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The determinants of capital structure: Evidence from Tunisian banks

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Abstract
Capital structure refers to the way a company finances its overall operations and growth through the use of different sources of funds. In the simplest terms, it is the mix of debt and equity a company uses to fund its business activities. The goal of a well-designed capital structure is to strike the optimal balance between debt and equity that minimizes the cost of financing while maximizing the company's value. These are foundations on which a company is built and carefully managing this structure determines how it funds its day-to-day activities, expansion and future prospects. In this article we studied the determinants of capital structure in 11 banks quoted in financial market of Tunis over the period (2014….2023). By applying a model of panel static we found that ROA, ROE, size, capital, total credit, tangibility and inflation have significant effect on bank leverage.

Keywords: Capital structure, bank, panel, size, credit, tangibility

1. Introduction

Laux (2011) [16] claims capital structure is the combination of debt and equity used to fund a company assets. Choosing the capital structure is one of the most crucial yet denting tasks since it has a significant impact on the performance (Oholiab and Inyang (2013); competitiveness and survival (Aggarwal (1990) [2] of the business. Beltratti and Stulz (2012) [6] argue that banks like any other firm enjoy a tax shield when they use debt financing up to a certain point when the net of the tax buffers on extra debt is balanced out by a rise in current value of economic stress costs and the agency implications. This implies that banks are able to benefit for an optimal mix of financing in their capital structure.

Mishkin (2000) [18] argues that as banks want to hold less capital because of high costs so it is not necessary to examine the capital structure choice of banks because the bank capital is the major determinant of bank.

In general banks have a more concentrated ownership than non-financial firms; which makes it more difficult for small equity holds to exert influence over the management of the banks; there is less competition regarding financial products and takeover activity and banks have a safety net available; which affects the stake holders incentives to monitor banks. (Oliveria and Raposo (2021) [21].

The introduction of the Basel 3 leverage ratio also limits a bank's overall leverage by comparing its Tier 1 capital to its total exposure.

Our objectif in this article is to study the determinants of capital structure of banks in Tunisia. We used a methodology of 3 sections. The first section is devoted to literature review; the second section concern empirical study. We make a conclusion in the end of article.

2. Literature review

There are several studies that analyzed the determinants of capital structure in Tunisian context.

Using an international sample of 586 banks from 21 European countries for the period (2000….2016). Oliveira and Raposo (2021) [21] found that compared with private banks; publics banks are more subject to market discipline. Obadire *et al* (2023) [20] studied 45 listed banks across 6 countries in Africa for the period (2010…2019).

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They showed positive association between Z score and net interest margin ratio with bank leverage. In addition, the results revealed positive correlation between earnings volatility; profitability; risk with bank leverage.

Khan *et al* (2023) [14] examined the significant factors affecting the capital structure decision for banks in MENA region. An unbalanced panel data comprising of 132 banks operating in different countries of the MENA region from (2012…2017). They found a negative and significant relationship between profitability and leverage. No significant association between tangibility and leverage is found. The relationship between growth and leverage is negative and significant. Alo GDP growth and inflation are negatively associated with leverage.

Kebede (2024) [12] studied 14 commercial banks in Ethiopia for the period (2010…2022). They found that tangibility; non-tax shield; growth and interest rate had a positive and significant effect. While the gross domestic product had a negative and significant effect on leverage.

Khan *et al* (2020) [15] studied 11 Saudi commercial banks listed on the Tadawul stock exchange for the period (2010…2017). They found that earning volatility; growth and bank size have positive and significant relationship with bank leverage

Solangi *et al* (2022) [27] studied banks in Pakistan for the period (2010…2019). They found that ROA have negative impact on leverage; tangibility has moderate negative impact alos growth and inflation a weak negative relationship with leverage.

Baltaci and Ayaydin (2014) [4] studied banks in Turkey for the period (2002…2012). They found that leverage is significantly and negatively associated with tangibilitiy; profitability; inflation and financial risk.

AlMutairi and Naser (2015) [3] studied 47 commercial banks in GCC for the period (2001…2010). They found that liquidity and profitability affect bank's capital structure decisions. Kenddunim and Thaddous (2024) [13] studied 8 banks in Nigeria for the period (2010….2019). They found that size has significant impact on leverage whereas working capital and profitability are not significant with leverage. Shrestha and Gurny (2023) [26] studied 20 banks in Nepal over the period (2014…2023). They found that capital structure is negatively impacted by profitability and liquidity; whereas it is positively impacted by bank size. Furthermore, it is positively influenced by the GDP growth rate and inflation rate.

Da Ganna *et al* (2021) [29] studied a sample of banks in Portugal over the period (2009…2018). They found a significant impact of regulatory capital; the global financial crisis and the Eurozone crisis on the leverage level of the Portuguese banks.

MBA and Diaz (2017) [30] studied 31 commercial banks in Vitenam over the period (2009…2014). They found that size; profitability; growth rate has significant effect on leverage.

Rehan *et al* (2023) [25] studied 52 banks in Southa Asian association for regional cooperation. They show that tangibility; growth, profitability and non-performing loans have positive significant influence where liquidity and gross domestic product have negative effect on the capital structure of bank.

Also, tradeoff theory advocates the use of higher debt level for profitable firms to attain higher tax saving benefits related to debt. This theory assumes a positive association between profitability and leverage. Frank; Goyal (2009) [10] suggested that considered the bankruptcy cost and tax benefits profitable firms are likely to choose debt.

Pecking order theory based on information asymmetry advocates the use of internal funds followed by debt and finally the equity. It assumes that this way firms could avoid sending negative information to the market. Pecking order theory respond a negative association between leverage and profitability (Titman and Wessels (1988); Viviani (2008); Khan *et al* (2020) [28, 31, 15].

Tradeoff theory predicts a negative association between leverage and firm size. Likewise; agency theory suggests the use of debt as tool to mitigate the agency problems related to monitoring and free cash.

Contrary to this; pecking order theory suggests the use of internally available funds if available predicting a negative relationship between a leverage and debt. (Khan *et al* (2023) [14].

The capital structure of a commercial bank is the combination of liabilities and equities to finance the lending; trading; investment and other activities of the commercial bank. An optimal capital structure is to achieve 3 conditions ((1) minimizing the cost of capital; (2) minimizing risk; (3) maximizing profits) (Tran Nngoe Tho *et al* (2007) [32].

In many ways; banks are different from non-financial firms which are able to induce differences in their capital structure decisions. surmise that the main difference share that a high proportion of bank failures lead to negative externalities; agency problems are enhanced by the inefficient monitoring of banks by depositors and other shareholders.

In general banks have a more concentrated equity ownership than non-financial firms; which makes it more difficult for small equity holders to exert influence over the management of the banks; there is less competition regarding financial products and takeover activity and banks have a safety net available; which affects the stakeholders incentives to monitor banks (Olivera and Raposo (2021) [21].

According to BIS (2017); the elements of the Basel 3 accord; such as the capital adequacy requirements mandate banks to maintain high levels of regulatory capital as a buffer against potential losses.

This influences bank's financing decisions by encouraging them to raise additional equity capital or retain earnings to meet the new requirements. Also the liquidity coverage ratio mandates bank to hold sufficient high liquid assets to meet short term liquidity needs during times of financial stress. (Obadire *et al* (2023) [20].

According to Lim (2016) [17]; banks operations are financed predominately through equity and debt capital. On the one hand; bank funding through equity capital consist of the owner's equity, minimum regulatory capital; reserves arising from reevaluations of non-current assets; and long-term securities.

Also, Aboura; Lepinette (2015) [1] argue that for banks to maximize their capacity to absorb losses; they should move from the composition of 100% equity towards a composition that includes debt capital to benefit from lower costs of financing and reduce the level of taxable income.

In the other hand; signaling theory emanates from information asymmetries between firm management and shareholders. If managers believe that their firms are undervalued; they will issue debt first and then issue equity as a last resort. Conversely; il management believes that their firm overvalued they will issue equity first.

The signaling theory believes that if managers have inside

information their choice of capital structure premise that increase in debt are a positive sign that mangers are confident about future earnings (Qureshi *et al* (2015) [33].

Debt contracts are a commitment by managers to make future interest payments. Failure to repay debt could lead to bankruptcy.

The signals confidence to the market that the firm have sufficient cash flow to service detect (Amatya (2021) [34].

3. Empirical study
3.1 Sample
We studied a sample of 11 banks quoted in financial market of Tunis over the period (2014…2023).

11 banks (Attijari bank; …BIAT, ATB, BH, BNA, STB; UIB; UBCI; UIB, BTEI, Amen Bank).

3.2 Spécification of Model
$Lev_{i,t} = b0 + b1\ ROA_{i,t} + b2\ ROE_{i,t} + b3\ NIM_{i,t} + b4\ Size_{i,t} + b5\ TLA_{i,t} + b6\ CAP_{i,t} + b7\ Tdeposit_{i,t} + b8\ ALA_{i,t} + b9\ Growth_{i,t} + b10\ Tangability_{i,t} + b11\ TPIB_{i,t} + b12$

$TINF_{i,t} + E_{i,t}$

i=bank t= time
Lev= leverage = total liabilities / total assets
ROA = return on assets
ROE =return on equity
NIM = Net interest margin
Size = Log of total assets
TLA = total credits / total assets
CAP= total equity / total assets
T deposit = total deposits / total assets
ALA = Liquid assets / total assets
Growth = Total assets (t)- Total assets (t-1)/ Total assets (t-1)
Tangibility = Fixed assets / total assets
TPIB = Economic Growth
TINF = rate of inflation

3.3 Analysis of Descriptives statistics

Table 1: Descriptive statistics

	Observations	Mean	Standard deviation	Minimum	Maximum
ROA	110	0.015	0.0178	0.00089	0.0983
ROE	110	0.143	0.0753	0.0034	0.3615
NIM	110	0.034	0.0189	0.0085	0.1746
Size	110	16.45	0.95	14.56	18.36
TLA	110	0.793	0.1457	0.14	0.9817
CAP	110	0.1456	0.0738	0.0092	0.09
T deposit	110	0.8615	0.1538	0.096	0.973
ALA	110	0.0324	0.0254	0.0135	0.01642
Growth	110	0.3015	0.037	0.275	0.4025
Tangability	110	0.7283	0.059	0.5714	0.85
TPIB	110	0.031	0.0465	-0.1052	0.067
TINF	110	0.075	0.0169	0.035	0.08674
Leverage	110	0.058	0.037	0.0475	0.094

- The mean of ROA (0.015). The net return represent 1.5% an average of total assets. The standard deviation is low. There is no big difference between banks in term of return on assets
- The mean of ROE (0.143). The net return represent 14.3% an average of total equity. The standard deviation is high. There is big difference between banks in term of return on equity
- The mean of net interest margin (0.034). The net interest margin represent 3.4% an average of total assets. The standard deviation is low. There is no big difference between banks in term of net interest margin
- The mean of size (16.45). The standard deviation is big. There is big difference between banks in term of size
- The mean of TLA (0.793). The total loans represent an average 79.3% of total assets. The standard deviation is big. There is big difference between banks in term of size.
- The mean of capital (0.1456). Total capital represent an average 14.56% of total assets. The standard deviation is big. There is big difference between banks in term of capital
- The mean of T deposit (0.8615).Total deposit represent an average 86.15% of total assets. The standard deviation is high. There is big difference between banks in term of deposits.
- The mean of ALA (0.032). Asset liquid represent an average 3.2% of total assets. The standard deviation is low. There is no big difference between banks in term of liquid assets
- The mean of growth (0.3015). There is no big difference between banks in term of growth
- The mean of tangibility (0.7283). Fixed assets represent an average 72.83%) of total assets. There is big difference between banks in term of tangibility
- The mean of TPIB (0.031). Economic growth is 3.1% an average over the period (2014.2023)
- The mean of TINF (0.075). Inflation is 7.5% an average over the period (2014…2023)

3.4 Multicolinearity test

Table 2: Multicolinearity between the variables

	ROA	ROE	NIM	ALA	TLA	Size	CAP	T deposit
Roa	1.000							
Roe	0.524	1.000						
Nim	0.157	0.176	1.000					
Ala	0.741	0.825	0.816	1.000				
Tla	0.825	0.714	0.643	0.157	1.000			
Size	0.183	0.195	0.28	0.34	0.42	1.000		
Cap	0.024	0.026	0.029	0.036	0.041	0.076	1.000	
T deposit	0.034	0.038	0.043	0.053	0.076	0.1225	0.1485	1.000
Growth	0.056	0.081	0.094	0.1021	0.1225	0.1451	0.1531	0.1893
Tangibility	0.079	0.093	0.1051	0.1245	0.1451	0.1543	0.1792	0.1945
Tpib	0.054	0.056	0.064	0.087	0.093	0.1046	0.1821	0.2147
Tinf	0.075	0.069	0.073	0.064	0.082	0.093	0.1123	0.2569

Table 3: Suite of correlation between the variables

	Growth	Tangibility	TPIB	TINF
Growth	1.000			
Tangibility	0.071	1.000		
TPIB	0.085	0.093	1.000	
TINF	0.063	0.052	0.064	1.000

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

Table 4: VIF of variables

Variable	VIF	1/VIF
ROA	2.25	0.44
ROE	2.58	0.38
NIM	2.76	0.36
Size	3.05	0.32
CAP	3.17	0.31
TLA	2.85	0.35
Tdeposit	2.71	0.37
ALA	3.29	0.30
Growth	3.87	0.2583
Tangability	2.17	0.46
TPIB	4.012	0.25
TINF	4.81	0.2079
Leverage	3.94	0.2538

VIF is a measure of the amount of multicollinearity in a multiple regression variables.
VIF inferior to 5 there is no problem of multicollinearity.

3.5 Hausman test
It is a key tool in econometrics for determining endogeneity in regression models. It helps researchers choose between fixed effects and random effect in panel data analysis.
Under the null hypothesis both the fixed effect and random effect estimators are consistent random effect are more efficient. Alternative hypothesis correlation between explanatory variables and error term. Fixed effect estimation is consistent.
In our model pv = 0.069 superior to 5% we choose random effect.

3.6 Results and interpretations of model

Table 5: results of model estimation

Leverage	Coefficient	Z	Z<p
ROA	0.174	2.45**	0.0518
ROE	0.185	2.75***	0.0117
NIM	0.193	1.45	0.249
Size	-0.1043	3.28***	0.0129
CAP	0.1358	3.19***	0.0145
TLA	0.2476	3.07***	0.0187
Tdeposit	-0.018	1.85	0.27
ALA	-0.027	1.46	0.35
Growth	0.2719	2.35	0.241
Tangability	0.4536	2.86***	0.0127
TPIB	0.5218	1.48	0.31
TINF	-0.0839	2.35**	0.0525

(***) significant at 1% (**) significant at 5%

- There is a positive relationship between leverage and ROA (if ROA increase by 1%; Leverage will increase by 0.174%). The increase of return on assets has a positive effect on leverage. The result is contrary to result found by Khan *et al* (2023) [14] but similar to result found by Kebede (2024) [12].
- There is a positive relationship between return on equity and leverage (if ROE increase by 1%; Leverage will increase by 0.185%). The increase of return on equity has a positive effect on leverage.
- There is a positive relationship between net interest margin and leverage (if NIM increase by 1%, leverage will increase by 0.193%). The increase of net interest margin has a positive effect on leverage.
- There is a negative relationship between size and leverage (if Size increase by 1% leverage will decrease by 0.1043%). The increase of size has a negative impact on bank leverage. This is contrary to result found by Khan *et al* (2023) [14], Gropp and Heider (2010) [11].
- Amidu (2007) [35] reported that short term total debt is positively related to bank size and negative relationship between bank size and long-term debt
- There is a positive relationship between CAP and leverage (if CAP increase by 1%; leverage will increase by 0.1358%). The increase of capital has a positive impact on bank leverage.
- There is a positive relationship between TLA and leverage (if TLA increase by 1%, leverage will increase by 0.2476%). The increase of leverage has a positive impact on bank credit.
- There is a negative relationship between T deposit and leverage (if Tdespoit increase by 1%; leverage will decrease 0.018%). The increase of deposit has a negative impact on bank leverage.
- There is negative relationship between ALA and leverage (if ALA increase by 1%; leverage will decrease by 0.027%). The increase of liquid assets has a negative impact on bank leverage. This result is contrary to result found by Kebede (2024) [12].
- There is a positive relationship between Growth and leverage (if Growth increase by 1%, leverage will increase by 0.2719%). The increase of growth has a positive impact on leverage. This is contrary to result found by Khan *et al* (2023) [14] but similar to result found by Kebede (2024) [12]. Expanding banks need to expand their branches to serve more consumers which requires them to take on more debt (Ramli *et al* (2019) [23], Rashid *et al* (2021) [17], Vo (2017) [36].
- There is a positive relationship between Tangibility and leverage (if Tangibility increase by 1%; leverage will increase by 0.4536%). The increase of tangibility has a positive impact on leverage. This result is similar to result found by Khan *et al* (2023) [14]. This in line with the tradeoff theory which assumes that physical assets can based as collateral to borrow more.
- There is a positive relationship between TPIB and leverage (if TPIB increase by 1%; leverage will increase by 0.5218%). The increase of economic growth has a positive impact on leverage. This result is similar to result found by Khan *et al* (2023) [14], Beck *et al* (2008); Chipeta and Mbululu (2013) [5, 8] but contrary to result found by Kebede (2024) [12]
- There is a negative relationship between TINF and

leverage (if TINF increase by 1%; leverage will decrease by 0.0839%). The increase of inflation has a positive effect on bank leverage. This result is contrary to result found by Khan *et al* (2023) [14], Kebede (2024) [12] but similar to result found by (Booth *et al* (2001), [7].

4. Conclusion
Kewon *et al* (1985) defined capital structure as the combination of the financial resources such as debt and equity which are listed in the balance sheet of the companies or institutions. Also, Beltratti and Stulz (2012) [6] argue that banks like any other firm; enjoy a tax shield when they use debt financing up to a certain point when the net worth of the tax buffers on extra debt is balanced out by a rise in current value of economic stress costs and the agency implications. This implies that banks are able to benefit from an optimal mix of financing in their capital structure.

Besides the introduction of the Basel 3 leverage ratio also limits a bank's overall leverage by comparing its Tier 1 capital to its total exposure. In general banks have a more concentrated ownership than non-financial firms; which makes it more difficult for small equity holds to exert influence over the management of bank.

Understanding capital structure choice of banks is important because there is a tradeoff between liquidity creation and default risk minimization; and there is an indirect implication of high capitalization on monetary policy transmission through the bank capital channel (Mohammad (2022) [19].

Bank capital structure decisions have implications for bank intermediation and its stability. Capital help in reducing default risk but negatively impacts liquidity creation (Diamond; Rajan (2000) [9].

In this article our objective is to study the factors affecting bank capital structure in Tunisia. We used a sample of 11 banks quoted in financial market of Tunis over the period (2014….2023). By applying a model of panel static we found that ROA; ROE; size; capital; total credit; tangibility and inflation have significant effect on bank leverage.

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