on the Iraq Stock Exchange and within the regular market, and their financial statements, supplementary explanations, audit committee reports, and board of directors reports must be available and approved during the study period.

2-9 Hypothetical Study Plan:

Figure (1): Hypothetical Study Plan



3- Theoretical Aspect:

3-1 Governance:

Good governance is a set of rules, regulations, and organizational structures that form the proper foundation for business operations. It can refer to a series of activities aimed at ensuring that companies adhere to specific regulations (Naciti et al., 2021:2). Pert Wirtz defined it as the set of mechanisms that ensure various owners receive a return on their investments, while preventing managers or major shareholders from acquiring an

http://joshuc.edu.iq ISSN: 2079 -7486

excessive portion of these benefits (Pert Wirtz, 2019:9). Teixeira & Carvalho believe that good governance includes a system of rules, processes, and practices through which management and leadership direct and monitor the company. This primarily involves balancing the interests of the organization's diverse stakeholders, such as government, society, shareholders, senior management, customers, and financiers (Teixeira & Carvalho, 2024:303). The primary goal is to maximize shareholder value over the long term while taking into account the interests of stakeholders. Thus, implementing good governance can improve the business environment and increase stakeholder confidence (Ben Fatma & Chouaibi, 2023:2). Over the past two decades, corporate governance has gained importance due to scandals (Worldcom, Satyam, Adelphia Communications, Enron), which were primarily attributed to weak corporate ethics (Effah et al., 2023:119). This has intensified the focus on the importance of strong governance practices to avoid these risks. Companies that follow well-defined governance practices are better able to manage effective mechanisms and oversight, provide more opportunities for prosperity, and have better access to resources, thus improving overall performance and reducing risks (Kijkasiwat et al., 2022:2). The goal is to shift the focus from achieving short-term financial goals to long-term, future-oriented business models and values-based approaches to corporate governance (Alkaraan et al., 2022: 8).

3-2 Financial performance:

Financial performance is viewed as a company's financial position over a specific period, including the collection and use of funds, measured by several indicators such as capital adequacy ratio, liquidity, leverage, solvency, and profitability (Fatihudin, 2018: 554). It also refers to a company's ability to manage and control its resources in an effort to achieve its goals (Isiaka, 2020: 65). Financial performance refers to the efficient use of resources during the production and consumption process, and demonstrates the relationship between output results and input resources (Nguyen et al., 2021: 304).

(Batrancea et al., 2022: 2) defines it as an assessment of a company's overall condition over a period of time, including financial information measured by several indicators such as profitability, liquidity, and cost-effectiveness. (Elhenawey et al., 2023: 32) defines it as the company's revenues recorded in an accounting record based on measuring operations related to the financial framework over a specific period of time. It is compared to other similar companies. The primary goal of companies is to maximize profits, protect the interests of shareholders, and care for all stakeholders. Companies with good financial performance are viewed as more sustainable and stable in the long term, and therefore less risky (Coelho et al., 2023: 1541).

3-3 The Relationship Between Bank Governance and Financial Performance:

Governance impacts a company's financial performance. Studies indicate that the Board of Directors' Index is an important element of governance. Banks are keen to increase the number of competent board members to enhance the company's profitability and enable prompt, rational, and effective decision-making. Furthermore, the independence of the board of directors can enhance financial performance. The more the audit committee strictly controls fraud, the bank's profits automatically improve. Financial performance is negatively impacted if the audit committee is incompetent (Huynh et al., 2022: 3-4). Banks with an independent board of directors have a positive impact on the company's share price and financial performance. The audit committee's role is to ensure that the company's financial reports are fair and consistent with governance standards. It also impacts the quality of accounting performance metrics. Furthermore, dual CEOs lead to superior financial performance for the bank, as they allow for clear leadership direction (Kyere & Ausloos, 2021: 1875). Boachie (2023) concluded that audit independence, dual CEO and non-executive directors, and bank size

have a positive impact on performance. The results also revealed that foreign ownership has an impact on profitability. Governance mechanisms, particularly board composition, can impact a bank's financial performance. Large boards of directors are characterized by diversity in experience, skills, and ideas, and provide opportunities for networking and access to resources, which leads to improved financial performance for banks (Ben Fatma & Chouaibi, 2023: 2). Factors such as board size and independence can play a role in the relationship between ownership structure and financial performance. Good corporate governance practices help board members manage financial and operational issues more effectively (Teixeira & Carvalho, 2023:3). Good governance attracts investors and encourages their investment, improves shareholder welfare, and ensures stakeholder confidence and protection. Governance improves financial performance. Higher levels of investor investment lead to improved management oversight, which in turn impacts the bank's financial performance (Pamungkas et al., 2023:94). Governance mechanisms recognize the interests of stakeholders and their role in contributing to the long-term success of the company. Governance seeks to build an environment of trust, transparency, and accountability necessary to promote long-term investment, business integrity, and financial stability (Alkaraan et al., 2022;12). The internal and external mechanisms that governance seeks to deploy to protect the rights of capital providers and stakeholders are intended to create value for the company and improve its performance. Financial performance is a key indicator of a company's operational achievements, as financial indicators can help examine a company's financial condition. Performance measurement is the most specific measure of operational results, and financial indicators can reflect the achievement of a company's economic objectives (Lo & Liao, 2021: 2, 4).

4- Practical Aspect:

4-1 Testing the First Hypothesis

In order to test the first hypothesis (there is a statistically significant influence of banking governance indicators on financial performance), a multiple linear regression model was used to identify the indicators that influence financial performance. The results of the regression analysis, shown in the following eight tables, reveal the influence of banking governance indicators (board of directors' independence, board members' financial experience, audit committees, risk management committees, foreign ownership, government ownership, management ownership, ownership concentration, and financial distress) on financial performance indicators, as shown in the following table:

Table (2): Results of the linear regression analysis of the influence of banking governance indicators on the return on equity index.

Return on equity	Coef.	t-value	St.Err.	p-value	Sig
Board members' independence	.034	3.350	.025	.018	***
Board members' financial expertise	.031	2.310	.013	.023	**
Audit	.123	4.241	.029	.000	***
Risk management	.532	15.200	.035	.000	***
Foreign ownership	.043	3.070	.014	.003	***
Government ownership	.029	3.050	.019	.003	***
Administrative ownership	.039	2.720	.014	.008	***
Financial distress	.001	4.530	.002	.006	***
Concentration of ownership	.046	4.640	.028	.003	***
Constant	.013	2.040	.036	.005	**

Table (3): Results of linear regression analysis of the relationship between the impact of banking governance indicators on the return on assets index.

Return on assets	Coef.	t-value	St.Err.	p-value	Sig
Board members' independence	-.005	-.550	.010	.587	
Board members' financial expertise	.014	2.620	.005	.001	**
Audit	.234	45.800	.005	.000	***
Risk management	.677	16.925	.040	.000	***
Foreign ownership	.001	.190	.005	.846	
Government ownership	-.011	-1.420	.008	.158	
Administrative ownership	-.002	-.310	.006	.757	

Financial distress	.001	.930	.001	.353	
Concentration of ownership	.027	2.440	.011	.007	**
Constant	.014	1.030	.014	.306	

Table (4): Results of linear regression analysis of the relationship between the impact of banking governance indicators on the revenue power ratio index.

Revenue power ratio	Coef.	t-value	St.Err.	p-value	Sig
Board members' independence	-.014	-1.180	.012	.243	
Board members' financial expertise	.019	3.010	.006	.003	***
Audit	.129	4.161	.031	.000	***
Risk management	.225	11.250	.020	.003	***
Foreign ownership	-.003	-0.430	.006	.668	
Government ownership	-.017	-1.920	.009	.008	*
Administrative ownership	-.005	-0.760	.007	.448	
Financial distress	.001	1.130	.001	.261	
Concentration of ownership	.041	3.140	.013	.002	***
Constant	.020	1.200	.017	.235	

Table (5): Results of linear regression analysis of the relationship between the impact of banking governance indicators on the cash balance ratio index.

cash balance ratio	Coef.	t-value	St.Err.	p-value	Sig
Board members' independence	.532	2.210	68.656	.003	**
Board members' financial expertise	-.900	-2.830	36.345	.006	***
Audit	.138	6.571	.021	.000	***
Risk management	.256	9.481	.027	.000	***
Foreign ownership	-.013	-1.000	38.165	.322	
Government ownership	-.544	-0.930	53.400	.356	
Administrative ownership	.879	2.600	39.777	.005	***
Financial distress	.216	0.290	4.160	.771	
Concentration of ownership	.123	0.500	77.631	.006	***
Constant	-.785	-0.600	98.009	.550	

Table (6): Results of linear regression analysis of the relationship between the impact of banking governance indicators on the legal reserve ratio index.

Legal reserve ratio	Coef.	t-value	St.Err.	p-value	Sig
Board members' independence	.954	2.060	59.803	.043	**
Board members' financial	-.009	2.810	31.659	.006	***

expertise					
Audit	**.394**	**7.576**	**.052**	**.000**	***
Risk management	**.475**	**10.555**	**.045**	**.000**	***
Foreign ownership	**-.847**	**-1.050**	**33.244**	**.297**	
Government ownership	**-.287**	**-.740**	**46.514**	**.463**	
Administrative ownership	**.534**	**4.530**	**34.648**	**.004**	***
Financial distress	**.137**	**4.310**	**3.624**	**.004**	***
Concentration of ownership	**.235**	**.740**	**67.621**	**.460**	
Constant	**-.578**	**-.590**	**85.372**	**.555**	

Table (7): Results of linear regression analysis of the relationship between the impact of banking governance indicators on the cash-to-assets ratio index.

Cash to assets ratio	Coef.	t-value	St.Err.	p-value	Sig
Board members' independence	**.036**	**2.150**	**.233**	**.008**	***
Board members' financial expertise	**.070**	**2.570**	**.123**	**.002**	***
Audit	**.432**	**9.000**	**.048**	**.002**	***
Risk management	**.321**	**6.056**	**.053**	**.002**	***
Foreign ownership	**.101**	**3.780**	**.129**	**.009**	***
Government ownership	**-.204**	**-1.130**	**.181**	**.003**	***
Administrative ownership	**.199**	**5.480**	**.135**	**.004**	***
Financial distress	**.017**	**6.230**	**.014**	**.221**	
Concentration of ownership	**-.479**	**2.820**	**.263**	**.002**	*
Constant	**.599**	**2.800**	**.332**	**.005**	*

Table (8): Results of linear regression analysis of the relationship between the impact of banking governance indicators on the debt ratio index.

Debt ratio	Coef.	t-value	St.Err.	p-value	Sig
Board members' independence	**-.100**	**-.740**	**.135**	**.462**	
Board members' financial expertise	**-.047**	**-.660**	**.072**	**.509**	
Audit	**.397**	**4.092**	**.097**	**.000**	***
Risk management	**.323**	**14.681**	**.022**	**.000**	***
Foreign ownership	**.341**	**4.540**	**.075**	**.000**	***
Government ownership	**-.062**	**-.590**	**.105**	**.560**	
Administrative ownership	**-.106**	**-1.360**	**.078**	**.179**	
Concentration of ownership	**-.303**	**-1.980**	**.153**	**.001**	*
Financial distress	**-.081**	**9.820**	**.008**	**.000**	***
Constant	**.908**	**4.700**	**.193**	**.000**	***

Table (9): Results of linear regression analysis of the relationship between the impact of banking governance indicators on the equity added index.

Equity multiplier	Coef.	t-value	St.Err.	p-value	Sig
Board members' independence	-.872	3.820	1.061	.004	***
Board members' financial expertise	-.093	3.160	.562	.009	***
Audit	.345	5.750	.060	.000	***
Risk management	.189	4.846	.039	.000	***
Foreign ownership	.648	4.490	.590	.000	***
Government ownership	-.577	4.910	.825	.009	*
Administrative ownership	-.464	2.380	.615	.009	**
Financial distress	-.301	4.680	.064	.000	***
Concentration of ownership	-.754	-.630	1.200	.531	
Constant	.878	2.560	1.515	.000	**

It is noted through the results of the linear regression that there is a direct effect with statistical significance of the independence of the members of the board of directors on the return on equity, as the regression coefficient reached (0.034) and the probability value (P-value = 0.018) is less than 5%. This indicates that banks with independent boards of directors achieve a higher return, which may be a result of management monitoring and improving corporate governance. Through the regression coefficient of the financial experience index of the members of the board of directors, which amounted to (0.031) and (P-value = 0.023), it is clear that there is a statistically significant relationship between the return on equity and financial experience. This may be because banks are able to make the best financial decisions and manage their cash flows efficiently. It is also noted that there is a high direct effect with statistical significance for the index of audit committees and risk management committees on the return. This may be because the presence of these committees reduces the possibility of errors and manipulation in the financial accounts, enhances the accuracy of recorded profits, and increases investors' confidence in the company's ability to achieve profits, which

increases the company's reputation and evaluation in the market, which affects The return on equity has a positive effect, and the regression coefficient for government ownership reached (0.029) and the probability value (P-value = 0.003) is less than 5%, and indicates that any increase in the percentage of government ownership leads to an increase in the return, and this may be due to government support and financial stability enjoyed by banks. As for foreign ownership, it appears that it has a direct and significant effect on the return on equity with a regression coefficient of (0.034) and a probability value of (0.003). There is also a statistically significant direct effect relationship for administrative ownership on the return on equity with a regression coefficient of (0.039) and (P-value = 0.006). This effect may be due to the fact that managers who own large percentages are more accountable for their performance, which leads to improved decisions, as well as their monitoring of management and ensuring the use of assets for the benefit of all shareholders. There is a direct and significant effect relationship for financial distress on the return on equity, as the probability value reached (0.006) and a regression coefficient of (0.006). (0.001), and the regression coefficient for the ownership concentration variable reached (0.046), which indicates that every increase in the ownership concentration by (1%) leads to an increase in the return on equity by (0.046), and the probability value (p-value) reached (0.003), which is less than the statistical significance level of (5%). Based on this, it can be concluded that there is a direct effect relationship between ownership concentration and return on equity, which means that banks that have a higher ownership concentration tend to achieve a higher return on equity.

The revenue power ratio is affected by several indicators. It is noted that the indicators (financial expertise, audit committees, risk management committees, and ownership concentration) have a direct and statistically significant effect on the revenue power ratio of banks, with a regression coefficient of (0.019, 0.129, 0.225, 0.041)

respectively, and a probability value less than 5%. Financial expertise, audit committees, and risk management contribute to improving liquidity management, which allows for the effective allocation of resources. This leads to achieving more sustainable revenues, in addition to increasing the revenue power ratio. It is evident from the regression coefficient for government ownership (-0.017) and (P-value = 0.008) that there is an inverse and statistically significant effect on the revenue power ratio, as an increase in government ownership by (1%) leads to a decrease in the revenue power ratio by (1.7%).

The regression results indicate that the regression coefficient for the independence of board members reached (0.532) and (P-value = 0.003), which means that there is a statistically significant direct effect relationship on the cash balance ratio. The audit committees appeared with a regression coefficient of (0.138) and the probability value equals zero. This indicates the existence of a statistically significant direct effect relationship for audit committees on the cash balance ratio, as well as the existence of a direct effect relationship for the risk management committees indicator on the cash balance ratio, as risk management helps in identifying and mitigating various risks that affect liquidity, such as the unexpected increase in expenses, and thus it contributes to maintaining sufficient cash that meets the needs of the bank. The regression coefficient for administrative ownership is (0.879) and the probability value was (0.005), which indicates the existence of a statistically significant direct effect relationship for administrative ownership on the cash balance ratio. This means that banks in which board members own high percentages It achieved a higher cash balance, and the regression coefficient for ownership concentration reached (0.123) and (P-value=0.006), which means the existence of a statistically significant direct influence relationship. As for the corporate governance indicators that have an inverse influence relationship on the cash balance ratio, it is the financial experience indicator of the members of the board of directors, as it had a regression coefficient of (-0.900) and the probability value (P-

value=0.006), which is less than (5%), which means the existence of an inverse influence relationship with statistical significance on the cash balance ratio.

The results showed that the regression coefficient of the independence of the board members was (0.954) and the probability value was (0.043), which is less than the specified statistical significance level (5%). This indicates that there is a direct influence relationship on the legal reserve ratio. The probability value of the financial experience of the board members was (0.006) with a regression coefficient of (-0.009), which means that there is an inverse influence relationship with statistical significance, i.e. the lower the financial experience of the board members, the higher the legal reserve ratio. Meanwhile, the results indicate that (audit committees and risk management committees) appeared with a regression coefficient of (0.394 and 0.475) respectively and a probability value equal to zero, which indicates the existence of a direct influence relationship with strong statistical significance for them on the legal reserve ratio. As for (administrative ownership and financial distress), the results show that there is a direct influence relationship with statistical significance, as their probability value was (0.004 and 0.004) with a regression coefficient of (0.534 and 0.137) respectively, which means that any increase in administrative ownership or financial distress of banks leads to an increase in the legal reserve ratio, while government ownership, foreign ownership and ownership concentration have a statistically insignificant effect on the legal reserve ratio.

It is noted from the analysis results that the governance indicators that have an impact and are statistically significant (p-value < 0.05) on the cash-to-assets ratio are the independence of the board members, as it appeared with a regression coefficient of (0.036) and a probability value of (0.008). This indicates the existence of a direct impact relationship with statistical significance, i.e. banks that have more independent members maintain higher cash-to-assets ratios. It also appears that there is a direct impact relationship with statistical significance for the financial experience of the board

members on the cash-to-assets ratio with a regression coefficient of (0.07) and (p-value = 0.002). This indicates that any increase in the financial experience of the board members leads to an increase in the cash-to-assets ratio. It is also noted that there is a direct impact relationship with statistical significance for the indicators (audit committees, risk management committees, foreign ownership, and administrative ownership) with a regression coefficient of (0.432, 0.321, 0.101). 0.199) with a probability value of (0.002, 0.002, 0.009, 0.004) respectively, while the government ownership had a regression coefficient of (-0.204) and (P-value=0.003), which indicates the presence of a significant inverse effect relationship, meaning that a decrease in the cash to assets ratio may be a result of the increase in shares owned by the government. Also, the ownership concentration has a negative statistically significant effect on the dependent variable with a regression coefficient of (-0.479) and (P-value=0.002), which indicates that an increase in the ownership concentration by 1% leads to a decrease in the cash to assets ratio by (0.479), which is a statistically significant effect.

Table (30) shows that the indicators (audit committees, risk management committees, foreign ownership, financial distress, and ownership concentration) are statistically significant (p-value < 0.05), as the regression coefficient for audit committees reached (0.397), risk management committees (0.323), and foreign ownership regression coefficient (0.341), and the probability value for these three indicators is zero. This indicates the existence of a statistically significant direct effect relationship, meaning that the increase in the debt ratio is a result of the increase in the percentage of foreign ownership of bank shares. Also, the presence of audit and risk management committees has an important role in managing the debt ratio, as they help banks use debt in an effective and intelligent way, which leads to increased profitability and achieving growth without being exposed to great risks. The regression coefficient for financial distress reached (-0.081) and (P-value = 0), indicating the existence of a statistically significant

inverse effect relationship for financial distress on the debt ratio. This This means that banks that suffer from financial distress reduce their reliance on debts, in order to reduce financial risks, as well as the variable of ownership concentration, as it is noted through its regression coefficient, which reached (-0.303) and its probability value (P-value = 0.001), that there is a statistically significant inverse effect on the debt ratio.

The variance in the equity multiplier can be explained through the analysis results, as most of the governance indicators were statistically significant except for (ownership concentration), which did not have a statistically significant effect, meaning it cannot be relied upon to explain the potential change in the equity multiplier. The regression coefficient of the independence of board members and financial experience had a negative value and the probability value was less than 5%, which means that there is a significant inverse effect relationship between them on the equity multiplier. The regression coefficient of (audit committees and risk management) reached (0.345 and 0.189) and (P-value = 0), indicating the presence of a statistically significant direct effect relationship for these committees on the equity multiplier ratio, which means that the presence of committees contributes to managing equity and debt in a way that supports financial growth, and banks become more capable of using debt efficiently while reducing the risks associated with it, which leads to an increase in the equity multiplier. The regression coefficient of (government ownership, administrative ownership, and financial distress) reached (-0.577, -0.464, -0.301) respectively and the probability value reached (0.009, 0.009, 0.000) respectively, and this indicates that these variables have a statistically significant inverse effect on the equity multiplier, and this means that the presence of a decrease in the equity multiplier may be a result of an increase in the ownership of the government or members of the board of directors of bank shares or the presence of financial distress in the banks, while the regression coefficient of foreign ownership was (0.648) and (P-value = 0), and this indicates the presence of a statistically

significant direct effect relationship on the equity multiplier, and through the results of the analysis, the researcher concludes that:

- There is a statistically significant effect of board members' independence on financial performance.
- There is a statistically significant effect of board members' financial expertise on financial performance.
- There is a statistically significant effect of audit committees on financial performance.
- There is a statistically significant effect of risk management committees on financial performance.
- There is a statistically significant effect of government ownership on financial performance.
- There is a statistically significant effect of foreign ownership on financial performance.
- There is a statistically significant effect of managerial ownership on financial performance.
- There is a statistically significant effect of financial distress on financial performance.
- There is a statistically significant effect of ownership concentration on financial performance.

4-2 Testing the second hypothesis

Artificial neural networks (ANNs) can detect linear and nonlinear relationships using a non-compensatory model (Khaw et al., 2022). While regression analysis was used to identify causal and linear relationships, we used ANNs to predict the importance of banking governance indicators to financial performance based on non-linear and non-compensatory relationships. An ANN is a massively parallel processor consisting of very simple processing units that have a neural propensity to store and make knowledge available for use. In ANNs, like the human brain, knowledge retrieved through learning processes is stored in internal neurons as synaptic weights. To implement the ANN

method, we applied forward-back-propagation neural networks (FBNs) and multi-layer neural networks (Figure 2). Multi-layer neural networks comprise three layers (input, hidden, and output). Each layer includes neurons interconnected with neurons from another layer. Based on FBNs, a signal is fed forward from the input layer to the output layer. Each neuron calculates its output based on the amount of energy obtained from a given input vector (x). The weights connecting the input component (i) to the hidden neuron (j) are represented by Wji, while the weights connecting the hidden neuron to the output neuron (k) are represented by Vkj as simplified in Equations (1) and (2) (Alnoor et al., 2022)

$$net_j^h = \sum_{i=1}^{N} Wji\ x_i \ and\ Y_i = f\ (net_j^h) \qquad (1)$$

For the resulting neuron k-th,

$$net_k^0 = \sum_{j=1}^{J+1} V_{kj} y_j \ and\ o_k = f\ (net_k^0). \qquad (2)$$

The typical sigma function in Equation (3) with a parameter (π) is used to manipulate the gradient of the function, which ranges from 0 to 1 and is monotonically differentiable. In the learning process, for a given input pattern, an output (ok) is generated by the network, which is matched to the desired response of each neuron (dk). Additionally, the weights are modified to avoid or minimize errors, and the next pattern is redirected. The weight adjustment formula for the output layer weights (V) is calculated using Equation (4), while the hidden layer weights (W) are calculated using Equation (5), where dpk denotes the desired output of neuron k and opk denotes the actual output of neuron k for input pattern p (Khaw et al., 2022). Furthermore, the weights are continuously varied in this manner until the sum of squared errors (SSE) across all training patterns is minimized below a predefined tolerance level in Equation (6).

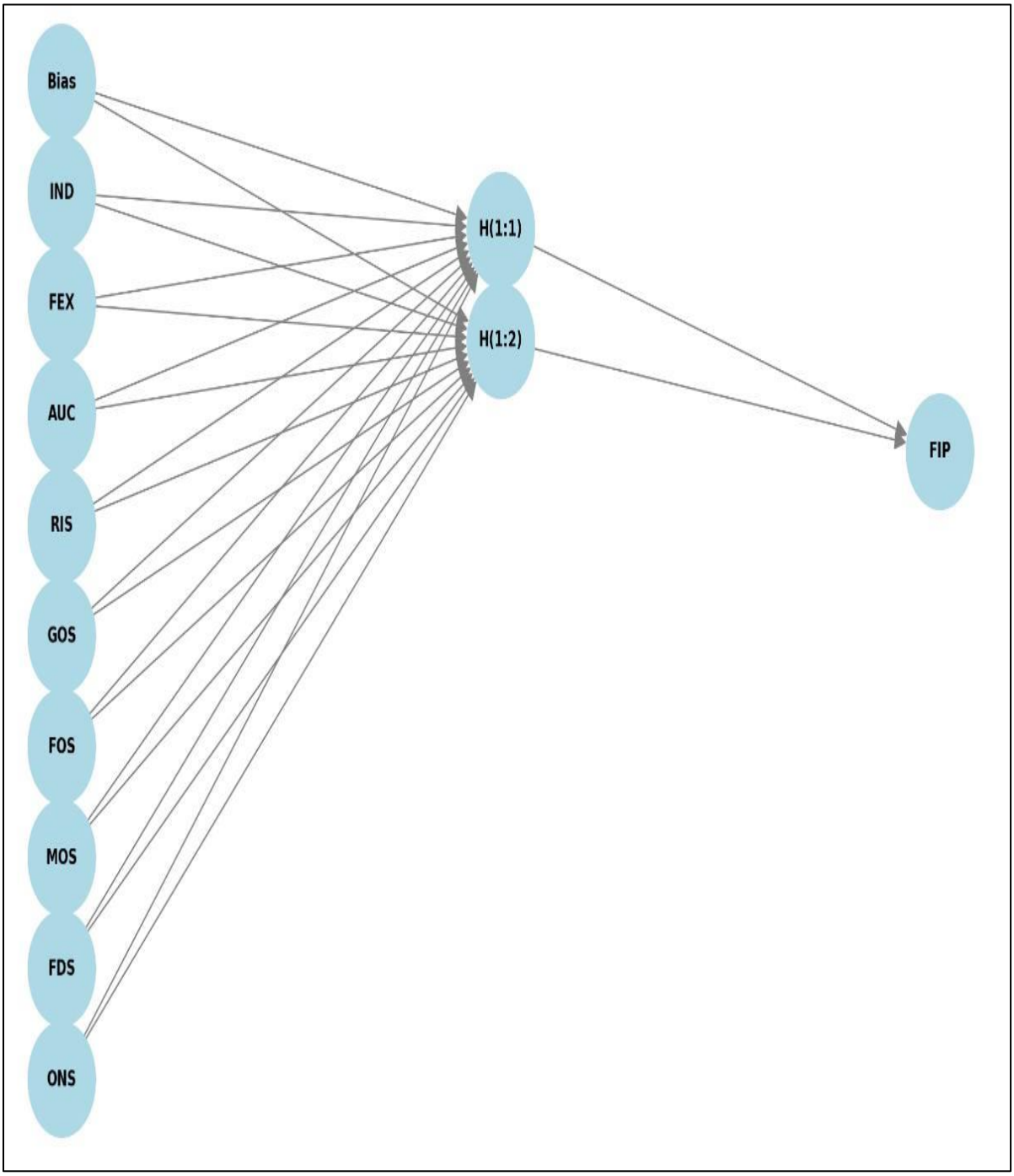
$$f\ (net) = \frac{1}{1+e^{-\lambda net}} \quad (3)$$

$$V_{kj}(t+1) = v_{kj}(t) + c\lambda(d_k - o_k)o_k(1-o_k)y_i(t) \quad (4)$$

$$W_{ji}(t+1) = W_{ji}(t) + c\lambda^2\, y_j(1-y_j)x_i\,(t)\left(\sum_{k=1}^{k}(d_k - o_k)o_k(1-o_k)V_{kj}\right) \quad (5)$$

$$SSE = \frac{1}{2P}\sum_{p=1}^{p}\sum_{k=1}^{k}(d_{pk} - o_{pk})^2 \quad (6)$$

Figure (2): Artificial Neural Network (ANN) architecture



Note: Board Independence (IND), Board Member Financial Expertise (FEX), Audit Committees (AUC), Risk Management Committees (RIS), Government Ownership (GOS), Foreign Ownership (FOS), Management Ownership (MOS), Financial Distress (FDS), Ownership Concentration (ONS).

ANN analysis captures both linear and nonlinear relationships by providing

superior prediction accuracy compared to linear models. However, the black-box functionality of the ANN method is not suitable for hypothesis testing. Therefore, to complement the advantages of both regression analysis and ANN, two-stage regression and ANN were used. To this end, sigmoid functions were used as activation functions for the hidden and output layers. In addition, the number of hidden neurons was automatically calculated using the IBM SPSS neural network algorithm. We used tenfold ANN analysis to avoid the potential problem of overfitting 10% of the data used for testing and the remaining data used for training. Variables were filtered, and variables not supported by the path test were excluded.

Table (10): Forecasting Accuracy

Neural Network	Input neurons: Banking Governance Indicators Output nodes: Financial performance						Total
	Training			Testing			
	N	SSE	RMSE	N	SSE	RMSE	
1	88	43.363	0.997	12	0.251	0.611	100
2	94	41.971	0.903	6	0.062	0.554	100
3	92	43.449	0.955	8	0.403	0.683	100
4	85	37.288	0.888	15	2.136	0.623	100
5	92	43.598	0.958	8	0.567	0.575	100
6	90	73.447	0.650	10	189.072	0.920	100
7	87	39.297	0.883	13	0.066	0.648	100
8	90	47.686	0.109	10	0.273	0.550	100
9	87	7.169	0.165	13	5.232	0.207	100
10	88	45.655	0.495	12	1.901	0.225	100
Mean		42.292	0.700		19.996	0.560	
SD		15.927	0.335		59.429	0.210	

The prediction accuracy of the ANN model was measured using the root mean square error (RMSE). As shown in Table (10), the average RMSE values for training and testing were 0.700 and 0.560, respectively. The small and similar average RMSE values demonstrate that our ANN method can predict with high prediction accuracy. The importance of the predictors was confirmed by the amount of non-zero synaptic weights

associated with the hidden neurons. This indicates that the model performed well, and the higher RMSE in training compared to testing indicates the model's ability to generalize.

Table (11): Sensitivity Analysis

The contribution of banking governance indicators to financial performance									ANN
Ownership Concentration	Financial Distress	Management Ownership	Foreign Ownership	Government Ownership	Risk	Auditing	Financial Expertise	Independence	
0.136	0.116	0.076	0.035	0.052	0.046	0.030	0.032	0.042	1
0.050	0.120	0.069	0.051	0.053	0.067	0.073	0.173	0.092	2
0.009	0.029	0.087	0.090	0.060	0.084	0.081	0.084	0.049	3
0.087	0.136	0.053	0.066	0.024	0.078	0.089	0.048	0.054	4
0.112	0.048	0.008	0.140	0.055	0.077	0.078	0.055	0.048	5
0.064	0.064	0.046	0.071	0.063	0.095	0.067	0.069	0.145	6
0.037	0.088	0.011	0.031	0.059	0.041	0.086	0.054	0.068	7
0.084	0.086	0.067	0.030	0.037	0.041	0.052	0.111	0.060	8
0.072	0.166	0.040	0.073	0.049	0.078	0.058	0.040	0.081	9
0.082	0.070	0.083	0.039	0.037	0.042	0.048	0.091	0.087	10
0.073	**0.148**	**0.052**	**0.028**	**0.065**	**0.068**	**0.060**	**0.018**	**0.083**	**Importance**
49.5%	**100.0%**	**35.0%**	**19.2%**	**43.9%**	**45.6%**	**40.7%**	**12.4%**	**56.0%**	**Percentage**

Sensitivity analysis was used to assess the contribution of each indicator to improving financial performance. The normalized importance was calculated according to the percentage based on the relative importance portion of each section of the input neurons to examine the greatest relative importance of the financial performance model. In Table (11), the results reveal that financial performance is primarily related to financial distress, followed by board member independence, ownership concentration, risk

management committees, government ownership, audit committees, management ownership, foreign ownership, and financial expertise.

Conclusions:

1. Good governance contributes to enhancing transparency and financial disclosure, achieving efficient resource use, and reducing corruption through the presence of audit committees and risk management committees. This is reflected positively in improving financial performance.

2. There is a statistically significant impact of banking governance indicators on banks' financial performance.

3. The artificial neural network (ANN) model is distinguished by its ability to predict financial performance based on governance indicators, making it an effective tool that can be used to guide future strategic decisions.

4. The artificial neural network (ANN) model demonstrated great accuracy in analyzing the relationship between banking governance indicators and financial performance, identifying trends and patterns that are difficult to detect using traditional methods.

Recommendations:

1. Banks should work to improve governance practices by adhering to international standards that stipulate the activation of the role of governance and audit committees and increasing transparency in financial reporting.

2. It is recommended to use artificial neural network models as a primary analytical tool to assess the relationship between banking governance and financial performance, given their ability to provide accurate predictions and handle complex data.

3. Banks should train their employees on how to design and use AI technologies and analyze the results to maximize their benefits in financial decision-making.

4. It is recommended that future research be expanded to include advanced AI

technologies and tested across different industries and sectors to gain a deeper understanding of the impact of governance.

References

1. Adu, D. A., Abedin, M. Z., Saa, V. Y., & Boateng, F. (2024). Bank sustainability, climate change initiatives and financial performance: The role of corporate governance. International Review of Financial Analysis, 95, 103438.
2. Alkaraan, F., Albitar, K., Hussainey, K., & Venkatesh, V. G. (2022). Corporate transformation toward Industry 4.0 and financial performance: The influence of environmental, social, and governance (ESG). Technological Forecasting and Social Change, 175, 121423.
3. Alnoor, A., Al-Abrrow, H., Al Halbusi, H., Khaw, K. W., Chew, X., Al-Maatoq, M., & Alharbi, R. K. (2022). Uncovering the antecedents of trust in social commerce: an application of the non-linear artificial neural network approach. Competitiveness Review: An International Business Journal, 32(3), 492-523.
4. Batrancea, L. M., Nichita, A., & Cocis, A. D. (2022). Financial performance and sustainable corporate reputation: Empirical evidence from the airline business. Sustainability, 14(20), 13567.
5. Ben Fatma, H., & Chouaibi, J. (2023). Corporate governance and firm value: a study on European financial institutions . International Journal of Productivity and Performance Management, 72(5), 1392-1418.
6. Boachie, C. (2023). Corporate governance and financial performance of banks in Ghana: the moderating role of ownership structure. International Journal of Emerging Markets, 18(3), 607-632.

7. Coelho, R., Jayantilal, S., & Ferreira, J. J. (2023). The impact of social responsibility on corporate financial performance: A systematic literature review. Corporate Social Responsibility and Environmental Management.
8. Effah, N. A. A., Asiedu, M., & Otchere, O. A. S. (2023). Improvements or deteriorations? A bibliometric analysis of corporate governance and disclosure research (1990–2020). Journal of Business and Socio-Economic Development, 3(2), 118-133.
9. El Ghonemy, R. A., El-Diftar, D., & Magdy, N. (2023). The Effect of Corporate Financial Performance on Growth Potential: Perspectives from the Listed Non-Financial Firms in Egypt Exchange. Alexandria Journal of Accounting Research, 7(3), 1-18.
10. El Khoury, R., Nasrallah, N., & Alareeni, B. (2023). ESG and financial performance of banks in the MENAT region: concavity–convexity patterns. Journal of Sustainable Finance & Investment, 13(1), 406-430.
11. ElHenawey, N. I., Khattab, G. S. S., & Nada, M. A. (2023). The Impact of the Board of Directors as One of the Environmental Governance Mechanisms on the Financial Performance of the Cement Egyptian Companies. Journal of Environmental Science , 52(2), 23-47.
12. Fatihudin, D. (2018). How measuring financial performance . International Journal of Civil Engineering and Technology (IJCIET), 9(6), 553-557.
13. Ganesan, Y.,Sadaa, A. M., Yet, C. E., Alkhazaleh, Q., & Alnoor, A. (2023). Corporate governance as antecedents and financial distress as a consequence of credit risk. Evidence from Iraqi banks. Journal of Open Innovation: Technology, Market, and Complexity, 9(2), 100051.
14. Gold, N. O., & Aifuwa, H. O. (2022). Board Meeting and Sustainability Reporting of Banks in Nigeria. Copernican Journal of Finance & Accounting, 11(3), 49-67.

15. Huynh, Q. L., Hoque, M. E., Susanto, P., Watto, W. A., & Ashraf, M. (2022). Does financial leverage mediates corporate governance and firm performance?. Sustainability, 14(20), 13545.
16. Isiaka, A. (2020). Outsourcing Strategy and Financial Performance of Quoted Commercial Banks in Nigeria.
17. Khaw, K. W., Alnoor, A., Al-Abrrow, H., Chew, X., Sadaa, A. M., Abbas, S., & Khattak, Z. Z. (2022). Modelling and evaluating trust in mobile commerce: a hybrid three stage Fuzzy Delphi, structural equation modeling, and neural network approach. International Journal of Human–Computer Interaction, 38(16), 1529-1545.
18. Kijkasiwat, P., Hussain, A., & Mumtaz, A. (2022). Corporate Governance, Firm Performance and Financial Leverage across Developed and Emerging Economies. Risks, 10(10), 185.
19. Kyere, M., & Ausloos, M. (2021). Corporate governance and firms financial performance in the United Kingdom. International Journal of Finance & Economics, 26(2), 1871-1885.
20. Lo, F. Y., & Liao, P. C. (2021). Rethinking financial performance and corporate sustainability: Perspectives on resources and strategies. Technological Forecasting and Social Change, 162, 120346.
21. Mpofu, Bhekizulu M.(2019).Corporate Reputation And Financial Performance: Perspectives Of South African Company Executives, A Thesis Submitted To The Department Of Business Management, Faculty Of Economic And Management Sciences, University Of Pretoria, In Fulfilment Of The Requirements For The Degree Of Doctor Of Philosophy.
22. Naciti, V., Cesaroni, F., & Pulejo, L. (2021). Corporate governance and sustainability: A review of the existing literature. Journal of Management and Governance, 1-20.

23. Naz, M. A., Ali, R., Rehman, R. U., & Ntim, C. G. (2022). Corporate governance, working capital management, and firm performance: Some new insights from agency theory. Managerial and Decision Economics, 43(5), 1448-1461.
24. Nguyen, V. H., Nguyen, T. T. C., Nguyen, V. T., & Do, D. T. (2021). Internal factors affecting firm performance: A case study in Vietnam. The Journal of Asian Finance, Economics and Business, 8(5), 303-314.
25. Pamungkas, I. D., Purwantoro, P., Sari, M. P., & Hersugondo, H. (2023). Corporate Governance and Financial Performance on Firm Value: The Case of Indonesia. WSEAS Trans. Bus. Econ, 20, 92-103.
26. Pandey, N., Andres, C., & Kumar, S. (2023). Mapping the corporate governance scholarship: Current state and future directions. Corporate Governance: An International Review, 31(1), 127-160.
27. Pert wirtz, (2019). Les meilleurs pratique de gouvernance d'entreprise, édition la découverte, Paris, France.
28. Ramadan , Abdulhadi H.(2009). Determinants of capital structure and the firm's financial performance: An application on the UK capital market, Thesis submitted in fulfilment of the requirements for the award of PhD degree.
29. Sadaa, A. M. (2023). Corporate Governance Mechanisms As Antecedent And Financial Distress As Consequence Of Credit Risk In The Iraqi Banks (Doctoral dissertation).
30. Teixeira, J. F., & Carvalho, A. O. (2024). Corporate governance in SMEs: a systematic literature review and future research. Corporate Governance: The International Journal of Business in Society, 24(2), 303-326.
31. Wahlen, J. M., Baginski, S. P., & Bradshaw, M. T. (2015). Financial reporting, financial statement analysis, and valuation: A strategic perspective. Cengage learning .

32. Zolfaghari, M., Vaez, S. A., & Khodamoradi, M. (2025). Effect of the Corporate Governance Structure on the Performance of Banks in Financial Crises. International Journal of Finance & Managerial Accounting, 10(37), 133-140.