THE IMPACT OF CAPITAL STRUCTURE ON BANK PERFORMANCE IN TÜRKİYE

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Abstract

The aim of this study is to examine the impact of capital structure on Turkish banking performance by using a panel regression model for the period between 2012 and 2023. The ratios of return on assets (ROA) and return on equity (ROE) are used as dependent variables, which are two of the important indicators of banking performance. There are 9 bank-specific and 2 macroeconomic (inflation and economic growth) independent variables in the analysis. Panel data analysis results reveal that the capital structure [Debt ratio (DTA) and Debt-to-equity ratio (DTE)] negatively impacts business performance (ROA) of Turkish private deposit banks. The financial performance, which is measured by ROA, is significantly and negatively associated with variables such as Non-Performing loan ratio (NPL), credit risk (CIR) and cost management (OA), whereas the effect of bank size (BS), economic growth (GDP) and inflation (INF) have positive impact. On the other hand, the effects of DTA, DTE, BS, NPL, CIR, OA and GDP on ROE are significant. Besides, the effects of DTA, BS and GDP are positive, whereas the effects of DTE, NPL, CIR and OA are negative. The study concludes that the capital structure proxies have an impact on the financial performance of Turkish private deposit banks measured both by return on assets and return on equity.

Keywords: *Capital structure, Bank profitability, Banking performance, Bank capital, Leverage, Panel data analysis.*

TÜRKİYE'DE SERMAYE YAPISININ BANKA PERFORMANSINA ETKİSİ

Öz

Bu çalışmanın amacı, 2012-2023 dönemi için panel regresyon modelini kullanarak sermaye yapısının Türk Bankacılık Sektörü performansı üzerindeki etkisini incelemektir. Çalışmada bankacılık performansının önemli göstergelerinden biri olan aktif getirisi (ROA) ve öz sermaye getirisi (ROE) oranı bağımlı değişken olarak kullanılmıştır. Analizde 9 banka özelinde ve 2 makroekonomik (enflasyon ve ekonomik büyüme) bağımsız değişken bulunmaktadır. Panel veri analizi sonuçları, sermaye yapısının [Borçlanma oranı (DTA) ve Borç-özkaynak oranı (DTE)] Türk özel mevduat bankalarının iş performansını (ROA) negatif yönde etkilediğini göstermektedir. ROA ile ölçülen finansal performans Takipteki krediler oranı (NPL), kredi riski (CIR) ve maliyet yönetimi (OA) gibi değişkenlerle anlamlı ve negatif ilişkiliyken; banka büyüklüğü (BS), ekonomik büyüme (GSYİH) ve enflasyona (INF) etkisi pozitiftir. Diğer taraftan DTA, DTE, BS, NPL, CIR, OA ve GSYİH'nin ROE üzerindeki etkileri anlamlıdır. DTA, BS ve GDP'nin etkileri pozitif iken; DTE, NPL, CIR ve OA'nın etkisi negatiftir. Çalışmada, sermaye yapısı değişkenlerinin hem varlık getirisi hem de öz sermaye getirisi ile ölçülen Türk mevduat bankalarının finansal performansı üzerinde etkisi olduğu sonucuna varılmıştır.

Anahtar kelimeler: *Sermaye yapısı, Banka karlılığı, Banka performansı, Banka sermayesi, Panel veri analizi.*

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1.INTRODUCTION

Bank capital structure basically displays the bank's preference of how to finance their operations, that is, what mix of equity, subordinated debt, and deposits to use. Commercial banks substantially operate with debt-based rather than equity-based. The banking sector has a high sensitivity to financial leverage due to the low equity ratio in the capital structure compared to other sectors. It is an issue of central importance for bank stability, efficiency of resources, credit, risk management, and financial soundness. Various theories have been proposed to explain the relationship between capital structure and the value of a firm. The aim of the capital structure decision is to identify the financial leverage that maximizes the value of the financial institution or minimizes the average cost of capital, which is a complex task. The level of leverage ratio used varies from one bank to another.

The financial crisis between November 2000 and February 2001 resulted in removal of the operating licenses of 25 banks and their transfer to the TMSF (Savings Deposit Insurance Fund). Some of them were sold by being combined, while others were liquidated with the cancellation of banking licenses. The BRSA report (2009) represents the structural and failures of the Turkish banking system as insufficient equity capital, small-scale banking structure, the share of public banks in the system that do not operate in accordance with market requirements, weak asset quality, fragility to market risks, inadequate internal control, risk and corporate governance, lack of transparency, lack of market discipline. The banking sector is not only the most important element of the Turkish financial system, but also a major sector that affects the entire economy. As the dominant role and share of banks' assets in the financial sector is 82.6 percent (BRSA, 2023: 13), exploring and strengthen the financial structures of deposit banks have always been at the center of finance and banking literature.

As a result of the financial crises, measures to examine and strengthen the financial structures of banks have gained importance not only in Türkiye but also in international financial markets. The Basel III consensus, an international capital-adequacy standart, limits the risk-taking behavior of banks and recommends increasing the bank capital adequacy ratio. It is unloved by practitioners but much needed in the banking industry. The standards for bank capital and liquidity of BASEL III are regulated to reduce the bank's risk against crises. Increase in capital and liquidity standards generally enhance the banking soundness against crises by holding more capital for given assets in the long run. However, it has a negative impact on economic activities via credit supply restrictions in the short run (Angelini et al., 2014: 221). Higher cost of funding and higher lending spreads will make it difficult for companies or individuals to access credits.

In response to the 2007-2008 financial crisis, Basel III regulations were designed to improve the soundness of banks by enhancing their capital buffers and liquidity positions. These standards are particularly important for emerging markets like Türkiye, where the banking sector is closely tied to the overall economic stability and credit availability. Basel III introduces more stringent capital and liquidity standards for banks, aimed at strengthening their ability to absorb shocks during times of financial stress. One of the primary metrics for assessing a bank's financial health is the capital adequacy ratio (CAR), which compares a bank's capital to its risk-weighted assets (RWAs). The Basel III framework requires banks to maintain a minimum common equity tier 1 (CET1) capital ratio of 4.5%, a tier 1 capital ratio of 6%, and a total capital ratio of 8%, along with a capital conservation buffer of 2.5% (BIS, 2011: 59). These standards design to ensure that banks have sufficient capital to cover potential losses in times of crisis, reducing the risk of insolvency and promoting stability in the financial system.

The Banking Regulation and Supervision Agency (BRSA) has set its target CAR as 12% in Türkiye. This is significantly higher than the minimum level of 8% set by Basel III. This diversity raises some points regarding the Turkish banking sector's capital position relative to international standards. As the data suggests, the Turkish banking sector currently meets or exceeds the target CAR of 12% on average, which is an important indicator of financial stability. It should be noted that although a high capital standard is a critical measure in maintaining long-term financial stability, it also has some disadvantages or trade-offs. Higher capital buffers (such as the 12% target set by the BDDK) increase the resilience of banks to economic shocks, but they can have negative effects in the short term.

Banks with higher capital requirements are generally more conservative in their lending practices, which can lead to credit supply restrictions. As banks allocate more resources to fulfill regulatory capital standards, they may be less disposed to lend, especially in an environment where the cost of capital is rising due to the need to maintain higher capital levels. This can have a restrictive effect on credit growth, especially for small businesses or individual borrowers. As Angelini et al. (2014) emphasize, although stricter capital and liquidity requirements increase the resilience of banks, they tend to limit the credit supply, especially during economic downturns or when banks are under pressure to meet higher capital requirements. This could be particularly effective given the cyclical nature of the economy in Türkiye and the external risks posed by factors such as exchange rate volatility and geopolitical instability. The BDDK's 12% CAR target reflects the importance given to long-term financial stability in Türkiye. However, it also illustrates the ongoing difficulty of the trade-off between bank soundness with the need for continued economic growth and access to credit.

There have been an extensive literature on the essential role of the banking and finance sector on economic growth. But, capital and equity adequacy is also crucial for deposit banks in terms of risk and profitability management. However, when the borrowing costs is high, they generally continue their operations with lower capital, and as a result, the risks they are exposed to increased steadily. Bank managers are being difficulties in precisely determining the optimal capital structure level. Optimal capital structure is defined as a minimum weighted average cost of capital that maximize the value of institution. It is stated to be non-performing loans and insufficient capital are among the biggest challenges facing the banking system in Türkiye. Considering the importance of the subject, the aim of this study is to analyze the impact of capital structure (measured as total debt to total assets and total debt to equity) and selected dependent variables (including bank size, operating cost rate, liquidity, economic growth, and inflation) on banking performance for 20 Turkish private deposit banks by using panel data analysis for the period between 2012 and 2023.

The right combination of debt and equity will have a positive impact on bank performance. Bank profitability is affected by bank-specific risks as well as risks associated with the macroeconomic environment which is known as non-diversifiable or systemic risk (Flamini et al., 2009: 3). This study focuses on analyzing the impact of capital structure (measured by total debt to total assets and total debt to equity) and selected independent variables (covering debt-to-assets ratio (DTA), debt-to-equity ratio (DTE) and 9 other variables) on bank performance (measured by ROA and ROE). The panel regression models will be applied to the annual dataset gathered from 20 Turkish private deposit banks during the period 2012-2023.

The paper is organized as follows: after the introduction provided above, the function of capital in banks and the importance of capital structure is given in Section 1. Literature review is explained in Section 2. Data and methodological framework is situated in Section 3. Empirical findings are shown in Section 4. The 5th and the final section of the study includes conclusion and recommendations information.

2. THE FUNCTION OF CAPITAL IN BANKS AND THE IMPORTANCE OF CAPITAL STRUCTURE

Bank capital refers to the funds that a bank's owners (shareholders or investors) invest in the institution. Capital in banks plays a crucial role in maintaining financial stability, facilitating operational efficiency, and ensuring risk management. It serves as a buffer to absorb losses, protect depositors, and reassure creditors.

Banks operate in a highly leveraged environment, which means they rely on a mix of equity capital (funds raised from shareholders) and debt (loans or deposits) to finance their operations. The capital structure of a bank, which refers to the ratio of debt to equity financing, significantly impacts the bank's ability to withstand financial shocks, its profitability, and its growth prospects. A well-designed capital structure that balances debt and equity financing enables banks to weather financial stress, optimize their profitability, and comply with regulatory requirements. It also supports economic growth. It meets the financing needs of businesses and consumers.

Regulatory capital standards set by local authorities (Banking Regulation and Supervision Agency in Türkiye) as well as authorities such as the Basel Committee on Banking Supervision play an important role in determining the minimum amount of capital a bank must hold.

The functions of capital in banks are grouped under five headings (Svitek, 2001: 37):

(1)   *The loss-absorbing function:* Capital serves as a cushion to absorb losses when a bank's liabilities exceed its assets. For example, if a bank experiences a significant rise in loan defaults or suffers from bad investments, its capital base acts as a safeguard, protecting depositors and creditors from direct losses. The higher a bank's capital, the greater its ability to absorb shocks without facing insolvency.

(2)   *The confidence function:* Capital serves as a signal of a bank's financial health and stability. When investors and customers perceive a bank as well-capitalized, they are more likely to trust the institution with their savings and investments. A strong capital base enhances a bank's credibility and can help attract both investors and customers, contributing to long-term sustainability.

(3)   *The financing function:* Banks use capital to finance new ventures, provide loans, and expand operations. By maintaining a healthy capital base, banks can support lending activities, which in turn drives profits and stimulates economic growth. Moreover, banks can use their capital to diversify into different financial products or geographic regions, reducing risk and increasing profitability.

(4)   *The restrictive function:* Regulatory authorities imply banks to maintain specific levels of capital to safeguard the broader financial system. Basel III, an international regulatory framework, establishes minimum capital requirements and introduces risk-weighted asset calculations to ensure banks have enough capital to withstand economic downturns. This is vital for the overall stability of the banking sector and prevents banks from over-leveraging.

In conclusion, the effective management of capital in banks is essential for ensuring financial stability, fostering growth, and maintaining trust in the banking system. By carefully balancing debt and equity, banks can better absorb losses, comply with regulations, and continue to support economic development, ultimately contributing to the resilience of both individual institutions and the broader financial system.

3. LITERATURE REVIEW

As we mention before, the impact and the crucial role of the banking sector and finance on economic growth are widely accepted in economic and finance literature. There have been numerous studies demonstrating the effect of capital structure on bank performance. Understanding the drivers of capital structure on different indicators of bank performance has received considerable attention in the banking sector. Three main points stand out in the literature review. First, the studies conducted in the literature focused on the determinants of bank capital structure factors for cross-country (Francis, 2013; Flamini et al., 2009; Gropp & Heider, 2009; Al-Hashimi, 2007; Barth et al., 1997) or individual countries' banking systems. Besides, most of the studies —the details of which are provided in the following section— are focused on individual country analyses.

Second, some studies are specifically focused on the financial or banking crises period (Wanke et al., 2021; Jouida, 2018; Andrieş et al., 2016; Iqbal & Kume, 2014; Ganioğlu and Us, 2014; Berger & Bouwman, 2013; Gardó & Martin, 2010; Sufian & Habibullah, 2010). Literature review suggests that a financial crisis may impact the capital structure and bank performance of the banking sector. As Berger and Bouwman (2013) state, this effect varies across banking crises, market crises, and normal times. Capital adequacy helps not only small banks probability of survival but also enhances the performance of medium- and large-sized banks in times of crises.

Third, there are different findings regarding the level of significance and direction (positive or negative) of the relationship between capital structure and financial performance. While some research papers have findings about the negative impact of capital structure on bank performance, other studies confirm positive effects. Distinct countries may also produce different results in terms of various estimation procedures, various business practices, different legal regulations, and bank sub-samples that are used. On the other hand, Kazak (2024) aims to reveal the convergence status of the European Union member and candidate countries in terms of the ratio of bank capital to assets, which is one of the important indicators of the banking sector.

There are different views in the literature on the relationship between capital structure and profitability of banks. Alternatively, some other researchers think that the capital structure cannot be a determinant of a

bank's performance. There is no relationship between capital structure and a bank's performance. According to this argument, banks are not willing to increase their capital base. Mishkin (2000) states that the capital of banks mostly does not exceed the requirement fixed by regulatory authorities to avoid cost burden. Conversely, researchers such as Berger (1995), Kaufman (1991), and Keeley & Furlong (1989) argue that banks holding more capital will reduce the probability of bankruptcy by creating a barrier against failure.

Zidi & Hamdi (2024) analyze the determinants of capital structure and 10 commercial Tunisian banking performances for the period 2012-2019 by applying the panel-corrected standard error (PCSE) regression model. They conclude that the bank capital structure (measured by the equity-to-total-assets ratio) negatively affects bank performance. But the debt-to-total-assets ratio is a positive impact on bank performance.

Muhammed et al. (2024) analyze the relationship between capital structure and the profitability of Ethiopian commercial banks, taking a sample of 14 commercial banks over a period of 6 years from 2017-2022. Their results conclude that the loan-to-deposit ratio and the total deposit-to-total asset ratio have a positive and significant impact on financial performance, but the asset growth ratio displays a negative effect. Likewise, Birru's (2016) study of selected Ethiopian commercial banks employed multiple regression models for a period of 2011 to 2015. He examines the relationship between bank performance (where financial performance is measured as ROA and ROE) and 5 capital structure measures such as debt ratio, debt-to-equity ratio, loan-to-deposit ratio, bank size, and asset tangibility. But his findings indicate that there is a negative and significant relation with ROA measures such as debt-to-equity ratio, firm size, tangibility of assets and debt ratio.

In their study of the determinants of capital structure and 22 commercial Tunisian banking performance for the period 2005-2014 by applying pooled ordinary least square (OLS) analysis, Siddik et al. (2024) find that a significant negative effect of capital structure choice on the performance of the sampled banks. Their results find out that all capital structure variables have significant inverse impacts on bank performance measures such as ROA, ROE, and EPS.

Nguyen et al. (2021) investigate the determinants of bank performance for the 28 Vietnamese commercial banks covering the period between 2010 and 2019 by using pooled OLS, fixed effect (FEM), and random effect (REM) regression models. The empirical findings indicate that capital structure (measured by total debt to assets and debt to equity ratios) negatively and significantly influences the performance of selected commercial banks (measured by ROA and ROE). Besides, all of the control variables (bank size, non-performing loan, liquidity, and GDP growth rate) represent significant and positive relationships with bank performance, except for the operating cost rate.

Molla (2020) examines the impact of capital structure and the performance of listed banks on the Dhaka Stock Exchange in Bangladesh for the period of 2014-2018 by using a panel regression model. The analysis findings demonstrate that long-term debt has a positive influence on the performance of banks measured as ROA and ROE. Besides, there is no statistically significant impact on ROA, ROE, and EPS with the capital structure component of total debt. However, it has a significant positive impact on the performance of banks measured by P/E ratio. Lastly, there is no relationship between long-term debt and total debt on the EPS. From these findings, he concludes that capital structure has weak or no impact on the performance of publicly listed banks in Bangladesh.

Kumar (2018) evaluates the relationship between capital structure and financial performance of 21 commercial banks in India by using a panel regression model over the period of 2011–2015. While debt-to-total-assets ratios and debt-to-equity ratios are used as measures of corporate structure; return on capital (ROCE), net profit ratio (NP), and net interest margin (NIM) are used as measures of financial performance. The findings demonstrate that there is strong evidence on capital structures in explaining the commercial banks' financial performance.

Saeed et al. (2013) empirically examine the capital structure of 25 Pakistani banks listed at Karachi Stock Exchange by using panel data regression for the period 2007-2011. The bank capital structure is measured by the earnings per share (EPS), return on assets (ROA), and return on equity (ROE) ratio, and all three dependent variables positively affect bank performance. They also suggest that the efficient use of resources to reduce operational costs and diversification to increase bank performance.

While the effect of capital structure on firm performance has attracted great attention in Türkiye, studies addressing the issue in the banking context are quite limited. Ozdemir (2024) examines the relationship between bank performance and leverage (where leverage is measured as total debt-to-assets ratio and non-performing loans-to-total assets) for banks in Türkiye and ROA as a measurement of performance. The study covers all banks operating in Türkiye between 2005/Q4 (last quarter) and 2017/Q3 (third quarter). Findings of the study validated a negative relationship between determinants of capital structure and performance of the Turkish banking industry. However, there is a difference between development-investment banks and deposit banks in terms of the effect of capital structure on performance.

Taştemel & Koç's (2024) study of eleven private sector banks in Türkiye covering the period 2010-2022 using panel regression models. Six independent variables are used in the study, including three market-based financial performance ratios (P/E, PD/DD, LOGPD) as dependent variables, two ownership structure indicators (EBOSP, HAO), three financial structure indicators (TBO, OTA, TA), and the age of the bank (YAS). Their findings reveal that banks' financial and ownership structure affects the financial performance of banks.

Güzel (2023) used panel data analysis to determine the factors affecting the capital structure covering the period 2002Q1-2021Q4 of 15 banks operating in the Turkish banking system and having the highest share in the sector in terms of asset size. The analysis findings found a statistically significant and positive relationship between the capital adequacy ratio and net interest margin, the bank's share in the sector, the ratio of non-interest income to non-interest expenses, and the average dollar interest rate. Besides, a statistically significant and negative effect was determined between the variables of return on assets, liquidity ratio, total deposit/total resources ratio, overdue receivables (gross)/total loans and receivables ratio, liquid assets/total assets ratio, leverage ratio, and average TL loan interest rate and the capital adequacy ratio. However, there was no statistically significant relationship between the total asset size, average annual growth rate and inflation rate and capital adequacy ratio.

Akkaynak (2022) empirically examines determinants of the capital structure of the banking sector in Türkiye using a sample of 14 Turkish commercial banks between 2002 and 2020 by using panel data analysis. The main objective of the study is to examine the relationship between leverage and determinants of capital structure decision and to explore which capital structure theory is applicable in commercial banks in Türkiye. It reveals that asset structure, ROA, credit risk and interest rate risk variables are positively correlated with leverage, while growth opportunities, size and ROE variables indicate a negative effect. Besides, it is observed that the capital structure of the Turkish banking sector is generally compatible with the pecking order theory.

Okuyan (2013) analyzes the determinants of capital adequacy ratio in the Turkish banking sector by using panel data regression for the quarterly period 2002: Q4–2012: Q1. While there is a negative relationship between capital adequacy ratio and risk, size, deposit ratio and credit ratio, there is a positive relationship between economic growth and return on assets.

Kahveci et al. (2016) conducted a study regarding the capital structure and its impact on financial performance measured as net interest return by using panel data analysis during 2002 to 2014 for the Turkish commercial banking sector. The result of research validated the positive relationship between capital structure and net interest income in times of crises.

The study made by Gülhan and Uzunlar (2011) is to identify the determinants of bank profitability by using panel data regression analysis for both local and foreign banks operating in Türkiye between 1990 and 2008. The findings reveal that the variables such as capital adequacy, operational costs, liquidity, size, security portfolio and nonaccruing loans have a significant effect on the return of assets. However, domestic and foreign banks statistically produce different results.

The main objective of the study made by Demirhan (2010) is to identify the effects of capital structure decisions on private deposit bank performance in Türkiye for the period 2003-2008 by applying the panel data analysis method. The study uses four dependent capital structure variables (ROA, ROE, net interest margin (NIM) and non-interest earnings) for 32 foreign and domestic banks. The findings for domestic and foreign banks are

statistically different. However, since the capital ratio is positively related to profitability ratios for both bank groups (foreign and domestic), she argues that the agency costs hypothesis is not valid.

Kahveci and Sayılgan (2006) aimed to determine the impact of capital structure on net interest income of deposit banks by using panel data regression over the period of 2002 to 2004 for 33 banks (12 foreign capital deposit banks, 18 private capital deposit banks and 3 public capital deposit banks) in Türkiye. The analysis results state that equity financing has a more positive effect on net interest income in small banks, whereas deposit financing has a more positive effect on net interest income in large banks. Deposit banks in Türkiye generally obtain their lowest net interest income from foreign exchange deposit accounts in the analysis period.

In summary, the literature on the relationship between capital structure and bank performance has produced distinct or controversial results depending on the scope of the research, the financial variables and the analysis method used. Besides, the findings may naturally differ in terms of private deposit banks, public banks, development and investment banks.

4. DATA AND METHODOLOGY

This section outlines the methodology adopted in this research, including the data source, variables used, and the types of analysis adopted. This study aims to determine the variables affecting the capital structure decisions of commercial banks operating in Türkiye by using panel data analysis regression. Public banks are not included in the analyzed data set. Because public interest is at the forefront rather than profit in public banks. Since public banks operate for different motives, the analysis is limited to private Turkish deposit banks in this study.

The panel data set consists of 20 private deposit banks in Türkiye for a 12-year period from 2012 to 2023. This research used secondary data. The source of data is the annual reports of commercial banks taken from The Banks Associations of Türkiye's (TBB) website, which includes financial reports such as balance sheets and income statements. Key financial indicators data are employed from the Central Bank of Türkiye (TCMB) and the Turkish Statistical Institute (TUIK). The total number of bank observations is 240.

Since there are both horizontal and vertical series in the study, the most appropriate model for the study was panel data analysis. The strongly balanced panel data model was used in the panel data analysis because of the data structure including ratio-type scale parameters (Hsiao, 2022; Raj and Baltagi, 2012). For this reason, the time series between 2012-2023, which is the widest range with balanced data for all dependent and independent variables, was used.

Bank performance is usually measured by the return on assets (ROA), the return on equity (ROE) and/ or the net interest margin (NIM) reported by a bank. Following the general trend in the literature, this study uses ROA and ROE as the dependent variables. ROA is calculated by dividing net profit after tax by total assets and represents the return obtained from the bank's invested assets. The asset profitability ratio is one of the commonly used measures of how efficiently a financial institution uses its assets to generate profit. An increase in the ROA indicates that the financial institution can generate more profit with fewer assets. In this sense, it is seen as an important measure of managerial efficiency.

ROE is a second important measure of a company's financial performance. ROE is the rate used to measure the profitability of the capital invested by the shareholders of the business. It allows business owners to see how effectively their invested capital is being used. That is, it shows the management performance of the financial institution. ROE shows performance based on shareholder equity, while ROA shows the profitability of the financial institution based on its total assets. Return on equity (ROE) and return on assets (ROA) are two key measures to determine how efficient a bank is at generating profits. Bank capital structure is also typically measured by debt-to-assets ratio (DTA) and debt-to-equity ratio (DTE).

The study covers bank-specific and macroeconomic financial variables for determining the impact of capital structure on banking performance, which are widely used in the literature (Table 1). There are 9 bank-specific and 2 macroeconomic variables included in the regression. Bank performance is a function of capital structure and independent variables in the model.

Bank performance = f (capital structure, independent variables)

The regression models are in the following form:

Model 1 $ROA_{jt} = \beta_0 + \beta_1 DTA_{i,t} + \beta_2 DTE_{i,t} + \sum_{s=3}^{11}(\beta s\ \lambda i, t) + \varepsilon_{jt}$

Model 2 $ROE_{jt} = \beta_0 + \beta_1 DTA_{i,t} + \beta_2 DTE_{i,t} + \sum_{s=3}^{11}(\beta s\ \lambda i, t) + \varepsilon_{jt}$

Here:

ROA_{jt} refers to return on asset for bank i at time t

ROE_{jt} refers to return on equity for bank i at time t

DTA and DTE represent the capital structure of deposit banks

λ refers to the independent variables

j refers to an individual bank

t refers to year

β is coefficient while ε_{jt} is the error term.

ROA and ROE refer to dependent variables and observations on bank performance. The study's data set and relevant information are given in Table 1. As indicated in Table 1, return on assets (ROA) and return on equity (ROE) are used as dependent variables. Independent variables are classified into two groups. The first group includes bank-specific (controllable) internal factors. The second group includes macroeconomic (uncontrollable) factors such as inflation and economic growth (Table 1).

Table 1: Definition of the variables

Notation	Name of Variables	Measurement
ROA	**Dependent variables** Return on assets	Net income over total assets
ROE	Return on equity	Net income over shareholder's equity
DTA	**Bank-spesific variables** Debt ratio	Total debt/Total assets
DTE	Debt to equity ratio	Total debt/Total equity
BS	Bank size	Natural logarithm of total assets
NPL	Non-performing loan ratio	Non-performing loans over total loans
LIQ	Liquidity ratio	Loans over deposits
CIR	Cost to income ratio	Total cost over total income
NII	Revenue diversification	Non-interest income over total assets
DA	Deposits	Deposits/Total assets
OA	Cost management	Overheads/Total assets
INF	**Macroeconomic variables** Inflation	Annual inflation rate (CPI growth rate)
GDP	Economic growth	Annual growth rate of real GDP per capita

5. EMPIRICAL FINDINGS

Table 2 presents descriptive statistics of variables, including the mean, standard deviation, minimum, and maximum values. ROA mean private deposit banks was 0.02±0.02 with a -0.11-0.14 range. ROE mean was 0.11±0.29, and the range was -3.99-0.50. DTA mean was 0.88±0.04, DTE mean was 8.65±3.59, BS mean was 17.43±1.79, NPL mean was 0.05±0.07, LIQ mean was 1.01±0.55, CIR mean was 0.68±0.17, NII mean was 0.01±0.01, DA mean was 0.63±0.12, and OA mean was 0.02±0.01. GDP range was 9.06-9.48 with 9.28±0.12 mean. The inflation mean was 21.02±21.66 with a 7.49-72.31 range (Table 2).

When we look at the capital structure, total debt accounts for an average of 88% of total assets, and outstanding loans are 8.65 times higher than total equity. According to BDDK (Banking Regulation and Supervision Agency), the capital adequacy ratio is aimed at legally 8% and 12% as a target as the basis for the total risk ratio in the

banking sector. The current analysis data shows that banks have achieved the target rate of 12% (1-0.88) on average. The average NPL ratio of 5% is equal to the BDDK's benchmark of 5%, suggesting that bad loans have been under control. However, it can be stated that the NPL ratio is at the recommended limit level.

Table 2: Descriptive statistics

	Mean	Standard Deviation	Minimum	Maximum
ROA	0.02	0.02	-0.11	0.14
ROE	0.11	0.29	-3.99	0.50
DTA	0.88	0.04	0.60	1.03
DTE	8.65	3.59	0.17	33.71
BS	17.43	1.79	13.47	21.62
NPL	0.05	0.07	0.00	0.65
LIQ	1.01	0.55	0.21	8.06
CIR	0.68	0.17	0.21	1.53
NII	0.01	0.01	0.00	0.17
DA	0.63	0.12	0.19	1.10
OA	0.02	0.01	0.00	0.07
GDP	9.28	0.12	9.06	9.48
INF	21.02	21.66	7.49	72.31

In the inflation and DTE series, the standard deviation value is higher than the other series. This situation reveals that inflation and DTE followed a more fluctuating and volatile course in the examined time period.

The correlation matrix for the explanatory variables is reported in Table 4. A correlation matrix is a simple statistical tool that measures the strength and direction of relationships between variables. ROA was significantly correlated with ROE ($r=0.701$; $p<0.01$), DTA ($r=-0.524$; $p<0.01$), DTE ($r=-0.477$; $p<0.01$), BS ($r=0.180$; $p<0.01$), NPL ($r=-0.300$; $p<0.01$), CIR ($r=-0.479$; $p<0.01$), NII ($r=0.193$; $p<0.01$), DA ($r=-0.209$; $p<0.01$), GDP ($r=0.163$; $p<0.05$) and INF ($r=0.466$; $p<0.01$). ROA was significantly correlated with DTA ($r=-0.188$; $p<0.01$), DTE ($r=-0.436$; $p<0.01$), BS ($r=0.229$; $p<0.01$), NPL ($r=-0.246$; $p<0.01$), CIR ($r=-0.324$; $p<0.01$), OA ($r=-0.152$; $p<0.05$), GDP ($r=0.159$; $p<0.05$) and INF ($r=0.305$; $p<0.01$). The results present that the correlations between the independent variables are mostly statistically significant at the 5% and 1% level (Table 4).

Levin Lin and Chu (2002) Unit root test and Pesaran (2004) CD test for Cross-sectional Dependency results showed that all parameters in the research did not have unit root and cross-sectional dependency (Table 3).

Table 3. Levin Lin and Chu (2002) Unit root test and Pesaran (2004) CD test for Cross-sectional Dependency

	LLC	CD
ROA	-1.5477*	20.41**
ROE	-3.7430*	12.47**
DTA	-4.0983*	25.09**
DTE	-4.9799*	19.60**
BS	-4.1434*	34.81**
NPL	-3.6920*	10.97**
LIQ	-7.1665*	23.39**
CIR	-2.5725*	22.21**
NII	-7.2635*	7.41**
DA	-5.4342*	23.59**
OA	-3.7291*	23.91**

*Not has a unit root, **Not has cross-sectional dependence, GDP and INF are vertical series, and unit root with CD were not tested.

The inflation variable (INF) has a relatively high standard deviation of 21.6 compared to other variables. This high standard deviation suggests that inflation has varied widely across the observed period, indicating significant fluctuations in inflation rates. The range of inflation is between 7.49 and 72.31, which further supports this observation of high variability. Such volatility in inflation could be indicative of an unstable macroeconomic condition, which can have an evident effect on the banking sector. High inflation can lead to increased uncertainty in the economy, affecting interest rates, demand for loans, and the general performance of financial institutions.

The second highest standard deviation variable is the Debt-to-Equity ratio (DTE), which has a relatively high standard deviation of 3.39. This indicates that the leverage levels of the private deposit banks in the sample vary significantly. The mean of DTE is 8.65, with a minimum of 0.17 and a maximum of 33.71, reflecting a wide range of debt usage relative to equity across the banks in the sample. High variability in DTE may suggest differences in banks' risk-taking behaviors, capital structures, or financial strategies. Some banks might be highly leveraged, while others might be more conservative with their debt usage. This variability in financial leverage could contribute to varying degrees of financial stability and risk across banks.

Table 4. Correlation matrix for research variables

	ROA	ROE	DTA	DTE	BS	NPL	LIQ	CIR	NII	DA	OA	GDP	INF
ROA	1	0.701**	-0.524**	-0.477**	0.180**	-0.300**	-0.023	-0.479**	0.193**	-0.209**	-0.083	0.163*	0.466**
ROE	0.701**	1	-0.188**	-0.436**	0.229**	-0.246**	0.007	-0.324**	0.051	-0.111	-0.152*	0.159*	0.305**
DTA	-0.524**	-0.188**	1	0.741**	0.286**	0.168**	0.053	0.357**	-0.338**	0.165*	-0.312**	-0.062	-0.020
DTE	-0.477**	-0.436**	0.741**	1	0.168**	0.197**	0.024	0.322**	-0.078	0.175**	-0.222**	-0.073	0.053
BS	0.180**	0.229**	0.286**	0.168**	1	0.153*	0.058	-0.240**	-0.114	-0.042	-0.435**	-0.041	0.273**
NPL	-0.300**	-0.246**	0.168**	0.197**	0.153*	1	-0.048	-0.007	-0.042	0.168**	-0.086	-0.267**	0.041
LIQ	-0.023	0.007	0.053	0.024	0.058	-0.048	1	0.038	-0.084	-0.410**	0.022	-0.039	-0.158*
CIR	-0.479**	-0.324**	0.357**	0.322**	-0.240**	-0.007	0.038	1	-0.054	0.198**	0.284**	0.292**	-0.160*
NII	0.193**	0.051	-0.338**	-0.078	-0.114	-0.042	-0.084	-0.054	1	-0.060	0.314**	0.040	0.017
DA	-0.209**	-0.111	0.165*	0.175**	-0.042	0.168**	-0.410**	0.198**	-0.060	1	-0.074	-0.054	0.112
OA	-0.083	-0.152*	-0.312**	-0.222**	-0.435**	-0.086	0.022	0.284**	0.314**	-0.074	1	0.433**	-0.298**
GDP	0.163*	0.159*	-0.062	-0.073	-0.041	-0.267**	-0.039	0.292**	0.040	-0.054	0.433**	1	0.201**
INF	0.466**	0.305**	-0.020	0.053	0.273**	0.041	-0.158*	-0.160*	0.017	0.112	-0.298**	0.201**	1

*$p<0.05$, **$p<0.01$.

The regression results are given in Table 4. Both regression models include fixed effects as determined by the Hausman test (X^2 values and p-values), which indicated that fixed effects should be used in the analysis. This model was chosen as the appropriate specification for both ROA (X^2: 21.92; p: 0.0250) and ROE (X^2: 81.78; p: 0.0000) regressions based on the Hausman test results (Table 4). The Hausman test assesses whether the model specification should account for individual differences across banks, which is important when analyzing panel data. Panel data analysis results showed that the capital structure [DTA (β =-0.1527; p<0.01), DTE (β =-0.0015; p<0.01)] negatively impacts business performance (ROA) of Turkish private deposit banks. These findings are consistent with previous studies such as Ozdemir (2024), Zidi & Hamdi (2024), Nguyen et al. (2013), and Siddik et al. (2017). The effects of bank size (BS: β=0.0048; p<0.01) on ROA were negative and statistically significant.

The NPL ratio is one of the most important indicators of the asset quality of the banking sector. An increase in the rate of non-performing loans provided by banks deteriorates the asset quality of the bank and negatively affects its profitability. There is a negative and statistically significant relationship between ROA and NPL ratio (B=-0.0471; p<0.01) and credit risk (CIR: B=-0.0244; p<0.01) as expected. This means that an increase in the level of nonperforming loans and the credit risk will reduce the return on assets (ROA). Besides, overheads-to-total-assets ratio as a proxy of cost management (OA: β=-0.3155; p<0.05) on ROA was also negative and statistically significant.

Conversely, bank size (BS: β=0.0048; p<0.01), economic growth (GDP: β=0.0285; p<0.01) and inflation (INF: 0.0002; p<0.01) on ROA were positive and statistically significant. In summary, the effect of capital structure (DTA and DTE), nonperforming loans ratio (NPL), credit risk (CIR), and overheads to total assets ratio (OA) was negative, whereas the effect of bank size (BS), economic growth (GDP) and inflation (INF) was positive on bank

profitability. Finally, there is no statistically significant relationship between the liquidity rate (LIQ), non-interest income over total assets (NII), and deposits to total assets (DA) with the performance of private deposit banks in Türkiye for the analyzed period (Table 4).

The second regression model on ROE mostly produces results in a similar way. The effects of debt to assets (DTA: β=1.5098; $p<0.05$), debt to equity (DTE: β =-0.6778; $p<0.01$), bank size (BS: β=0.0844; $p<0.01$), non perfoming loans ratio (NPL: β=-0.5226; $p<0.05$), credit risk (CIR: β=-0.6665; $p<0.01$), OA (β =-6.8677; $p<0.01$) and GDP (β =0.7554; $p<0.01$) on ROE were significant. Besides, the effects of debt to assets (DTA), bank size (BS) and economic growth (GDP) were positive, whereas the impact of debt to equity (DTE), nonperforming loans ratio (NPL), credit risk (CIR) and overheads to total assets ratio (OA) were negative on bank performance measured as ROA (Table 4). Lastly, the empirical findings could not shown a statistically significant relationship between the liquidity rate (LIQ), non-interest income over total assets (NII), deposits to total assets (DA) and inflation with the performance of private deposit banks in Türkiye (Table 4).

Table 5: Regression results for the impacts of capital structure on Turkish bank performance

Regressions	ROA	ROE
Constant	-0.1623	-8.6158
Capital Structure		
DTA	-0.1527**	1.5098*
DTE	-0.0015**	-0.6778**
Economic and Market Conditions		
BS	0.0048**	0.0844**
NPL	-0.0471**	-0.5226*
LIQ	0.0006	0.0073
CIR	-0.0244**	-0.6665**
NII	0.0903	2.2966
DA	-0.0064	0.1458
OA	-0.3155*	-6.8677**
GDP	0.0285**	0.7554**
INF	0.0002**	0.0001
R^2	0.5876	0.3894
F-statistic	32.04	24.26
No. of observations	240	240
Hausman Test	X^2: 21.92; p: 0.0250 (Fixed)	X^2: 81.78; p: 0.0000 (Fixed)

*$p<0.05$, **$p<0.01$

6. CONCLUSION

The financial system in general and the banking sector in particular play a dominant role in Turkish economic development. It is generally agreed that a strong and well-functioning of the banking system is a prerequisite for sustainable economic growth. The research is conducted to survey the impact of capital structure on commercial bank performance by using bank level and macroeconomic factors in Türkiye. The objective of this article is to examine the influence of capital structure on the performance of 20 Turkish deposit banks by using panel data regression over the period of 12 years from 2012 to 2023.

While the majority of studies in Türkiye analyze the profitability of banks, the number of studies examining the impact of banks' financial structures on profitability is quite limited. Besides, some variables that were not included in previous studies on Türkiye were also included in the analysis. In this context, it is thought that it will contribute to the limited studies on Turkish banking capital structure-bank performance literature. The study employs return on Assets (ROA) and Return on Equity (ROE) as dependent variables and measures of firm's

financial performance which are widely accepted indicators of financial performance. The findings indicate that capital structure, particularly the debt-to-assets (DTA) and debt-to-equity (DTE) ratios, plays a significant role in determining bank profitability, with negative relationships observed between capital structure and performance.

The results show that higher leverage, as indicated by higher DTA and DTE, negatively impacts both ROA and ROE. This aligns with prior research, suggesting that excessive reliance on debt can reduce profitability due to higher financial risk. Additionally, non-performing loans (NPL) and credit risk (CIR) were found to negatively affect profitability, which is consistent with the idea that poor asset quality and high credit risk lead to lower returns. Conversely, factors like bank size (BS), economic growth (GDP), and inflation (INF) were found to have a positive effect on profitability, highlighting the importance of economic conditions and effective management in determining bank performance.

Although the majority of these results are consistent with some studies in the literature, there are also findings that are contradictory to the literature. Furthermore, the findings may also produce different results in terms of the countries analyzed, the various estimation procedures used and bank sub-samples. The study has several limitations that must be acknowledged. First, as we mentioned before, only private Turkish deposit banks are included in the analysis. Although an important role in the Turkish banking system, public banks are excluded as they work with different motives. Politically public benefit motive is more important than profitability in public banks. Including them could have provided a more comprehensive understanding of the capital structure and performance dynamics in the Turkish banking sector. The second is data limitations. The study relies on secondary data from annual reports, which may not fully reflect the most up-to-date or detailed financial information available. Third, although panel data analysis is a robust method, it has limitations, especially in terms of potential endogeneity issues. Further research may incorporate advanced econometric techniques, such as dynamic panel models or instrumental variable approaches, to address this concern.

Although inflation in Türkiye has been at very high levels in recent years, affecting many sectors, the banking sector has been the sector that has made the highest profit during this process. According to TÜİK and EVDS 2023 data, banking sector profitability rates have reached between 400%-500% (EVDS, 2023). While the effect on ROA is negative, the effect on ROE is positive. These results generally show the fragility of the economy and the predominance of financial instruments such as short-term investment and loans.

In summary, some of the literature findings, as in this study, support the view that the capital structure negatively affects the performance of banks. This means that banks cannot benefit from the financial leverage effect to increase their profit margins and as a result, they are exposed to high capital costs. From the findings, it is strongly recommended that firms should focus on the proportion of debt used by the bank, the management of nonperforming loans and credit risk and the manner of utilizing the resources while operating the banks. Therefore, we can conclude that this study makes contribution to the literature by exploring the effects of capital structure impact on bank performance in Türkiye for the analyzed period, which is important in terms of providing information and guidance for bank managements and policy makers.

This study provides valuable insights into the relationship between capital structure and bank performance in the Turkish banking sector. While the findings confirm the negative impact of high leverage on profitability, they also highlight the importance of economic conditions and effective management. However, further research is needed to address the limitations identified and to explore the broader dynamics at play in the ever-evolving banking environment. Future research could include public banks to understand how their performance differs from private banks, especially in terms of capital structure decisions and profitability. Furthermore, to address the limitations of the current model, future studies could employ more advanced econometric techniques, such as the generalized method of moments (GMM) or structural equation modeling (SEM), to account for potential endogeneity and dynamic relationships. Lastly, future studies could examine how technological advancements and digital transformations affect capital structure and profitability in the banking sector.

Although there have been difficult economic conditions and high inflation in Türkiye in recent years, banks continue to be profitable. This situation also reveals the determinant role of banks in the sector. It can be stated that the DTA effect of banks, which is negative with ROA and positive with ROA, indicates an economic breakdown in the long term. However, more research is needed on this subject. In future studies, comprehensive and detailed studies can be conducted on these issues.

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