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The Impact of Governance on Bank Risk: The Case of Tunisia

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Mohamed Aymen Ben Moussa[1]

Abstract:

Purpose: *This study examines the impact of corporate governance on bank risk in the Tunisian banking sector. Given the nature of banking activities, particularly deposit-taking and lending, banks are inherently exposed to various forms of risk that may affect their financial stability and performance. Corporate governance provides the institutional framework through which banks are directed, controlled, and held accountable, and may therefore play an important role in mitigating or influencing bank risk.*
Design/Methodology/Approach: *The study employs two static panel-data models to investigate the relationship between corporate governance mechanisms and bank risk. The empirical analysis is based on a sample of 11 Tunisian banks over the period 2016–2025. Bank risk is measured using two indicators: non-performing loans (NPL) and the Z-score. The governance variables considered include gender diversity, board size, board independence, audit committee size, and ownership structure.*
Findings: *The results indicate that several corporate governance mechanisms significantly affect bank risk in Tunisia. In particular, gender diversity, board size, and board independence have significant effects on bank risk, as measured by both NPL and the Z-score. In contrast, audit committee's size and ownership structure do not have a statistically significant effect on bank risk.*
Originality/Value: *The study contributes to the literature on corporate governance and bank risk by providing empirical evidence from the Tunisian banking sector over a recent ten-year period. The findings highlight the importance of board characteristics, particularly gender diversity, board size, and board independence, in understanding variations in bank risk.*

Keywords: *Bank, corporate governance, bank risk, gender diversity, board size, board independence, audit committee size, ownership structure, static panel data.*

JEL Classification: *G21, G32, G34, G38, J16.*

Paper type: *Research article.*

[1]*Doctor in finance, Faculty of business administration Afif Saudia Arabia, Shaqra University, Saudia Arabia, e-mail: aymenmoussa271@gmail.com;*

1. Introduction

Financial institutions have their own particularities such as opaqueness, leverage, regulation, and intervention by the government which require a distinct investigation of governance issues (Srivasta and Hagendorff, 2016; Abdebadie and Salama, 2019). Banks are subject to various types of risk (credit, operational, insolvency and liquidity risk) during their operations. Factors such as leverage levels and the considerable mismatch between assets and liabilities on the banks more complex and opaquer than non-financial firms (Srivastav and Hagendorff 2016; Abdelbadie and Salama, 2019).

Dada *et al.* (2023) argue that conflicts arise when the interests of managers and shareholders do not align. Therefore, governance policies are developed to ensure the convergence of interests and mitigate opportunistic behavior. This tension is even greater in the banking industry, as bank operations are highly opaque, banks have complicated risk profiles, and they depend on customer deposits (Singh and Milan, 2023; Saka, 2025).

The failure of banking and other financial institutions that occurred in the late 2000s was a consequence of deficiencies in bank governance policies, particularly regarding how boards of directors discharged their fiduciary duties (Laeven, 2013). In this context, the role of corporate governance in banking has been highlighted not only by academics but also by regulators and policymakers (Basel Committee on Banking Supervision, 2010; OECD, 2010).

As commercial banks engage in both conventional and innovative business operations, they are subject to a wide range of complex risks. Therefore, maintaining the necessary level of stability and safety in both domestic and global financial systems while achieving performance targets depends on an appropriate governance structure for controlling all forms of risk (Raouf, 2018).

Protecting the interests of stakeholders, improving banks' efficiency, and ensuring adherence to legal and ethical requirements all depend on good corporate governance (Fernandez and Fresly, 2017; Hussain, 2018).

In this article, we aim to study the impact of governance on bank risk in Tunisia. The article is organized into three sections. The first section is devoted to literature review, while the second section presents empirical study. Finally, the article concludes with a conclusion.

2. Literature Review

According to La Porta *et al.* (2020), corporate governance is defined as the set of mechanisms through which external investors protect themselves against the risk of appropriation by internal investors (majority shareholders and managers).

According to another approach, governance is considered a system designed to delimit managers' freedom of action and their discretion; in other words, their discretionary space (Charreaux, 1997).

A good governance structure enables investors to deal more efficiently with risk diversification and reduces investor uncertainty (Ntim *et al.,* 2013; Shahbaz, 2018; Audi and Masri, 2024).

For instance, government guarantees, such as deposit insurance and bailout support, serve as options, encouraging high-risk taking (Merton, 1977). Additionally, the highly leveraged nature of banks amplifies these incentives, as the value of government guarantees increases with leverage (John *et al.,* 2010).

An efficient corporate governance system has the advantage of protecting organizations from external disruptions and providing stability to achieve their financial goals, which is essential for banking organizations (Bhagat and Jefferis, 2005; Bawhede, 2003).

Olawle (2024) points out that, in many cases, the large amount of risk taken can be attributed to poor peer review and a weak governance system, which cannot limit the phenomenon of moral hazard in environments where the mechanisms of the legal system are underdeveloped.

El Labban *et al.* (2025) used a sample of 150 banks operating in 15 MENA countries between 2009 and 2020. The empirical results show that large boards, a large proportion of external directors, higher gender diversity, separation of the CEO and chairperson roles, and the existence of a board-level risk committee enhance the financial stability of MENA banks.

Ben Moussa (2019) examined the impact of corporate governance variables, including board size, board composition, and board gender diversity, on credit risk. Panel data regression analysis was applied to a sample of listed banks in Tunisia during the period 2000–2014. She found that a higher number of board members was associated with lower credit quality and increased credit risk.

Nguyen (2024) examined the impact of corporate governance on risk-taking in Vietnamese banks. Using data from 2007–2020 and employing the two-step generalized method of moments (GMM) technique, he found that certain aspects of corporate governance significantly influence bank stability and efficiency.

Specifically, the presence of female board members, independent directors, and larger board size were associated with improved stability and efficiency, while the presence of foreign board members had a negative impact.

Kouki *et al.* (2024) assessed the influence of various types of crises, including the subprime crisis, the COVID-19 crisis, and political crises, on corporate governance attributes, regulation, and their association with bank risk. Their study was conducted in the Tunisian context and covered the period from 2010 to 2021. They found that crises have a discernible effect on the relationship between corporate governance and bank risk.

Abid *et al.* (2021) investigated how the characteristics of risk committees and chief risk officers affect the risk-taking behavior of Asian commercial banks in the aftermath of the global financial crisis. Using a sample of 1,480 observations representing 185 banks from 2010–2017, they found evidence of a negative and significant relationship between risk governance mechanisms and risk-taking.

Bekri *et al.* (2022) examined corporate governance mechanisms and their impact on the risk-taking of listed banks in the MENA region. They used a sample of 141 banks from nine countries over the period 2015–2019. They found that state ownership, the presence of owners on board committees, and independent directors have a negative impact on bank risk.

Amda *et al.* (2025) employed a quantitative explanatory design with panel data regression analysis using a purposive sample of listed commercial banks in Kenya, Nigeria, Ghana, and South Africa from 2014–2024. They showed that board independence reduces credit risk and strengthens capital buffers, while CEO duality leads to riskier behavior and weaker performance.

Anh *et al.* (2023) used a sample of 21 listed commercial banks in Vietnam over the period 2007–2022. The results found that board size, the education level of board directors, and the reputation of women directors have a negative impact on bank risk-taking.

Pathan (2009) demonstrates that smaller board size is associated with increased levels of risk-taking in banks. These findings are supported by Jose and Garcia *et al.* (2022).

Women directors can help banks reduce the level of bank risk (Gulamhussen and Santa, 2015), enhance financial stability (Oyar *et al.,* 2022), or make riskier decisions (Palvia *et al.,* 2015).

Dogan and Eksi (2020) investigated the characteristics of boards of directors and their effect on risk levels, measured by non-performing loans. They used a sample of 19 deposit banks in Turkey over the period 2012–2018.

The results of the study determined that board size, foreign board members, and independent board members have an effect on non-performing loans.

Sallemi *et al.* (2024) examined the relationship between corporate governance and banking stability by considering the moderating role of corruption controls. Using a sample of 74 banks in 10 Organization for Economic Co-operation and Development (OECD) countries during the period 2006–2016, the empirical results reveal that banking governance is positively associated with bank stability, as measured by the Z-score.

Farag and Mallin (2017) discovered that having female board members may reduce the likelihood of a financial crisis when analyzing the effect of board diversity on the financial fragility and performance of European banks.

Cardillo *et al.* (2021) suggest that European banks with high gender diversity on boards have a lower probability of receiving public bailouts and are allocated less cash in the event of a bailout.

Bhatia and Gulati (2021) also point out that outside directors are more effective monitors than internal directors, a statement that aligns with the resource dependence hypothesis. During crises, when banks experience decreased revenues and increased expenses, independent directors can provide innovative ideas to mitigate these difficulties.

Debhrah *et al.* (2022) used quantile regression modeling, with data obtained from 12 universal banks in Ghana over the period 2011–2018. The findings revealed that a universal bank with a small board size is not likely to reduce credit risk.

Hunjra *et al.* (2020) analyzed the impact of ownership structure on the risk-taking behavior of banks in emerging markets, including Pakistan, India, and Bangladesh. They collected data from 64 banks in the selected countries from 2011–2018. They found that public and private ownership have a significant relationship with the risk-taking behavior of banks.

Rehman *et al.* (2023) used a sample of Pakistani banks and a two-step system GMM approach over the period 2009–2020. The estimation results confirm that corporate governance indicators have a significant impact on bank risk exposure.

Abdulla and Elshandidy (2023) examined the impact of governance factors on the effectiveness of credit, market, operational, and aggregate risk disclosures in banks. The study measures the effectiveness of risk management disclosure by assessing the level of compliance with local and institutional banking regulations in the UAE.

By controlling for year fixed effects and other bank-level factors, the empirical analysis reveals that the influence of governance factors on the effectiveness of risk management disclosure varies depending on the type of risk being considered, including credit, market, and operational risk.

Ofori *et al.* (2025) examined the impact of corporate governance mechanisms on the risk-taking behavior of commercial banks in Ghana. They used a panel dataset of 14 commercial banks in Ghana from 2010–2022. They showed that board meetings have a positive and significant relationship with operational risk in banks. Conversely, board size is negatively and significantly associated with operational risk.

Banaerjee and Shetty (2026) examined the impact of corporate governance on sustainability-related risk in Indonesian banks across crisis and post-crisis periods. They used data from 37 public and private banks between 2006 and 2018. They found that director busyness is associated with higher liquidity risk, while higher director and auditor fees are associated with improved liquidity management. Smaller and more independent boards and higher director fees are associated with lower solvency risk.

Nguyen and Yang (2020) examined the effect of ownership structure on the risk-taking behavior of banks in ASEAN countries. Using a sample of 96 commercial banks in ASEAN countries from 2002–2018, the study demonstrates that the relationship between ownership structure and bank risk-taking behavior is correlated with the characteristics of individual banks in terms of quantile regression.

Carestocea and Anghel (2025) also explored the relationship between governance standards and risk-taking behavior in European banks, focusing on those listed on stock markets and considering the regulatory changes that followed the financial crisis. The data come from the European banking-wide transparency coverage for the period 2021–2024. The results demonstrate a strong and statistically significant association between a bank's governance and its willingness to take risks.

Setiawan and Khoirotumim (2020) examined the effect of board gender diversity on credit risk. Using a sample of 41 Indian banks over the period 2012–2018, they found that board gender diversity has a significant negative effect on bank credit risk.

Amen *et al.* (2024) examined the role of independent directors' networks in bank risk-taking. Following the shareholder incentive hypothesis and social network theory, they found that independent directors are positively associated with bank risk-taking.

Liu *et al.* (2022) used a sample of Australian banks for the period 2004–2019. They examined board gender diversity from two perspectives: across the board and among board leaders. They support the context-dependent impact of gender diversity on boards of directors and highlight its impact on bank risk in relation to gender diversity and the presence of a dominant gender group in the boardroom.

Liu and Wu (2023) investigated how a gender-diverse board or a female chief executive officer affects balance-sheet and equity risk. Using panel data from U.S. bank holding companies over the period 1992–2019, the authors found that female directors significantly reduce all types of risk.

Ramli and Ramly (2022) investigated the effect of board capital on commercial bank risk-taking and the moderating effect of board independence on commercial bank risk-taking.

Data from eight Malaysian commercial banks from 2002–2014 were analyzed using generalized least squares (GLS) and panel data regression techniques to estimate the effect of board capital and the moderating effect of board independence on bank risk-taking. The findings suggest that it is not sufficient to focus solely on-board independence. The directors' ability to perform monitoring and advisory roles varies depending on the human and social capital resources they bring to the board.

Elahi *et al.* (2025) analyzed the role of audit committee effectiveness in determining banks' systemic risk in a group of seven countries from 2002–2021. Using a sample of 52 publicly traded banks by market capitalization across seven countries, this study employs a two-step system GMM approach. The results of this study reveal that financial expertise and independence on audit committees are inversely associated with bank systemic risk across the full sample period.

Al Maani *et al.* (2023) aimed to identify the impact of audit committee characteristics on voluntary risk disclosure and to investigate the moderating effect of family ownership on the relationship between audit committee characteristics and voluntary risk disclosures.

Badran and Chanoun (2024) investigated the determinants of bank stability through a comprehensive analysis of various financial and governance factors. The results indicated that capital, return on assets, bank size, gross domestic product, board composition, and audit quality have significant effects on bank stability.

Al Marwwaroh and Setiawan (2023) aimed to examine the influence of audit committee characteristics on risk disclosure. This analysis includes 202 bank statements from 2017–2021. The results demonstrated that audit committee expertise positively affects risk disclosure.

Al Hares (2025) measured the effect of corporate governance and corporate social responsibility on bank risk. The data were collected from DataStream from 2010–2021 and from the World Development Indicators. The analysis in this study utilized a fixed-effects model, in which multiple parameters were found to be negatively associated with credit risk, such as board independence, board size, and board meetings. By contrast, ownership concentration can positively affect bank credit risk.

Ammor *et al.* (2025) examined the effect of board characteristics on insolvency risk. Data were collected from a sample of 19 banks in Ghana from 2008–2020. The results indicate a positive and significant relationship between board meetings and insolvency risk and a negative and significant relationship between gender diversity and bank insolvency risk.

Hang (2025) analyzed the ownership structure of 29 commercial banks in Vietnam from 2012–2023 and its impact on credit risk. The regression results derived from the feasible generalized least squares (FGLS) method reveal that both state ownership and concentrated ownership in commercial banks exert a positive effect on credit risk.

3. Empirical Study

3.1 Methodology

We will use a sample of 11 banks (Attijari Bank, Amen Bank, ATB, BIAT, BT, BTEI, BH, STB, BNA, UIB, and UBCI) included in the Tunisian financial market for the period 2016-2025.

3.2 Specification of Variables

Model (1):

(1) NPLi,t = a0+b1 ROAi,t +b2 Sizei,t+b3 TLAi,t + b4 CAPi,t +b5 CEAi,t +b6 T depositi,t +b7ALAi,t +b8 GDi,t +b9 BSi,t +b10 BINDi,t +b11 OWi,t +b12 ASCi,t +b13 TPIBi,t +b14 TINFi,t +Ei,t

Model (2):

(2) Zscore i,t = a0+ b1 ROAi,t +b2 Sizei,t +b3 TLAi,t +b4 CAPi,t b+5 CEAi,t +b6 Tdepositi,t+b7ALAi,t +b8 GDi,t +b9 BSi,t +b10 BINDi,t +b11 OWi,t +b12ASCi,t +b13 TPIBi,t +b14 TINFi,t +Ei,t

Where:
NPL = non-performing loans / total loans;
Zscore = EAi,t + ROAi,t /6(ROAi,t);
ROA = net profits / total assets;
Size = logarithm of total assets;
TLA = Total credits / total assets;
CAP = equity / total assets;
T deposit = total deposits / total assets;
ALA = asset liquid / total assets;
GD = gender diversity in the board = percentage of female members in the board;
BS= size of board = total number of administrators in the boards;

BIND = independence of board = number of independent members in the board;
OW = ownership structure = 1 if the bank is public 0 otherwise;
ASC= size of audit committee;
TPIB = economic growth;
TINF = rate of inflation;
E= error term;
i=bank ; t= time;
a0= constant;
b1…….b14: parameters to be estimated;

We test the following hypothesis:

H1: Gender diversity in the board has a significant impact on bank risk.
H2: Board size has a significant impact on bank risk.
H3: Board independence has a significant impact on bank risk.
H4: Ownership structure has a significant impact on bank risk.
H5: Audit committee size has a significant impact on bank risk.

3.3 Analysis of Descriptive Statistics

Table 1. *Descriptive statistics*

Variable	Observations	Mean	Standard deviation	Minimum	Maximum
NPL	110	0.264	0.091	0.256	0.28
Zscore	110	0.032	0.025	0.016	0.048
ROA	110	0.017	0.023	0.0092	0.0985
Size	110	17.25	0.97	14.87	18.59
TLA	110	0.814	0.1623	0.15	0.9914
CAP	110	0.1592	0.0841	0.0095	0.46
CEA	110	0.091	0.031	0.0052	0.41
Tdeposit	110	0.9215	0.1681	0.7718	0.984
ALA	110	0.0514	0.0324	0.0138	0.01872
GD	110	0.3214	0.092	0.415	0.226
BS	110	7	0.0117	6	8
BIND	110	4	0.0126	3	5
OW	110	0.561	0.0147	0.427	0.637
ASC	110	6	0.0164	5	7
TPIB	110	0.035	0.052	-0.1052	0.069
TINF	110	0.077	0.0172	0.0364	0.08214

Source: *Own study.*

NPL (mean = 0.264): The credits non performants represent 26.4% of total credits on average. The standard deviation is not high. There is no big difference in terms of NPL between the banks.

Zscore (mean = 0.032): The equity and return on assets represent 3.2% of standard deviation of ROA. The standard deviation is not high. There is no big difference between banks in terms of Zscore.

ROA (mean = 0.017): The net profit represents 1.7% of total assets. The standard deviation is not high. There is no big difference between banks in terms of ROA

Size (mean = 17.25): The logarithm of total assets equals 17.25 an average. The standard deviation is high. There is big difference between banks in terms of Size.

TLA (mean = 0.814): The total credit represents 81.4% of total assets on average. There is big difference between banks in terms of TLA.

CAP (mean = 0.1592): The total equity represents an average of 15.92% of total assets. The standard deviation is high. There is big difference between banks in term of Capital.

CEA (mean = 0.091): The operating costs represent an average 9.1% of total assets. The standard deviation is not high. There is no big difference between banks in terms of operating costs.

Tdeposit (mean = 0.9215): The total deposit represents an average 92.15% of total assets. The standard deviation is high. There is a big difference between banks in terms of deposits.

ALA (mean =0.0514): The asset liquid represents an average of 5.14% of total assets. The standard deviation is low. There is no big difference between banks in terms of asset liquids.

GD (mean = 0.3214): The gender diversity represents average 32.14%. The standard deviation is high. There is big difference between banks in terms of GD.

BS (mean = 7): The number of board size is 7 on average. The standard deviation is not high. There is no big difference between banks in terms of BS.

BIND (mean = 4): The number of board independent members is 4 on average. The standard deviation is not high. There is no big difference between banks in terms of BIND.

Ow (average = 0.561): The ownership structure is 0.561% public an average. The standard deviation is high. There is a big difference between banks in terms of ownerships structure.

ASC (average = 6): The size of audit committee is 6 members on average. The standard deviation is not high. There is no big difference between banks in terms of ASC.

TPIB (average = 0.035): The economic growth is 3.5% an average for the period (2016-2025). The standard deviation is high. There is big difference between banks in terms of TPIB.

TINF (average = 0.077): The rate of inflation is 7.7% an average for the period (2016-2025). The standard deviation is high. There is big difference between banks in terms of rate inflation.

3.4 Multicollinearity Test

The correlation between the variables is presented in Tables 2-5.

Table 2. *Correlation between variables*

	ALA	TLA	ROA	Size	CAP	CEA	Tdeposit
ALA	1.000						
TLA	0.326	1.000					
ROA	0.641	0.524	1.000				
Size	0.425	0.036	0.194	1.000			
CAP	0.316	0.024	0.028	0.036	1.000		
CEA	0.247	0.281	0.191	0.243	0.342	1.000	
Tdeposit	0.326	0.036	0.054	0.062	0.071	0.079	1.000
TPIB	0.392	0.038	0.072	0.091	0.1251	0.1423	0.076
TINF	0.327	0.095	0.064	0.084	0.093	0.1014	0.092
NPL	0.019	0.026	0.032	0.025	0.043	0.1523	0.1726
Zscore	0.025	0.284	0.091	0.1034	0.1245	0.1724	0.1824

Source: *Own study.*

Table 3. *Suite of correlation between variables*

	ALA	TLA	ROA	Size	CAP	CEA	Tdeposit	TPIB
GD	0.015	0.23	0.32	0.41	0.024	0.026	0.032	0.056
BS	0.023	0.51	0.51	0.68	0.074	0.032	0.046	0.073
BIND	0.042	0.65	0.65	0.72	0.086	0.056	0.071	0.081
OW	0.064	0.094	0.094	0.017	0.081	0.077	0.086	0.096
ASC	0.086	0.1025	0.1025	0.023	0.096	0.1023	0.1224	0.1734

Source: *Own study.*

Table 4. *Suite of correlation between variables*

	TPIB	TINF
NPL	0.256	0.278
Zscore	0.341	0.451

Source: *Own study.*

Table 5. *Suite of correlation between variables*

	CEA	T deposit	TPIB	TINF	Zscore	NPL
CEA	1.000					
Tdeposit	0.032	1.000				
TPIB	0.046	0.053	1.000			
TINF	0.058	0.061	0.086	1.000		
Zsore	0.076	0.1053	0.1241	0.1425	1.000	
NPL	0.091	0.1224	0..1451	0.1635	0.1763	1.000

Source: *Own study.*

All the coefficients of variables are inferior to 80%. There is no problem of multicollinearity.

A VIF (Variance Inflation Factor) test is used in statistics to detect multicollinearity in a regression analysis. It measures the extent to which the variance of a regression coefficient is inflated due to correlation between predictor variables. How to interpret VIF results: VIF = 1: There is no correlation between the variable and the others. The model is reliable. VIF between 1 and 5: There is moderate correlation, but this is generally acceptable in most models. VIF greater than 5 or 10: Indicates strong multicollinearity. The model is unstable, and the estimated coefficients become unreliable

Table 6. *VIF of variables*

Variable	VIF	1/VIF
ROA	1.15	0.86
Size	2.26	0.44
TLA	2.84	0.35
CAP	2.73	0.36
CEA	3.04	0.32
Tdeposit	3.24	0.30
ALA	3.25	0.30
GD	3.65	0.27
BS	2.74	0.36
BIND	3.16	0.316
OW	3.35	0.29
ASC	2.92	0.34
TPIB	2.71	0.36
TINF	2.65	0.37

Source: *Own study.*

3.5 Hausman Test

The Hausman test (also known as the Durbin-Wu-Hausman test) is a statistical method used in econometrics to detect endogenous regressors. In panel data analysis, it is most commonly applied to choose between a Fixed Effects (FE) model and a Random Effects (RE) model.

In model 1 the Pv = 0.069 while in model 2 the Pv = 0.065. Therefore, we choose the random effect methodology for both models.

3.6 Results of Estimations and Interpretations of models

Model 1:

Table 7. *Results of estimations of model 1*

NPL	Coefficient	Z
ROA	-0.456	0.53
Size	0.052***	0.019
TLA	0.314***	0.0114
CAP	0.062***	0.0112
CEA	-0.036	0.86
Tdeposit	-0.092	0.94
ALA	-0.185**	0.0477
GD	-0.027**	0.0436
BS	0.046***	0.01073
BIND	-0.053**	0.0513
OW	-0.078	0.27
ASC	-0.094	0.32
TPIB	0.062**	0.0416
TINF	-0.0157	0.49

Note: *(***) significant at 1% (**) significant at 5% (*) significant at 10%*
Source: *Own study.*

There is a negative relationship between NPL and ROA. If ROA increases by 1%, NPL will decrease by 0.456%. The increase in return on assets has a negative impact on NPL. This result is similar to the result found by Abdulla and Elshandidy (2023), but contrary to the result found by Nguyen (2024).

Besides, there is a positive relationship between NPL and Size. If Size increases by 1%, NPL will increase by 0.052%. The increase in bank size has a positive impact on NPL. This result is similar to the results found by Nguyen (2024) and Abdulla and Elshandidy (2023).

Larger financial institutions are more diversified and possess a higher degree of risk-management expertise, making them less exposed to risk than their smaller counterparts (Karavitis *et al.,* 2021).

Credit risk is considered to be the exposure faced by banks and other financial institutions when a borrower defaults on their debt obligations on the due date (Chaibi and Ftiti, 2015; Faleye and Krishnan, 2017). A loan is considered non-performing if the principal and/or interest on the loan has not been paid as agreed under the loan contract.

Moreover, there is a positive relationship between NPL and TLA. If TLA increases by 1%, NPL will increase by 0.314%. The increase in TLA has a positive impact on NPL. There is also a positive relationship between capital and NPL. If CAP increases by 1%, NPL will increase by 0.062%. The increase in capital has a positive impact on NPL. This result is similar to the result found by Nguyen (2024). On the other hand, there is a negative relationship between CEA and NPL. If CEA increases by 1%, NPL will decrease by 0.036%.

The increase in operating costs has a negative impact on NPL. In addition, there is a negative relationship between total deposits and NPL. If total deposits increase by 1%, NPL will decrease by 0.092%. High operating costs can significantly increase non-performing loans (NPLs) by encouraging banks to pursue high-risk, high-yield lending strategies to cover their expenses, which can place additional pressure on their credit management resources.

When a bank experiences high operating costs, often measured by the operating costs-to-operating income ratio (BOPO), it typically faces compressed profit margins. This may encourage management to pursue riskier lending strategies in order to increase revenue and cover these expenses. These aggressive, high-interest loans may be extended to borrowers with weaker credit profiles, potentially resulting in higher default rates and NPLs.

Furthermore, high administrative costs may limit the resources available for effective credit monitoring and risk assessment, thereby exacerbating the problem.

Moreover, there is a negative relationship between ALA and NPL. If ALA increases by 1%, NPL will decrease by 0.185%. The increase in liquid assets has a negative impact on NPL. High levels of liquid assets enable banks to overcome sudden difficulties caused by unforeseen cash withdrawals (Ossuca and Akbostanca, 2016; Ghenimi *et al.,* 2017).

Liquid assets act as a crucial buffer for banks against non-performing loans (NPLs). High liquidity allows banks to absorb credit shocks, meet sudden withdrawal demands, and fund provisions for bad debts without having to liquidate illiquid, long-term assets at a loss.

The specific impact of liquid assets on bank credit quality can be explained through several key mechanisms:

Risk Mitigation and Loss Absorption:

- **Buffering NPL shocks:** Adequate high-quality liquid assets (HQLA) provide banks with the financial capacity to absorb immediate revenue losses resulting from loan defaults. When loans become non-performing, banks are required to allocate capital to loan-loss provisions.

- **Regulatory compliance:** Regulators enforce strict liquidity and capital requirements. Holding adequate liquid reserves ensures that banks do not breach minimum regulatory thresholds, even when non-performing assets increase significantly.

The Danger of Excessive Liquidity Creation:

- **Lending standards and moral hazard:** Although liquid assets contribute to bank stability, excessive liquidity can have unintended adverse effects. When banks are highly liquid, they may face pressure to deploy these funds in order to avoid opportunity costs.

There is a negative relationship between gender diversity and NPL. If GD increases by 1%, NPL will decrease by 0.027%. The increase in gender diversity has a negative impact on NPL. This result is similar to the results found by Abou El Sood (2021) and Cardillo *et al.* (2021), but contrary to the results found by Nguyen (2024) and Berger *et al.* (2014). Women board members bring new perspectives to board discussions, which can help mitigate cognitive biases in problem-solving and strategy formulation (Westphal and Milton, 2000).

In contrast, there is a positive relationship between board size and NPL. If BS increases by 1%, NPL will increase by 0.046%.

The increase in board size has a positive impact on NPL. This result is similar to the result found by Anh *et al.* (2023), but contrary to the results found by Abdulla and Elshandidy (2023) and Amda *et al.* (2025). Pathan (2009) demonstrates that smaller board size is associated with increased levels of risk-taking in banks. This finding is supported by Jose *et al.* (2022).

Neifar *et al.* (2020) argue that large boards can enhance monitoring capabilities and bring diverse expertise, potentially improving operational risk management. However, Settembre *et al.* (2021) suggest that oversized boards may encounter coordination problems and slower decision-making, which could exacerbate operational risk.

Stewardship theory suggests that managers act in the best interests of the organization, and large boards may provide the necessary support to enable managers to manage the bank's resources effectively, thereby enhancing risk management. Resource dependence theory highlights that large boards bring diverse external expertise, which is crucial for banks operating in a regulatory environment that requires extensive board knowledge to mitigate operational risk (Dogan *et al.,* 2021).

Moreover, there is a negative relationship between board independence and NPL. If BIND increases by 1%, NPL will decrease by 0.053%. The increase in board

independence has a negative impact on NPL. This result is similar to the results found by Nguyen (2024), Rehman *et al.* (2023), and Abdulla and Elshandidy (2023).

There is also a negative relationship between OW and NPL. If OW increases by 1%, NPL will decrease by 0.078%. The increase in public ownership has a negative impact on NPL.

Ownership structure profoundly influences the level of non-performing loans (NPLs) in banks. Publicly owned banks may have higher NPL levels due to political pressure regarding lending. Conversely, private or concentrated ownership may be associated with lower credit risk, although this depends on the local governance and regulatory environment.

State-controlled banks often exhibit higher non-performing loan (NPL) ratios. This can be attributed to several factors:

- **Political interference:** Governments may direct lending toward unprofitable projects or state-owned enterprises for employment or economic development purposes.
- **Lax credit policies:** Risk management may be less stringent because of implicit state bailout guarantees.

Private and foreign ownership may be associated with better-performing loan portfolios because of the following factors:

- **Profitability objectives:** Private banks generally focus on the commercial viability of borrowers rather than political objectives.
- **Rigorous risk management:** Stricter credit-underwriting procedures and more effective collection monitoring can reduce the accumulation of bad debts.

Ownership concentration, referring to the share of stock held by major owners, can have varying effects:

- **Institutional concentration:** In private banks, strong institutional ownership can reduce non-performing loans (NPLs) through closer monitoring of management.
- **State concentration:** In certain contexts, such as China, high ownership concentration in the hands of the state may reduce NPLs by centralizing control and limiting risky off-balance-sheet lending.
- **Risk of opportunism:** In other markets, excessive ownership concentration can foster conflicts of interest or lending to related parties, thereby increasing credit risk.
- **Managerial and institutional ownership:** When management holds a stake in the bank's capital, this generally aligns managers' interests with those of shareholders, which can help contain non-performing loans (NPLs). Institutional investors, such as investment funds and other banks, can impose financial discipline that encourages banks to maintain better asset quality and limit the accumulation of non-performing loans.

There is a negative relationship between audit committee size and NPL. If ASC increases by 1%, NPL will decrease by 0.094%. The increase in audit committee size has a negative impact on NPL. This result is similar to the result found by Al Marwwaroh and Setiawan (2023).

Members of audit committees with accounting or financial expertise can assess issues more comprehensively and help overcome potential problems and risks (DeZoort and Salterio, 2001).

Moreover, TPIB has a positive relationship with NPL. If TPIB increases by 1%, NPL will increase by 0.062%. The increase in economic growth has a positive impact on NPL. This result is similar to the result found by Nguyen (2024).

During periods of economic expansion, rising GDP and lower unemployment generally increase borrowers' incomes and repayment capacity, thereby reducing default rates. Conversely, economic downturns reduce borrowers' repayment capacity, causing NPLs to rise. This can subsequently force banks to restrict lending and weaken broader economic recovery.

Economic growth affects bank loan portfolios primarily through corporate revenues and household incomes.

- **Expansionary periods:** Higher real GDP growth generally leads to increased business profitability and household employment. This improves borrowers' capacity to service their debt, leading to a decrease in distressed and non-performing loans.
- **Economic downturns:** Recessions or periods of slower growth frequently result in higher unemployment, business insolvencies, and reduced cash flows. Borrowers may struggle to meet interest payments, causing NPL ratios to increase and negatively affecting banks' capital structures and profitability.

There is also a negative relationship between TINF and NPL. If TINF increases by 1%, NPL will decrease by 0.0157%. The increase in inflation has a negative impact on NPL.

Inflation affects non-performing loans (NPLs) by eroding household purchasing power and corporate profit margins. This reduces borrowers' ability to repay their debts. Consequently, banks may experience a reduction in interest income and may need to increase their provisions for bad debts.

There is a positive relationship between Z-score and ROA. If ROA increases by 1%, the Z-score will increase by 0.523%. The increase in return on assets has a positive impact on the Z-score. This result is similar to the results found by Nguyen (2024) and Badran and Chanoun (2024).

Besides, there is a positive relationship between Z-score and Size. If Size increases by 1%, the Z-score will increase by 0.064%. The increase in bank size has a positive impact on the Z-score.

Moreover, there is a positive relationship between Z-score and TLA. If TLA increases by 1%, the Z-score will increase by 0.319%. The increase in total credit has a positive impact on the Z-score.

Table 8. *Results of estimation of model 2*

Zscore	Coefficient	T
ROA	0.523	0.567
Size	0.064***	0.0139
TLA	0.319**	0.0556
CAP	0.078***	0.0114
CEA	-0.036	0.93
Tdeposit	-0.064	0.94
ALA	-0.194**	0.053
GD	-0.032**	0.052
BS	0.072***	0.0114
BIND	-0.065**	0.055
OW	-0.1042	0.421
ASC	-0.1536	0.736
TPIB	-0.042***	0.0112
TINF	0.0168*	0.1042

Note: *(***) significant at 1% (**) significant at 5% (*) significant at 1%.*
Source: *Own study.*

There is also a positive relationship between CAP and Z-score. If CAP increases by 1%, the Z-score will increase by 0.078%. This result is similar to the result found by Nguyen (2024). The increase in capital has a positive impact on the Z-score. Higher capital directly improves a bank's Z-score, meaning that it lowers the probability of insolvency. Because the Z-score is calculated using capital and profitability relative to earnings volatility, an increase in equity allows a bank to absorb larger shocks to its assets without defaulting.

Besides, there is a negative relationship between CEA and Z-score. If CEA increases by 1%, the Z-score will decrease by 0.036%. The increase in operating costs has a negative impact on the Z-score.

Operating costs directly influence a bank's Z-score, which is a standard measure of financial stability and insolvency risk. High operating costs reduce net profitability (ROA) and increase earnings volatility, which subsequently reduces the Z-score and increases default risk.

On the other hand, there is a negative relationship between total deposits and the Z-score. If total deposits increase by 1%, the Z-score will decrease by 0.064%. The

increase in deposits has a negative impact on the Z-score. Deposits can increase a bank's Z-score by providing stable, low-cost funding that supports return on assets (ROA) and equity-to-assets ratios. However, excessive deposit growth can lower the Z-score if banks retain excess liquidity instead of lending it, as this may reduce the marginal return on assets and increase earnings volatility.

There is a negative relationship between ALA and Z-score. If ALA increases by 1%, the Z-score will decrease by 0.194%. The increase in liquid assets has a negative impact on the Z-score.

Liquid assets primarily influence a bank's Z-score, a standard measure of insolvency risk and financial stability, by providing liquidity buffers and affecting profitability. An optimal level of liquid assets can improve stability; however, excessive holdings may reduce returns, which ultimately decreases the Z-score.

Moreover, there is a negative relationship between GD and Z-score. If GD increases by 1%, the Z-score will decrease by 0.032%. The increase in gender diversity on the board has a negative impact on the Z-score. This result is contrary to the result found by Ammor *et al.* (2025).

Gender diversity on boards of directors has a measurable impact on banking risk as assessed by the Z-score, which measures the number of standard deviations by which profitability would need to fall to deplete equity capital. Studies show that female directors tend to favor more prudent management, resulting in a lower probability of failure and, consequently, a higher Z-score.

However, empirical results vary across geographic and economic contexts. In some contexts, such as the Middle East and North Africa (MENA) region, a higher female presence on boards of directors is strongly correlated with a higher Z-score, indicating a lower risk of bankruptcy and improved governance, particularly during financial crises.

Research on microfinance institutions also indicates that the proportion of women on boards is positively associated with financial stability, as measured by the Z-score, supporting the notion that gender diversity may contribute to more rigorous risk management.

Risk aversion versus risk-taking: Other analyses, including studies of European and Tunisian banks, sometimes reveal different results. Some studies indicate that female directors contribute to better reserve accumulation but may also be associated with higher overall perceived risk or have no significant effect on insolvency risk. These variations are often attributed to the effects of "tokenism" (symbolic representation) or a lack of expertise specifically to the banking sector.

There is also a positive relationship between board size and Z-score. If board size increases by 1%, the Z-score will increase by 0.072%. The increase in board size has a positive impact on the Z-score of banks. This result is similar to the result found by Kouki *et al.* (2024).

The board of directors is a central component of corporate governance mechanisms in market economies and represents one of the main dimensions of governance (Fernandez *et al.,* 2017).

Boards of directors play a fundamental role in strengthening corporate governance by performing important monitoring and advisory functions and providing access to resources. The board of directors has a crucial role in managing and controlling the activities of banks.

Moreover, there is a negative relationship between BIND and Z-score. If BIND increases by 1%, the Z-score will decrease by 0.065%. The increase in board independence has a negative impact on the Z-score of banks. This result is similar to the results found by Nguyen (2024) and Kouki *et al.* (2024).

The inclusion of independent directors serves to align the interests of equity holders and firm managers (Donga and Rizolini, 2017), while providing essential skills in areas such as finance, management, sales, and marketing. Independent directors play a pivotal role in overseeing and addressing potential agency conflicts that may emerge between a firm's management and its shareholders. Independent directors are vital for internal governance because of their perceived ability to effectively monitor management and protect shareholders' interests (De Andres and Vallelado, 2008; Adams and Mehran, 2012).

There is a negative relationship between OW and Z-score. If OW increases by 1%, the Z-score will decrease by 0.1042%. The increase in ownership structure has a negative impact on the Z-score of banks.

A bank's ownership structure directly influences its risk appetite and strategic decisions. State-owned banks tend to be more stable, whereas family shareholders or private investors may opt for riskier strategies, depending on the nature of their control over management.

The effects vary significantly depending on the type of ownership:

- **Public (government-owned) banks:** These are generally considered more stable due to an implicit guarantee against failure, although they may sometimes exhibit lower-quality loan portfolios as a result of policy objectives.
- **Family and private ownership:** High concentration of family ownership is often associated with increased credit risk. Family owners may pursue bolder strategies when holding significant stakes.

- **Institutional ownership:** Institutional investors may encourage risk-taking to maximize short-term returns, although this depends on regulatory and market conditions.
- **Foreign ownership:** Foreign-owned subsidiaries or banks sometimes exhibit a higher risk profile than domestic banks, partly to offset the costs associated with international expansion.

Clarke *et al.* (2005) found that state ownership of banks might become a tool for raising capital to finance projects with high social returns, but this may involve higher risks or provide financing to favored entities such as state-owned enterprises.

There is also a negative relationship between ASC and Z-score. If ASC increases by 1%, the Z-score will decrease by 0.1536%. The increase in audit committee size has a negative impact on the Z-score of banks. For instance, Ho and Wong (2001) support the view that audit committees characterized by smaller size and greater representation of independent members have a favorable impact on bank stability.

The observed effectiveness can be attributed to the phenomenon of reallocation, resulting in increased profitability and greater motivation for banks to maintain appropriate levels of capital ratios. Nguyen (2019) examined the relationship between audit committee structure and bank stability in Vietnam. The effectiveness of audit committee risk oversight may be enhanced by the presence of high-quality external auditing.

Besides, there is a negative relationship between TPIB and the Z-score of banks. If TPIB increases by 1%, the Z-score will decrease by 0.042%. The increase in economic growth has a negative impact on the Z-score of banks.

During economic expansions, higher GDP growth typically boosts corporate revenues and household incomes, which decreases non-performing loans (NPLs) and increases banks' return on assets (ROA). This enhanced stability strengthens their capital buffers and increases Z-scores. Conversely, during periods of economic contraction or heightened uncertainty, banks face higher default rates, which reduce ROA and increase earnings volatility, thereby lowering their overall Z-score and increasing insolvency risk.

There is also a positive relationship between inflation and the Z-score. If inflation increases by 1%, the Z-score will increase by 0.0168%. The increase in inflation has a positive impact on the Z-score of banks. This result is similar to the result found by Ammor *et al.* (2025).

Inflation can affect the Z-score through two opposing dynamics. First, there can be a negative impact on stability, whereby high and persistent inflation erodes purchasing power, deteriorates asset quality due to rising bad loans, and increases banks' operating costs, such as rent and wages, faster than their revenues.

Recent studies on commercial banks indicate that this overall inflationary uncertainty tends to negatively affect banking stability.

Second, there can be a positive impact on stability. In certain contexts, such as the MENA region or ASEAN countries, moderate inflation can improve net interest margins as interest rates rise in response to inflation, thereby boosting profits and, consequently, capital buffers.

4. Conclusion

Corporate governance constitutes a set of mechanisms primarily designed to address agency problems and mitigate risks within firms. However, the characteristics of the banking sector, coupled with the complexity of its operations, pose heightened challenges for governance mechanisms. Factors such as information asymmetry and stakeholders' limitations in monitoring the decisions of bank managers become more pronounced (Kouki *et al.,* 2024).

According to the Basel Committee on Banking Supervision (BCBS, 2015), the effectiveness of corporate governance is crucial to ensure the proper functioning of the banking sector and the broader economy. Banks are subject to various types of risk, including credit, operational, insolvency, and liquidity risks, during their operations (Abid *et al.,* 2021).

Protecting the interests of stakeholders, improving banks' efficiency, and ensuring adherence to legal and ethical requirements all depend on good corporate governance (Fernandes and Fresly, 2017; Hussain, 2018).

A good governance structure enables investors to manage risk diversification more efficiently and reduces investor uncertainty (Shahbaz, 2018; Audi and Masri, 2024). The board also has ultimate responsibility for risk management in a bank.

By advising and monitoring bank executives, evaluating the consistency of the bank's risk exposure with its risk appetite, and designing executive compensation structures, the board plays a pivotal role in influencing the risk-taking culture of a bank (Srivastav and Hagendorff, 2016).

In this article, we studied the impact of governance on bank risk in the Tunisian context. We used a sample of 11 banks over the period 2015–2026. We found that gender diversity, board independence, and board size have significant effects on bank risk, as measured by NPL and the Z-score. However, ownership structure and audit committee size do not have a significant impact on bank risk.

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