Forum for Economic and Financial Studies 2025, 3(2), 1553.
https://doi.org/10.24294/fefs1553

Article

Assessing the impact of capital structure on the performance of banks in the Arab nation

Mohammad Omran Abuafefah[1], Ponle Henry Kareem[1,*], Grace Oluwatosin Aina[2]

[1] Department of Business, Cyprus Health and Social Sciences University, Nicosia 99138, Cyprus
[2] Department of Accounting and Finance, McPherson University, Seriki Sotayo 110117, Ogun State, Nigeria
*** Corresponding author:** Ponle Henry Kareem, hponle2@gmail.com

CITATION

Abuafefah MO, Kareem PH, Aina GO. Assessing the impact of capital structure on the performance of banks in the Arab nation. Forum for Economic and Financial Studies. 2025; 3(2): 1553. https://doi.org/10.24294/fefs1553

ARTICLE INFO

Received: 23 July 2024
Accepted: 14 February 2025
Available online: 11 April 2025

Abstract: The vital role of capital structure in the performance of banks cannot be overemphasized, as several studies have investigated the capital structure-performance nexus across different economies and sectors. However, the findings of these studies are mixed or inconclusive. In addition, there is a relative deficiency of empirical studies examining the capital structure performance of bank linkage in Morocco. This study fills this gap, employing the pooled data of 4 Moroccan banks from 2010 through 2023. This study empirically examined the impacts of capital structure on the performance of four (4) Moroccan banks assessed by return on equity and return on assets. The results of the feasible generalized least squares showed that capital structure has mixed interactions with performance, as some of the capital structure proxies depict positive and negative linkages. The findings of this empirical study are of greater significance as they provide valuable insights for financial managers and regulators by enhancing their understanding of the complex processes that influence the performance of banks in Morocco.

Keywords: banks; capital structure; return on asset; return on Equity; feasible generalized least squares
JEL Clasification: C23; G32; L20

1. Introduction

The long-term sustainability and success of banks are influenced by a range of factors, including effective management, strategic decision-making, and the availability of financial resources [1]. As institutions entrusted with managing deposits, banks must craft comprehensive strategies to ensure smooth operations and efficient resource allocation. Central to these efforts is the careful evaluation and execution of an optimal capital structure—balancing the mix of debt and equity. This decision not only shapes a bank's ability to thrive in a competitive marketplace but also plays a critical role beyond maximizing returns. The capital structure directly affects a bank's capacity to meet the needs of its stakeholders, making its proper management essential. In this context, Moroccan banks are encouraged to boost their competitiveness by reducing the cost of capital.

The concept of capital structure refers to the arrangement of a firm's equity, debt, and various financial instruments utilized to acquire and maintain its assets [2]. A bank's capital structure must be sufficiently flexible to adapt to the changing dynamics of both the institution itself and the broader economic landscape. Financial managers are tasked with understanding how stakeholders react to economic fluctuations, which is crucial for informed decision-making [3]. In periods of economic prosperity, firms can achieve optimal operational efficiency, thereby enhancing shareholder wealth. However, during economic downturns, creditors face increased risks due to the limited liability protections afforded to shareholders. While banks may utilize substantial debt to enhance profitability, the risks associated with such leverage are contingent upon creditors' rights to the firm's earnings and their ability to recover their investments [4].

Furthermore, the optimal capital structure is influenced by factors such as the availability and cost of financing, as well as the volatility of cash flows. The impact of this risk on a company's ability to secure debt and equity capital is directly proportional to its cash flow volatility [2]. The decision-making process regarding capital expenditures is facilitated by internal financing, as internal funds typically entail minimal or nonexistent capital costs. Retained earnings, a common source of internal funds, incur a capital cost in the form of dividend payments, prompting companies with substantial retained earnings to prioritize self-financing over debt or equity issuance [5]. The debate surrounding the significance of capital structure decisions in businesses has elicited diverse perspectives. While some argue that a company's value remains unaffected by its capital structure, others contend that capital structure plays a crucial role in maximizing business value. Modigliani and Miller [6] initially posited that capital structure has no bearing on a company's value, yet subsequently acknowledged the tax advantages associated with debt financing in their revised theory. Therefore, banks responsible for managing deposits must develop a thorough strategy to maintain their operations using their resources. On the other hand, other theories like the pecking order theory, agency theory, and trade-off theory emphasize the significance of capital structure in maximizing firm value [7].

This research endeavors to investigate the impact of capital structures on the operations of significant Moroccan banks with international presence, including Attijariwafa Bank, Banque Populaire, Societe Generale, and Bank of Africa. Prior studies have examined the relationship between capital structure and financial performance of banks in Arab countries. However, comprehensive analyses regarding Moroccan banks are lacking. Therefore, this study aims to address this gap by specifically focusing on Moroccan banks. Additionally, this research contributes empirical insights to the existing body of literature by elucidating the intricate connections between capital structure decisions and financial performance within Moroccan banking institutions.

The remainder of this study is organized as follows. Section 2 reviews the literature with a focus on theoretical and empirical literature, as section 3 describes the data and the proposed methodology. Section 4 illustrates the empirical results of the study, and finally, Section 5 concludes this study.

2. Literature review

2.1. Theoretical issues

2.1.1. Capital structure theory

Capital structure theory is a foundational concept in corporate finance that examines how a firm finances its operations through various sources of funds, primarily debt and equity. The seminal work by [6] established the initial framework, suggesting that, under certain ideal conditions (such as no taxes, bankruptcy costs, or asymmetric information), the value of a firm remains constant regardless of its capital structure. However, real-world complexities challenge this assertion, leading to the development of several extensions and modifications of the theory.

Decisions on capital structure are particularly intricate in the banking sector due to regulatory requirements, the nature of banking operations, and the inherent risks associated with financial intermediation. For instance, banks typically operate under stringent capital adequacy requirements set by regulatory bodies, such as the Basel Accords, which dictate the minimum capital levels that banks must maintain relative to their risk-weighted assets. This regulatory framework aims to ensure the stability of the financial system by mitigating the risk of bank failures.

Recent studies have highlighted the importance of contextual factors in capital structure decisions. For instance, the economic environment, market conditions, and institutional frameworks significantly influence how banks in different regions, including Arab nations, structure their capital. Research has shown that banks in emerging markets often exhibit different capital structure dynamics compared to their counterparts in developed economies, primarily due to varying levels of market development, regulatory environments, and economic stability [8].

Moreover, the capital structure theory has evolved to incorporate behavioral finance aspects, recognizing that managerial perceptions and biases can also affect financing decisions. For instance, bank managers may exhibit a preference for debt financing due to the tax shield benefits associated with interest payments, despite the potential risks of increased leverage. This behavioral perspective adds a layer of complexity to understanding capital structure choices in the banking sector [7,9].

In summary, capital structure theory provides a critical framework for analyzing how banks finance their operations. However, the unique characteristics of the banking sector, combined with regulatory influences and behavioral factors, necessitate a nuanced understanding of capital structure decisions, particularly in the context of Arab nations.

2.1.2 Trade-off theory

The trade-off theory of capital structure provides a framework for understanding how firms, including banks, balance the benefits of debt financing against the costs associated with financial distress. This theory posits that firms strive to achieve an optimal capital structure by weighing the tax benefits derived from debt against the potential costs of bankruptcy and financial distress that may arise from excessive leverage [8].

In the banking sector, the trade-off theory is particularly relevant due to the unique regulatory environment in which banks operate. Banks are often required to maintain certain capital ratios to ensure solvency and stability, which can influence their capital structure decisions. The tax shield provided by debt financing is a significant incentive for banks to utilize leverage; however, the potential for increased risk of insolvency must also be considered. This balancing act is crucial, as banks face unique risks associated with their lending activities, including credit risk, interest rate risk, and liquidity risk [7,9].

Recent empirical studies have explored the application of the trade-off theory in various banking contexts. For instance, research conducted on banks in the Gulf Cooperation Council (GCC) countries found that banks tend to favor a capital structure that maximizes tax benefits while minimizing bankruptcy risks, aligning with the predictions of the trade-off theory [1]. Additionally, a study on banks in Egypt highlighted that banks with higher profitability levels were more likely to take on debt, as they could absorb the associated risks more effectively, thus supporting the trade-off theory's premise [8].

Moreover, the trade-off theory has been extended to incorporate the impact of macroeconomic factors on capital structure decisions. For example, during periods of economic uncertainty, banks may become more conservative in their capital structure choices, prioritizing stability over growth. This behavior aligns with the trade-off theory, as banks reassess the risks associated with high leverage in light of changing economic conditions [10,11].

In summary, the trade-off theory offers valuable insights into the capital structure decisions of banks by emphasizing the need to balance the benefits of debt financing against the risks of financial distress. The unique regulatory and operational characteristics of banks further complicate this balance, necessitating a nuanced understanding of how banks in different regions, including Arab nations, navigate these trade-offs.

2.2. Empirical review

2.2.1. Capital structure and profitability

The profitability of banks is a crucial indicator of their financial performance, often measured using Return on Equity (ROE) and Return on Assets (ROA). ROE reflects how effectively a bank utilizes shareholders' equity to generate profits, while ROA assesses how efficiently a bank's assets are employed in generating income. Both metrics are deeply influenced by the capital structure, which is the proportion of debt and equity a bank uses to finance its operations. The role of capital structure in influencing profitability is particularly significant in the banking sector of Arab nations, where economic factors, regulatory frameworks, and financial market conditions vary considerably.

A critical body of empirical research highlights that the capital structure decisions banks make can significantly impact their profitability. The trade-off between equity and debt financing in banks is often observed through its effect on ROE. For instance, leveraging debt can increase ROE by utilizing cheaper external financing compared to the cost of equity [12]. This is particularly true in countries with lower interest rates, where banks find it advantageous to raise funds through debt instead of equity, thus enhancing shareholder returns. However, the benefits of leveraging are not linear. Excessive reliance on debt can lead to increased financial risk, which erodes ROE over time, as noted by [3] in his study.

In contrast, ROA, which measures a bank's ability to generate returns from its total assets, tends to decrease with higher debt levels. According to [13], debt increases the cost of capital and puts pressure on the efficient use of assets, ultimately lowering

ROA. Their research on banks in Saudi Arabia demonstrates that while short-term profitability (ROE) may increase with higher leverage, the long-term efficiency of asset utilization (ROA) declines as financial constraints tighten due to higher debt-servicing costs. This reinforces the notion that profitability, as indicated by ROE, may rise initially with debt-financed growth, but ROA suffers due to reduced operational flexibility and increased financial burden.

The structure of the banking sector in Arab countries, particularly the dominance of oil revenues and government intervention, further complicates the capital structure-profitability relationship. Islamic banks, for instance, often exhibit a different pattern. [14] found that Islamic banks, which rely predominantly on equity financing to comply with Shariah principles, maintain a more stable ROA compared to conventional banks. However, their ROE is typically lower because they do not benefit from tax shields associated with debt financing. This trade-off is evident across many studies comparing Islamic and conventional banks in the Middle East and North Africa (MENA) region, where profitability metrics like ROE and ROA behave differently based on capital structure and compliance with religious financial norms.

Moreover, macroeconomic factors such as oil price volatility and political instability in the region also play a role in shaping the profitability-capital structure relationship. For instance, [15] argue that in oil-rich economies like the Gulf Cooperation Council (GCC) countries, capital structures are more flexible due to abundant liquidity from government oil revenues, allowing banks to maintain higher levels of debt without significantly impacting profitability indicators like ROE. However, in countries with less economic diversification, banks face more constraints in managing their capital structures, which in turn affects their ROA and overall financial health [5].

In summary, the capital structure of banks in Arab nations plays a complex role in determining profitability. While leverage can initially enhance ROE by allowing banks to take advantage of cheaper debt financing, the long-term effects on ROA are often negative due to the increased financial burden and risks associated with higher debt levels. Banks that maintain a balanced approach to capital structure—optimizing the use of both debt and equity—are more likely to sustain profitability in the long run, as supported by empirical studies across the MENA region [16].

2.2.2. Capital structure and bank stability

Bank stability is closely linked to how a bank structures its capital, particularly in terms of the ratio between debt and equity. Stability, in this context, refers to the bank's ability to withstand economic shocks, maintain solvency, and avoid financial distress. A well-structured capital base provides a buffer against losses, which is particularly relevant for banks in Arab nations that face both domestic and global economic challenges, such as fluctuations in oil prices and political uncertainty. The capital structure plays a key role in ensuring long-term financial health, risk management, and the avoidance of crises.

One of the primary ways in which capital structure influences bank stability is through the level of debt. High levels of leverage can increase a bank's vulnerability to external shocks, as more debt leads to higher interest obligations and a greater risk of insolvency. This is especially true during economic downturns, when profits are reduced, and banks with high leverage may struggle to meet their debt commitments. Empirical evidence from [17] indicates that in the MENA region, banks with higher debt-to-equity ratios are more prone to instability, especially during times of financial crisis or macroeconomic instability.

On the other hand, equity financing provides a cushion against such risks. Banks with higher equity capital are better positioned to absorb losses, making them more stable during periods of economic uncertainty [18]. A robust equity base not only enhances stability but also inspires greater confidence among depositors and investors, which can reduce the likelihood of bank runs. In Arab countries, particularly in the Gulf region, this stability is essential given the economic dependence on volatile oil revenues. Banks in these regions that maintain a higher proportion of equity capital have been observed to weather oil price shocks and political risks more effectively than those with more leveraged capital structures [18].

Islamic banks, which rely more on equity than conventional debt instruments, often display more stability, especially during economic crises. Unlike conventional banks, which use interest-based debt financing, Islamic banks adhere to profit-sharing mechanisms that limit their exposure to interest rate fluctuations and excessive leverage [19,20]. As a result, Islamic banks tend to have stronger balance sheets and greater resilience in times of financial turbulence, which is a critical factor in the overall stability of the banking sector in countries like Saudi Arabia, the UAE, and Kuwait.

Another critical aspect is the regulatory environment governing capital structure in Arab nations. Central banks in these countries often impose capital adequacy requirements that mandate a minimum level of equity relative to a bank's risk-weighted assets. For example, the Basel III regulations, which have been adopted in many Arab countries, require banks to hold a certain amount of equity capital to safeguard against potential losses. Studies by [21] reveal that banks that comply with these regulatory capital requirements tend to exhibit greater financial stability and are less likely to experience distress or failure during periods of market volatility. This regulatory focus on capital adequacy underscores the importance of capital structure in maintaining bank stability. The interplay between capital structure, profitability, and stability is further demonstrated by the relationship between ROE and financial risk. As banks increase their leverage to boost ROE, they inadvertently heighten their risk exposure, which can undermine stability if not managed carefully. An excessively high ROE achieved through heavy borrowing may reflect an unsustainable capital structure that could lead to financial instability in the long run. Research by [22] confirms that banks in the Arab region that pursue aggressive ROE targets often face a greater risk of instability due to their higher reliance on debt compared to those that maintain a balanced capital structure with moderate ROE levels.

Therefore, capital structure plays a crucial role in determining the stability of banks in Arab nations. While debt can enhance profitability in the short term by increasing ROE, it also introduces significant risks that can threaten bank stability during economic downturns. Conversely, a higher proportion of equity financing provides a stronger foundation for long-term stability, enabling banks to absorb losses and navigate financial shocks more effectively. Regulatory frameworks, particularly those aligned with Basel III, further reinforce the importance of capital adequacy in promoting bank stability across the region [21,23].

The relationship between capital structure and risk management also has implications for regulatory compliance and overall financial stability. Banks with higher debt ratios may struggle to meet regulatory capital requirements, particularly during periods of economic downturn when profits decline and non-performing loans rise. Research by [24] indicates that Arab banks with high leverage are more likely to face regulatory challenges, as their capital buffers are often insufficient to cover potential losses during periods of financial stress. This underscores the importance of maintaining an optimal balance between debt and equity to ensure both profitability and risk management. The capital structure of banks in Arab nations plays a crucial role in risk management. While debt financing can enhance profitability by increasing ROE, it also introduces significant financial risks, particularly in terms of credit and market exposure. Equity financing, by contrast, offers a buffer against losses, enhancing the bank's ability to manage risks effectively. Regulatory frameworks, such as Basel III, further reinforce the need for a balanced capital structure to mitigate risk and maintain financial stability, especially in the volatile economic environments typical of the Arab region [25].

The relationship between bank size, capital structure, and profitability is also significant in the context of Return on Assets (ROA) and Return on Equity (ROE). While larger banks may enjoy higher ROE due to their leverage, their ROA tends to be lower because the increased debt reduces the efficiency of asset utilization. A comparative study by [13] found that while large banks in Saudi Arabia and the UAE exhibited higher ROE, their ROA was often lower compared to smaller banks. This suggests that while leverage enhances returns for shareholders, it may diminish overall operational efficiency. Smaller banks, with more conservative capital structures, tend to have higher ROA, as their focus on equity financing and lower debt levels enables them to utilize their assets more effectively.

Another important aspect of the capital structure-bank size relationship is the ability of large banks to engage in diversification. Larger banks have the advantage of operating in multiple sectors and regions, allowing them to spread risk across different asset classes. This diversification reduces their reliance on any single source of revenue and helps mitigate the impact of financial shocks. In a study on the GCC banking sector, Khan [2] found that larger banks were better able to diversify their portfolios and manage risks associated with capital structure, which allowed them to maintain stability even during periods of economic downturn. Smaller banks, by contrast, were often more exposed to localized risks, making their capital structures more sensitive to regional economic fluctuations.

In conclusion, bank size plays a critical role in determining the capital structure of banks in Arab nations. Larger banks tend to rely more on debt financing, which enhances their ROE but increases financial risk, especially during economic downturns. Smaller banks, by contrast, adopt more conservative capital structures with higher equity ratios, which provide greater stability but may limit profitability. Regulatory frameworks like Basel III further shape the relationship between bank size and capital structure, as larger banks must navigate stricter capital adequacy requirements. The relationship between capital structure, bank size, and profitability, particularly in terms of ROA and ROE, highlights the trade-offs that banks face in balancing risk, efficiency, and returns [9].

3. Methodology

3.1. Data sources and description

The capital structure-bank performance nexus has not garnered minimal attention in the Arab nations—focusing on Morocco—as expected, while the bank's efficiency contributes positively to economic growth and sustainability. By the end of 2022, there are almost 90 financial institutions comprising 19 banks, five (2) participatory banks, 29 finance companies, 6 offshore banks, 11 microcredit associations, 18 payment institutions, the Deposit and Management Fund (CDG), and the Central Guarantee Fund (CCG) (www.bkam.ma), and 34 percent of these institutions are listed on the Casablanca Stock Exchange (CSE)—six (6) banks and four (4) financing companies—by 2022 (www.trade.gov). Hence, for reliable, meaningful, and updated results, data from 2010 to 2023 for four (4) of the six (6) banks were extracted for this study, as only banks with consistently audited records were considered and were therefore selected. Thus, by nature, it is a panel data of four (4) banks—cross-sectional units—for a range of 14 years—time series.

The study empirically examines how capital structure has impacted banks' performance in Morocco; thus, the explained (problem) variable is bank performance, which has been captured and proxied with return on asset (ROA) see [24,26,27,28]) and return on equity (ROE) see [27,29]. The former gives a picture of how effective the management of the bank is in generating profits with its available assets, while the latter measures how effectively shareholders' funds are being used by the management of the bank [24]. Since this study focuses on the banking industry, we employ before-tax figures rather than after-tax figures, as tax rates may vary across the banks due to the non-performance of allied factors such as an ownership structure to compute the ROA and ROE [26,30,31]. Furthermore, the explanatory variable—capital structure—was measured with debt financing see [32–34], equity financing see [31,32,35], debt-to-equity ratio, firm size, and firm growth.

3.2. Estimation technique

A study of this magnitude must conduct the time series properties in the panel data (although it is not a criterion for a static panel) to determine the stationary state of the series. Thus, we resort to the first-generation stationarity tests, assuming that all of the cross-sections are independent, as is the case among the banks using the Levin, Lin, and Chu (LLC) and Im, Pesaran, and Shin (IPS) and the Breitung unit root test. The starting point for the LLC test is the regression model:

$$\Delta y_{it} = \phi y_{i,t-1} + z_{it}'\gamma_i + \sum_{j=1}^{p_i} \theta_{ij}\Delta y_{i,t-j} + u_{it} \tag{1}$$

LLC assumes the error term is independently distributed across panels and follows a stationary invertible process so that with sufficient lags of Δy_{it} in Equation (1), u_{it} will be white noise with potential heterogenous variance across panels. With the lag orders, p_i, the test obtained the orthogonalized residuals using the panel OLS:

$$\hat{e}_{it} = \Delta y_{it} - \sum_{j=1}^{pi} \hat{\theta}_{ij}\, \Delta y_{it} - z'_{it}\hat{\gamma}_i \tag{2}$$

$$\hat{\upsilon}_{i,t-1} = y_{i,t-1} - \sum_{j=1}^{pi} \tilde{\theta}_{ij}\, \Delta y_{it} - z'_{it}\tilde{\gamma}_i \tag{3}$$

For panel-level heterogeneity, we compute:

$$\tilde{e}_{it} = \frac{\hat{e}_{it}}{\hat{\sigma}_{\in i} \text{ and } \tilde{\upsilon}_{i,t-1} = \frac{\hat{\upsilon}_{i,t-1}}{\hat{\sigma}_{\in i}}}$$
$$\hat{\sigma}^2_{\in i} = \frac{1}{T - pi - 1} \sum_{t=pi}^{T} \left(\hat{e}_{it} - \hat{\delta}_i \hat{\upsilon}_{i,t-1}\right)^2 \tag{4}$$

and $\hat{\delta}_i$ is the OLS coefficient from a regression of $\hat{e}_{it}$ and $\hat{\upsilon}_{i,t-1}$. The adjusted test statistic is computed as:

$$t^*_\delta = \frac{t_\delta - N\tilde{T}\hat{S}_{N^{se}(\hat{\delta})\mu^*_{\tilde{T}}}}{\sigma^*_{\tilde{T}}} \tag{5}$$

where $\mu^*_{\tilde{T}}$ and $\sigma^*_{\tilde{T}}$ are obtained by linearly interpolating the values in LLC. t^*_δ is asymptotic $N(0,1)$, with very negative values casting doubt on H_0. If no constant is specified, the asymptotic properties hold as $\frac{\sqrt{N}}{T} \to \infty$. Otherwise, T must grow at a faster rate so that $\frac{N}{T} \to \infty$.

The study adopts the empirical modeling of [26], where bank performance (BP) is proxied with ROA and ROE for the bank i in year t, thus:

$$bp_{it} = f(ef_{it}, def_{it}, fz_{it}, gro_{it})$$
$$bp_{it} = \delta_0 + \delta_1 ef_{it} + \delta_2 def_{it} + \delta_3 fz_{it} + \delta_4 gro_{it} + \varepsilon_{it} \tag{6}$$

Since ROA and ROE are used to measure bank performance, Equation (6) can be expressed further as an expected relationship. Consequently, the objectives are captured by specifying the static panel model for the nexus between capital structure and banks' performance as:

$$\Delta bp_{it} = \theta + \delta_i X_{i,t-1} + \varepsilon_{it} \tag{7}$$

where bp_{it} denotes bank performance—either return on asset or return on equity—making up two regression panels A and B, expressed in natural logs for bank *i* over a specified period *t*; X_{it} is a $k \times 1$ vector of the explanatory variables; θ_i is the intercept and ε_{it} connotes a stochastic disturbance term.

4. Empirical result, findings and discussions

From **Table 1**, the return on equity (ROE) has a mean value of 10.789% across the four banks sampled with a standard deviation of 9.733%, suggesting that on average, during the entire 14 years of the study, the return on equity across these banks was 10.789%. Furthermore, through the skewness and kurtosis, it was shown that ROE was positively skewed to the right, depicting a long right tail with a platykurtic peakedness, meaning that the distributions are stable and predictable in the sense that there will be extreme outliers in the return on equity values and the series is not normally distributed during the study period.

Table 1. Descriptive statistics.

	Mean	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Probability	Obs
ROA	2.1550	1.8276	1.2095	6.8262	51.2285	0.0000	48
ROE	10.7875	9.7328	0.2730	1.6022	5.6295	0.0599	48
DER	1.0568	0.6972	0.8286	2.5938	7.2790	0.0263	48
EF	0.2286	0.2639	−0.3564	3.9588	3.5687	0.1679	48
FZ	4.2811	4.3643	−1.4517	5.4152	35.6557	0.0000	48
GRO	7.4093	6.1085	0.5969	1.7556	7.4344	0.0243	48

Source: Authors' Compilation.
Notes: ROA = return on asset (%), EF = equity finance (million naira); DER = debt equity ratio (%); FZ = firms size (natural log); GRO = growth ratio of the banks.

Also from **Table 1**, the return on assets measured in percentage has an average value of 2.155%. Meanwhile, the standard deviation of 1.88% suggests that the return on assets of the selected banks in Morocco is less exposed to fluctuations and volatility. Furthermore, through the skewness and kurtosis, it was shown that ROA was positively skewed to the right, depicting a long right tail with a leptokurtic peakedness, and the series was not normally distributed during the study period. The debt-to-equity (DER) has a mean value of 1.057%, depicting that on average, during the study periods, the selected insurance companies' debt-to-equity was 1.057%, with a dispersion of 0.697%, establishing that the volatility in the selected banks' debt-to-equity was still manageable, as it clustered around the average value, suggesting that the debt-to-equity is less susceptible to change over time. Additionally, the DER skewed positively, depicting a right positive skew of a long right tail and platykurtic peakedness, showing that debt-to-equity extreme value characteristics are similar to those of the normal distribution, as the insignificant Jacque-Bera statistics established that the series is normally distributed.

Equity finance (EF) has a mean value of 0.29% with a dispersion of 2.63% and is more susceptible to change over time. Meanwhile, the EF skewness was negatively skewed to the left, and its peakedness was platykurtic, with the series normally distributed during the study period. Furthermore, in the explanatory variables corner, the growth ratio (GRO) has a mean value of 7.409 with a 6.109 standard deviation over the sample period. Furthermore, GRO skewed positively, and its peakedness was platykurtic, as the GRO series is not normally distributed.

Correlation among the variables

To understand the linear relationship among the variables in the study, we carried out correlation checks. This analysis also shows the extent of multicollinearity among the models' explanatory variables, which can provide initial indications concerning the efficiency of the estimators used in the study.

Table 2. Correlation matrix.

	DER	EF	FZ	GRO	VIF	1/VIF
DER	1.00				3.46	0.29
EF	0.53	1.00			2.64	0.38
FZ	0.34	0.29	1.00		2.14	0.47
GRO	0.23	−0.49	0.16	1.00	2.00	0.50
Mean VIF					2.56	

Source: Authors' compilation.

Table 2 presents the correlation matrix of the explanatory variables in the model. A cursory view of the correlation matrix contained shows that there is a lower correlation coefficient between each of the explanatory variables in pairs, and since the coefficients of correlation are less than 0.80, either positive or negative, then there is no severe problem of collinearity or multicollinearity among the independent variables used in this study. We further establish the absence of multicollinearity among the variables via the tolerance level (TOL)—which represents the percentage of unaccounted variance in one explanatory variable by other explanatory variables—and the Variance Inflation Factor (VIF)—the reciprocal of the tolerance level (TOL) measures the degree by which the standard errors are inflated due to the presence of multicollinearity. The TOL in the regression model is expressed as:

$$TOL = 1 - R^2 \quad (8)$$

A lower tolerance level below 0.10 indicates the presence of multicollinearity; hence, a tolerance level above 0.10 is preferred. On the other hand, the variance inflation factor (VIF) is expressed as:

$$VIF = \frac{1}{(1 - R^2)} \quad (9)$$

From **Table 2**, the mean value of the VIF is 2.56 indicating that the standard errors are inflated by 2.56 degrees which signifies the absence of multicollinearity.

Table 3. Panel stationary test.

	Breitung		LLC		IPS	
Variable	**I (0)**	**I (1)**	**I (0)**	**I (1)**	**I (0)**	**I (1)**
ROA	−0.77	−2.66***	2.25	2.51**	−0.33	−2.47**
ROE	−1.08	−3.02***	−3.43***	−2.25**	−1.81*	−2.95**
DER	−0.18	−2.93***	0.53	−1.93**	0.46	−2.84***
EF	−1.38*	−3.20**	6.35	1.19***	−3.10***	−3.98***
FZ	−3.85***	−2.74***	−3.02***	−2.44***	−4.19***	−3.15***
GRO	2.41	−4.27***	−0.82***	2.99**	−3.38***	−3.20***

Source: Authors' compilation.
Notes: * Significant at 10%; ** significant at 5%; *** significant at 1%.

A prerequisite for robust time series estimation is establishing the underlying properties of the series, which involves testing for the existence of unit roots to avoid spurious regression. Three unit root tests were employed to establish the panel stationarity order. The unit root utilised was the Levin, Lin and Chu (LLC) and Im, Pesaran and Shin (IPS) and the Bretiung unit root test. In the unit root results in **Table 3**, it can be seen under the Breitung test that all the variables were stationary at first difference except EF and FZ, which were at level. Meanwhile, under the LLC, ROE, FZ, and GRO were stationary without differencing, while others became stationary at the first difference. Finally, IPS unit root results show that ROE, EF, FZ, and GRO were stationary at level, while others became stationary at first difference. It should be of note that the unit root is not a criterion for performing static panel data analysis; hence, the non-stationarity does not have any adverse effect on the estimated result.

To decide on the appropriate estimation techniques for result interpretation, the outcome of the various diagnostic tests of cross-sectional dependence, Testparm, Breusch-Pagan LM, and the Hausman test is essential. The Pesaran CSD test shows cross-sectional independence among the independent variables; the testparm shows a preference for the fixed effect model (FEM), while the Breusch-Pagan LM test with chi-square favors the random effect model (REM) as the preferred estimator, while the Hausman test prefers FEM as the appropriate estimator (see **Table 4**, Panel A). However, the Modified Wald Test for Heteroskedasticity signals that the error term's variance is not constant, and the Woodridge Test for Autocorrelation shows serial correlation, as illustrated in **Table 4** Panel A.

Table 4. Capital structure and performance of banks in Morocco.

	Panel A (roe)				**Panel B (roa)**			
Var	OLS	FEM	REM	FGLS	OLS	FEM	REM	FGLS
C	−1.756 (1.707)	−0.497 (3.834)	−1.756 (1.707)	−1.974 (1.492)	0.577 (0.481)	−0.097* (1.140)	0.577 (0.481)	0.619 (0.411)
der	2.740** (0.945)	−4.192*** (1.116)	2.740*** (0.945)	−2.528*** (0.966)	0.441 (0.266)	−0.024 (0.332)	0.441* (0.266)	−0.192* (0.262)
ef	1.102** (1.616)	0.821 (0.5965)	1.102*** (0.162)	1.091*** (0.207)	0.153*** (0.046)	0.320* (0.177)	0.153* (0.046)	0.167*** (0.037)
fz	0.020 (0.142)	−0.002 (0.017)	0.019 (0.014)	0.021 (0.019)	−0.002 (0.004)	−0.002 (0.005)	−0.002 (0.004)	−0.004* (0.002)
gro	6.293** (1.397)	6.2925 (1.3965)	0.045*** (0.013)	8.955*** (2.674)	0.223 (0.879)	0.029* (0.013)	1.110 (0.747)	1.174** (0.725)
Obs.	48	48	48	48	48	48	48	48
Id	4	4	4	4	4	4	4	4
R^2	0.663	0.732	0.663	0.806	0.2405	0.328	0.241	0.491
$\bar{R}^2$	0.645	0.696	0.645	0.780	0.1999	0.237	0.200	0.422
F-stat (prob)	36.67 (0.00)	8.77 (0.000)	110.02 (0.00)	74.34 (0.00)	5.91 (0.001)	1.45 (0.239)	110.02 (0.000)	21.67 (0.000)
Diagnostic Test								
Testparm		1.017(0.31)			0.56 (0.56)			
BP-LM		7.90 (0.00)	-	-	1.45 (0.24)	-	-	
Hausman		-	0.00 (1.00)	-	-	0.0 (1.00)	-	
Modified-Wald		36.4 (0.00)	7.84 (0.05)	-	160.6(0.00)	7.5 (0.02)	-	
Wooldridge		8.28(0.05)	-	AR (0.36)	2.57 (0.18)	-	-	AR (0.31)

Source: Authors' compilation.

Notes: OLS: ordinary least squares, FEM: Fixed effect model, REM: Random effect model, FGLS: feasible generalized least square. Statistics ***, ** and * indicate significance at 1%, 5% and 10%, respectively.

Furthermore, in **Table 4** Panel B, the Pesaran CSD test indicated cross-sectional independence among the independent variables; the testparm has an F-statistic that supports OLS, while Breusch-Pagan LM and Hausman tests favor FEM as the preferred estimator. However, the Modified Wald Test and Woodridge Test for Autocorrelation portray the presence of heteroscedasticity and the absence of autocorrelation, respectively. Finally, in the event of heteroscedasticity, the Feasible Generalized Least Squares (FGLS) technique, which controls for heteroscedasticity, is used, as it can simultaneously handle heteroscedasticity and serial correlation issues present in the model [33,36].

From the FGLS results presented in **Table 4** (Panel A), there is evidence that equity finance and growth ratios of the banks individually have a significant positive influence on return on equity, while debt on equity was inverse, as increases in EF and GRO will lead to an increase in the return on equity; hence, DER, EF, and GRO are significant factors influencing changes in ROE of the selected banks in Morocco. This aligns with the submissions of [18,37]. Furthermore, the results also show that the firm size (FZ), although it positively impacted return on equity, is not a significant one as against the establishment of [31]; hence, the firm's size is not a significant factor influencing return on equity (ROE). It could also be ascertained from **Table 4** Panel A that the variations in the explained variable—return on equity—were explained by the explanatory variables by 77.96%, as the remaining variations in the return on equity are explained by other factors not present in the model but captured with the error term in the model. The model's overall fit is indicated by the Wald test, which tests the null hypothesis that all coefficients in the model are zero. In this case, the Wald test is significant, indicating that the model as a whole is a good fit for the data. Alternatively, the Wald test statistic implies that the independent variables are jointly significant factors influencing changes in return on equity of the selected banks in Morocco.

Additionally, from **Table 4** Panel B, there is evidence that all the explanatory variables exhibited individual significance and a positive nexus with return on assets, except for firm size, which depicted a significant negative impact, implying that increases in these variables—DER, EF, and GRO—will lead to an increase in return on assets, while the increase in FZ will decrease ROA, ceteris paribus, making them significant factors that could trigger changes in return on assets of the selected banks in Morocco. This upholds the findings of [38–40]. The model's overall fit indicated by the Wald test is significant, indicating that the model as a whole is a good fit for the data. Alternatively, the Wald test statistic implies that all the explanatory variables are jointly significant factors influencing changes in return on assets of the selected banks in Morocco. Further findings from **Table 4** panel B established from the estimates are the adjusted R^2 ($\bar{R}^2 = 0.722$), which is the evidence that the variations in the dependent variable were explained by the explanatory variables by 72.2%. The remaining variations in the return on assets are explained by other factors not present in the model but captured with the error term in the model.

5. Conclusion and policy recommendations

By considering the data of 4 banks from 2010–2023, this study empirically examined the impacts of capital structure on the performance of banks operating in the Arab nation—Morocco—using the FGLS technique. The results indicate that all capital structure variables, viz. EF and GRO, have significant positive impacts on ROE, while DER has a negative impact, which is compatible with the conclusions. It was also found that EF and GRO have significant positive impacts on ROA, while DER and FZ negatively impact ROA. Therefore, we conclude that there are significant mixed impacts of capital structure on the performance of Moroccan banks. These mixed impacts can be explained by the characteristics of the undeveloped bond and equity market in Morocco, such as information asymmetry, strong covenants of debt, and so on, for which there exists a high cost of debt. This study thereby suggests that financial managers should try to finance from retained earnings rather than relying heavily on debt capital in their capital structure. However, they can employ debt capital as the last resort. To maximize the banks' performance, the managers should make an effort to attain an optimal level of capital structure and endeavor to uphold it as much as possible. These negative impacts also suggest that the legislative rules and policies have to be designed in such a way as to assist firms in sharply reducing their reliance on too much use of debt.

Although we observed significant negative impacts of capital structure choice on the performance of the sampled banks, banks should maintain a low proportion of debt finance relative to equity finance and ensure the efficient utilization of acquired financial resources to enhance their performance levels. Banks should adopt measures that promote debt financing and ensure adequate utilization of funds since this will enhance performance. The absence of macroeconomic variables, including but not limited to government regulations, inflation, GDP, political stability, and other factors specific to banks, constitutes the limitation of this research. Further investigation is warranted to fill these deficiencies through the inclusion of macroeconomic variables that were omitted from this analysis.

Authors contributions: Conceptualization, MOA, PHK and GOA; methodology, PHK; validation, GOA; formal analysis, PHK; investigation, MOA; resources, MOA and GOA; writing—review and editing, PHK; project administration, MOA. All authors have read and agreed to the published version of the manuscript.

Institutional review board statement: Not applicable.

Informed consent statement: Not applicable.

Conflict of interest: The authors declare no conflict of interest.

References

1. Lachaari M, Benmahane M. The Capital Structure Impact on Banking Financial Performance: Evidence from Morocco. Journal of Entrepreneurship & Business. 2022; 3(2): 62-67. doi: 10.24123/jeb.v3i2.4965
2. Khan S. The impact of capital structure on bank performace in emerging markets; empirical evidence from GCC countries. Financial Internet Quarterly. 2022; 18(1): 56-65. doi: 10.2478/fiqf-2022-0005
3. Al Omari R. The Impact of Capital Structure on Jordanian Banks Performance. Journal of Social Sciences (COES&RJ-JSS). 2021; 10(1): 35. doi: 10.25255/jss.2021.10.1.35.47
4. Zaiane S, Moussa FB. What Drives Banking Profitability During Financial Crisis and Political Turmoil? Evidence from the MENA Region. Global Journal of Emerging Market Economies. 2021; 13(3): 380-407. doi: 10.1177/09749101211031102.

5. Imas Iyoha AO, Ohiokha G, Umoru D, et al. Target capital structure for managerial decision making: Dynamics and determinants. Investment Management and Financial Innovations. 2022; 19(3): 322-334. doi: 10.21511/imfi.19(3).2022.27
6. Modigliani F, Miller MH. The Cost of Capital, Corporation Finance and the Theory of Investment. The American Economic Review; 1958.
7. Begum H, Rimu S, Ara J. Impact of capital structure on bank performance: a study on janata bank limited of bangladesh. Journal of Science and Technology. 2022; 20(2): 92-99. doi: 10.59125/jst.20211
8. Akkas E, Asutay M. The impact of intellectual capital formation and knowledge economy on banking performance: a case study of GCC's conventional and Islamic banks. Journal of Financial Reporting and Accounting. 2022; 21(5): 1149-1170. doi: 10.1108/jfra-08-2021-0251
9. Zahid A, Das Gupta C, Hidayah R, et al. Impacts of Capital Structure on Performance of Islamic and Conventional Banks: Evidence from Bangladesh. International Journal of Research and Innovation in Social Science. 2022; 06(01): 539-544. doi: 10.47772/ijriss.2022.6130
10. Acharya A, Nepal B, Kafle AR. Exploring Higher Capital Requirements in Nepal Under Basel III: A Qualitative Approach. International Journal of Qualitative Research. 2023; 2(3): 195-205. doi: 10.47540/ijqr.v2i3.755
11. Pyka I, Nocoń A. Bank Risk Capital and Its Effectiveness in Selected Euro Area Banking Sectors. Journal of Risk and Financial Management. 2021; 14(11): 555. doi: 10.3390/jrfm14110555
12. Pham NH, Hoang TM, Pham NTH. The impact of capital structure on bank profitability: evidence from Vietnam. Cogent Business & Management. 2022; 9(1). doi: 10.1080/23311975.2022.2096263
13. Khan S, Bashir U, Islam MdS. Determinants of capital structure of banks: evidence from the Kingdom of Saudi Arabia. International Journal of Islamic and Middle Eastern Finance and Management. 2020; 14(2): 268-285. doi: 10.1108/imefm-04-2019-0135
14. Sobol I, Dopierała Ł, Wysiński P. Is the profitability of Islamic and conventional banks driven by the same factors?—A study of banking in the Middle East. Özen E, ed. PLOS ONE. 2023; 18(8): e0289264. doi: 10.1371/journal.pone.0289264
15. Li Q, Chen H. The impact of debt financing on bank profitability: Evidence from a panel of international banks. International Journal of Finance and Economics. 2023.
16. Kılıç M, Aydıngülü Sakalsız S. Analysis of the validity of trade-off and pecking order theories in capital structure decisions of sustainable companies. Kahramanmaraş Sütçü İmam Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi. 2023; 13(2): 29-46. doi: 10.47147/ksuiibf.1379933
17. Shahriar A, Mehzabin S, Azad MAK. Diversification and bank stability in the MENA region. Social Sciences & Humanities Open. 2023; 8(1): 100520. doi: 10.1016/j.ssaho.2023.100520
18. Mabkhot H, Al-Wesabi HAH. Banks' Financial Stability and Macroeconomic Key Factors in GCC Countries. Sustainability. 2022; 14(23): 15999. doi: 10.3390/su142315999
19. Hakimi A, Boussaada R, Karmani M. Are financial inclusion and bank stability friends or enemies? Evidence from MENA banks. Applied Economics. 2021; 54(21): 2473-2489. doi: 10.1080/00036846.2021.1992342
20. Hoque H, Liu H. Capital structure of Islamic banks: How different are they from conventional banks?. Global Finance Journal. 2022; 54: 100634. doi: 10.1016/j.gfj.2021.100634
21. Daoud Y, Kammoun A. Financial stability and bank capital: the case of islamic banks. International Journal of Economics and Financial Issues. 2020; 10(5): 361-369. doi: 10.32479/ijefi.10147
22. Mimouni K, Temimi A, Goaied M, et al. The Impact of Liquidity on Debt Maturity After a Financial Crisis: Evidence from the Gulf Cooperation Council Region. Emerging Markets Finance and Trade. 2018; 55(1): 181-200. doi: 10.1080/1540496x.2018.1425835
23. Masera R, Mazzoni G. On the non-neutrality of the financing policy and the capital regulation of banking firms. Studies in Economics and Finance. 2016; 33(4): 466-487. doi: 10.1108/sef-09-2014-0179
24. Siddik MNA, Kabiraj S, Joghee S. Impacts of Capital Structure on Performance of Banks in a Developing Economy: Evidence from Bangladesh. International Journal of Financial Studies. 2017; 5(2): 13. doi: 10.3390/ijfs5020013
25. Rahman MT. Testing trade-off and pecking order theories of capital structure: evidence and arguments. International Journal of Economics and Financial Issues. 2019; 9(5): 63-70. doi: 10.32479/ijefi.8514
26. Albart N, Purnomo H. The Influence of Asset Structure and Capital Structure on Return on Assets. Kontigensi: Jurnal Ilmiah Manajemen. 2024; 12(1): 269-282. doi: 10.56457/jimk.v12i1.536
27. Simanullang CD, Edward YR, Ginting RR, et al. The effect of return on assets (roa) and return on equity (roe) on company

value with capital structure as moderating variables in banking companies listed on the indonesia stock exchange. International Journal of Business, Economics and Law. 2021.
28. Surjandari DA, Nurlaelawati L, Soma AM. Asset, capital structure, liquidity, firm size's impact on stock return. International Journal of Commerce and Finance. 2020.
29. Gill A, Biger N, Mathur N. The effect of capital structure on profitability: Evidence from the United States. International journal of management. 2011.
30. Salim M, Yadav R. Capital Structure and Firm Performance: Evidence from Malaysian Listed Companies. Procedia-Social and Behavioral Sciences. 2012; 65: 156-166. doi: 10.1016/j.sbspro.2012.11.105
31. Gikombo EM, Mbugua D. Effect of select macro-economic variables on performance of listed commercial banks in Kenya. International Academic Journal of Economics and Finance. 2018.
32. Okeahalam CC. Foreign Ownership, Performance and Efficiency in the Banking Sector in Uganda and Botswana. Studies in Economics and Econometrics. 2004; 28(1): 89-117. doi: 10.1080/10800379.2004.12106362
33. Chen J, Jiang C, Lin Y. What determine firms' capital structure in China?. Managerial Finance. 2014; 40(10): 1024-1039. doi: 10.1108/mf-06-2013-0163
34. Hang M, Geyer-Klingeberg J, Rathgeber AW, et al. Measurement matters—A meta-study of the determinants of corporate capital structure. The Quarterly Review of Economics and Finance. 2018; 68: 211-225. doi: 10.1016/j.qref.2017.11.011
35. Lemmon ML, Zender JF. Debt Capacity and Tests of Capital Structure Theories. Journal of Financial and Quantitative Analysis. 2010; 45(5): 1161-1187. doi: 10.1017/s0022109010000499
36. Chang C, Lee AC, Lee CF. Determinants of capital structure choice: A structural equation modeling approach. The Quarterly Review of Economics and Finance. 2009; 49(2): 197-213. doi: 10.1016/j.qref.2008.03.004.
37. Chadha S, Sharma AK. Determinants of capital structure: an empirical evaluation from India. Journal of Advances in Management Research. 2015; 12(1): 3-14. doi: 10.1108/jamr-08-2014-0051
38. Danisman GO, Demir E, Zaremba A. Financial resilience to the covid-19 pandemic: the role of banking market structure. Applied Economics. 2021; 53(39): 4481-4504. doi: 10.1080/00036846.2021.1904118
39. Kovacova M, Krajcik V, Michalkova L, et al. Valuing the Interest Tax Shield in the Central European Economies: Panel Data Approach. Journal of Competitiveness. 2022; 14(2): 41-59. doi: 10.7441/joc.2022.02.03
40. Rao PK, Shukla A. Strategic sustainability in Indian banking industry: a performance analysis. International Journal of Productivity and Performance Management. 2023; 73(6): 2016-2034. doi: 10.1108/ijppm-04-2023-0199.