



The impact of liquidity on bank lending: Case of Tunisia

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ARTICLE INFO	ABSTRACT
Article History:	Liquidity is the risk to a bank's earnings and capital arising from its inability to timely meet obligations when they come due without incurring unacceptable losses. Bank management must ensure that sufficient funds are available at a reasonable cost to meet potential demands from both fund providers and borrowers. Also, Lending is the process by which a financial institution provides funds to a borrower. Often called a lender, the institution typically receives interest in return for the loan. Lending in banking benefits lenders and borrowers alike by increasing liquidity within the marketplaces where loans are originated and used. This article aims to identify the impact of liquidity on bank lending. We used a sample of 12 banks in Tunisia over the period (2005....2022). By employing a method of panel static we found that liquidity has a significant impact on bank lending. Keywords: liquidity ; bank ; lending , Tunisia.
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1. Introduction

Lending is the principal activity of a bank. Also, liquidity is essential to guarantee the safety of operations and to meet several obligations of the bank.

During the global financial crisis of (2007...2009); governments and regulators intervened extensively to provide liquidity support to banks that were unable to meet short-term obligations. Since then, bank liquidity has attracted considerable attention from academics.

(Calorimis; al (2014); De Nicolo (2016); Chiaramonte; Casu (2017); Chiaramonte (2018); Bowman (2019)) Policymakers have introduced rules that require banks to hold more liquid assets.

Proponents of these new regulators contend that by holding liquid assets; banks become more resilient to sudden balance sheet shocks and as a consequence can continue lending to households; small and medium-sized enterprises (SMEs) and corporates even during stressed periods (Boissay; Collard (2016); Bressan (2018)).

For example; to meet stricter liquidity requirements; banks could increase stable funding (via increased deposit taking or by issuing new equity) and balance sheet size; possibly leading to an increase in lending to households; SMEs and corporates.

Alternatively; to avoid holding more liquidity; banks could reduce balance sheet size by shrinking assets; leading to a decrease in lending and resultant negative consequences to the real economy. Banks could also adjust the composition of loan portfolios towards shorter maturities; to improve liquidity without changing balance sheet size. (Anarou; al (2021).

Also, Mishra and Burns (2017) found evidence of an indirect feedback channel between monetary policy and bank lending operating through changes in bank lending.

The ultimate goal of our research is to identify the impact of liquidity on bank lending in Tunisia. We will use a methodology of three sections. The first section is devoted to a literature review; in the second section, we make an empirical study. We finalize by a conclusion.

2. Literature review

Tran and Millan (2020) investigate how funding liquidity affects bank lending using a large sample of US bank holding companies. They document consistent evidence of lower loan growth for banks that rely more on deposits. The quantile regression which dissects the lending behavior of banks at the right ail of loan growth distribution points out that the leveraged effect of funding liquidity is larger in high loan growth of banks.

Besides Anaron et al (2021) found that the liquidity balance rule increased the volume of lending by Deutch banks relative to other banks in the Eurozone.

Dang (2019) examined the impact of funding liquidity on bank lending in terms of loan growth using a data set of commercial banks in Vietnam over the period (2003 to 2017)). The empirical results by GMM estimators to control the dynamic nature of panel data show that banks owing higher funding liquidity measured by higher ratios of deposits tend to lend more.

Also, Bressen (2008) analyzed a large sample of US banks; they discovered that the lending on firms is lower when they load liquidity in the form of cash, interbank deposits; or

through transactions on federal funds. Using a structural VaR framework and unique bank liquidity index; this study builds a short-run model to analyze dynamic interactions among monetary policy; bank liquidity and bank lending in India.

They find that monetary policy shocks have a strong internal and persistent impact on bank lending while liquidity shocks impact bank lending after a 9 months' lag.

They also find evidence of an indirect feedback channel between monetary policy and bank lending operating through changes in bank liquidity.

Moreover, Madaghri (2022) examined the effect of bank liquidity creation on nonperforming loans in the Middle East and North Africa (MENA) region.

Berger and Bouwman's (2009) three-step methodology was employed to evaluate the level of liquidity creation of a selected sample of 11 commercial banks in 10 MENA countries from (2010....2017). In the next 2 steps system generalized method of moments (GMM) estimation was used to investigate the linkage between bank liquidity creation and NPLs.

The results demonstrated a significant negative effect of bank liquidity creation on NPLs in the short and long term; implying that liquidity creation through both on and off balance sheet activities decreases NPLs. Jeremiah and al (2022) used a sample of 12 listed commercial banks in Nigeria from the period (2006...2020). They found that bank liquidity significantly influenced the lending behavior of commercial banks.

Bonner (2012) and Bonner and Eijffinger (2012) test how the Dutch Liquidity Ratio affects interbank funding costs and corporate lending rates by exploiting the variation between banks that are just above or below their regulatory liquidity requirements. Consistent with our results they find that banks below their liquidity requirements do not charge higher interest rates on corporate loans. They also find that banks below their liquidity requirements pay higher interest rates on unsecured interbank funding, even though there is no public disclosure of this regulatory information.

Using data on bank holding companies in the USA and Europe; Ben Naceur and al (2018) analyzed the impact of capital and liquidity on bank lending growth following the 2008 financial crisis and the new measures inspired by the Basel III regulatory framework.

It is unclear whether the introduction of liquidity regulation led to an increase or decrease in bank lending; given that banks have many ways to manage liquidity.

For example, to meet stricter liquidity requirements; banks could increase stable funding (via increased deposit taking or by issuing new equity) and balance sheet size; possibly leading to an increase in lending to households; SMEs and corporates. (Anarou and al (2021))

Alternatively, to avoid holding more liquidity, banks could reduce balance sheet size by shrinking assets leading to a decrease and resultant negative consequence for the real economy. Banks could also adjust the composition of loan portfolios toward shorter maturities; to improve liquidity without changing balance sheet size.

Banks with adequate funding liquidity are less likely to experience liquidity crunches. As a consequence; banks may

restrain to originate credits to satisfy the liquidity requirements to maintain greater liquidity. Literature on bank liquidity risk also documents the precautionary motives for banks to ration credits (Allen, Gale (2004); Gale and Yorulmazer (2013)) and suggests that banks may be worried about lending; then respond by hoarding liquidity for precautionary reasons (against potential shocks of liquidity in the future) or for strategic reasons (to exploit of potential asset liquidation).

Diamond and Kashyap (2016) analyze 2 types of liquidity regulation that represent NSFR and LCR and show that important results are obtained: first; banks must hold an excess amount of safe assets and reduce their lending regardless of the regulation type when some depositors determine whether or not they should withdraw their deposits early hard on the bank's soundness and when the regulation restricts the bank's decisions.

Second which type of regulation is optimal depends on the bank's heterogeneity. If the bank's heterogeneity is sufficiently large; LCR-type regulation can lead to a smaller reduction of lending than NSFR type one does, otherwise NSFR type one leads to a smaller reduction of the bank's lending.

De Young and Kang (2016) examine the liquidity management of US banks following liquidity shocks. They find that small banks tend to adjust the composition of assets and liabilities, which temporarily depresses profitability, but find little effect on larger banks. They argue that the Basel III Net Stable Funding Ratio (NSFR) would have heterogeneous effects on banks by firm size. Other microeconomic studies of bank liquidity management have examined liquidity regulation and bank cash holdings, Bonner et al. (2013); the liquidity transformation of banks, Berger and Bouwman (2009); regulatory intervention and liquidity transformation, Berger et al. (2016); management of cash holdings and liquid securities, De Haan and van den End (2013b).

Okahara (2020) investigated whether a bank's lending decreases or not when there exist multiple sets of assets that satisfy a liquidity regulation. In addition, he analyses two types of liquidity regulation; one focuses on how continuity of their liquidity holding.

The model shows that even when there exist other ways to satisfy the regulation besides holding only resources; banks still hold an excess amount of liquidity under the type of liquidity regulation. However, the model also shows that the amount of bank lending varies according to how they satisfy the liquidity regulation and the probability that a save reduction of lending happens depends partly on the regulation.

3. Empirical study

We will utilize a sample consist of 11 banks quoted in Tunisia stock financial market for the period (2005...2022)

A-Specification of model

$$TLAi,t = b_0 + b_1 ROAi,t + b_2 ROEi,t + b_3 NIMi,t + b_4 Sizei,t + b_5 ALAi,t + b_6 CDi,t + b_7 CAPi,t + b_8 CEAi,t + b_9 CFCi,t + b_{10} Tdepositi,t + b_{11} TPIBi,t + b_{12} TINFi,t + Ei,t$$

$i = \text{bank}; t = \text{time}$

$b_0 = \text{constant}$

$b_1; b_2, \dots, b_{12} = \text{parameters to be estimated}$

$Ei,t = \text{error term}$

$TLA = \text{total loans} / \text{total assets} = \text{approximation of bank lending}$

It indicating the percentage of total loans by total assets

ROA = net income / total assets

ROA is a functional indicator of bank profitability. It is considered an accounting measure of bank's profitability. It gives an idea as how efficiently management deploys its assets to generate income (Prakash; Sindhaska (2018))

ROE = net income/total equity

ROE is a measure of how efficiently shareholder capital is being used to generate profit

NIM = net interest margin/total equity

Net interest margin reveals the amount of money that a bank is earning interest on loans compared to the amount it is paying in interests on deposits

Size = logarithm of total assets

CAP = total capital/total assets

Capital is essential to ameliorate the strength of bank capital

ALA = liquid assets/total assets

This ratio is an indicator of short term solvency. This ratio can provide some insight into the liquidity status of a firm since

the ratio can reveal the percentage of the remaining liquid assets compared to the firm's total assets. (Jeremiah; al (2022)).

CD = total credits/total deposits

It is used to assess the liquidity of a bank by doing a comparison between the total volume of its loans and its total deposits. A high ratio implies that the bank is lending more relative due what it receives as deposit which protected both credit and liquidity risk while in the other hand; a lower ratio represents higher deposits than what is given out as credits (Alvarez; Fernandez; Garcicabo; Posadu (2019)).

CEA = operating costs/total assets

CFC = financial expenses/total credits

T deposit = total deposits/total assets

TPIB = GDP growth

TINF =rate of inflation

We will estimate the following hypothesis:

H 1: bank liquidity has a significant impact on bank lending

H2: bank liquidity doesn't have a significant impact on bank lending

B-Analysis of descriptive statistics

Table 1: Descriptive statistics

Variable	Observations	Mean	Standard deviation	Minimum	Maximum
ALA	216	0.0345	0.0227	0.0028	0.0065
TLA	216	0.783	0.1253	0.12	0.98
ROA	216	0.014	0.0096	0.0088	0.0983
ROE	216	0.1356	0.0728	0.0029	0.3251
NIM	216	0.028	0.0157	0.0083	0.18475
Size	216	17.26	0.94	12.52	19.54
CAP	216	0.1251	0.0815	0.0086	0.5321
CEA	216	0.045	0.029	0.00023	0.37
CFC	216	0.042	0.0178	0.018	0.1853
Tdeposit	216	0.7918	0.1293	0.099	0.9674
TPIB	216	0.015	0.0561	-0.1051	0.065
TINF	216	0.063	0.0173	0.03410	0.08641

-ALA (mean = 0.0345). The asset liquid represents 3.45% on average of total assets. The standard deviation is low. There is a small difference between banks in terms of asset liquids

-TLA (mean =0.783). The total loans represent 78.3% on average of total assets. The standard deviation is high. There is a big difference between banks in terms of credit.

-ROA (mean =0.014). The net return represents 1.4% of total assets. The standard deviation is very low. There is a small difference between banks in terms of return on assets.

-ROE (mean = 0.1356). The net return represents 13.56% of total assets. The standard deviation is high. There is a big difference between banks in terms of return on equity

-NIM (mean = 0.028). The net interest margin represents 2.8% of total assets. The standard deviation is low. There is a small difference between banks in terms of NIM

-Size (mean = 17.26). The standard deviation is high. There is a big difference between banks in terms of size.

-Cap (mean = 0.1251). The capital represents 12.51% on average of total assets. There is a big difference between banks in terms of capital.

-CEA (mean = 0.045). The operating costs represent 4.5% on average of total assets. There is a low difference between banks in terms of operating costs.

-CFC (mean = 0.042). The financial expenses represent 4.2% on average of total credit. There is a low difference between banks in terms of CFC

-T deposit (mean = 0.7918). The total deposit represents 79.18% on average of total assets. There is a big difference between banks in terms of deposits

-TPIB (mean =0.015. The economic growth was 1.5% on average in the period (2005...2022). There is a big difference between the years because of the Tunisian revolution and the sanitary problem of Corona

-TINF (mean = 0.063). The rate of inflation is 6.3% on average. There is a big problem between years in terms of inflation.

C-Multicollinearity test

Table 2: Multicollinearity between variables

	ALA	CD	TLA	ROA	ROE	NIM	Size	CAP
ALA	1.000							
CD	0.0730	1.000						
TLA	-0.0844	-0.1949	1.000					
ROA	-0.1684	0.1631	0.1191	1.000				
ROE	-0.2150	-0.1616	-0.1176	0.3921	1.000			
NIM	0.0158	0.0833	0.2478	0.1073	0.0834	1.000		
Size	0.0973	-0.2745	0.1577	0.0857	0.3635	0.255	1.000	
CAP	-0.0775	0.6962	0.1346	0.2912	-0.1852	0.0615	-0.3575	1.000
CEA	0.2036	0.0159	-0.066	-0.0267	0.075	-0.0641	0.1237	-0.0075
CFC	-0.0378	-0.0258	-0.0117	-0.0070	-0.047	-0.1476	0.1384	-0.0227
T deposit	-0.2385	-0.5547	0.0531	0.0169	0.381	-0.0711	0.4336	-0.1691
TPIB	0.0604	0.0589	-0.1125	0.0679	-0.0117	-0.0250	-0.25	0.0123
TINF	-0.1198	-0.1198	0.3496	-0.0374	0.211	0.043	0.42	-0.1064

Table 3: Suite of correlation between variables

	CEA	CFC	Tdeposit	TPIB	TINF
CEA	1.000				
CFC	0.3142	1.000			
T deposit	-0.1459	-0.1598	1.000		
TPIB	-0.13940	-0.2223	-0.0303	1.000	
TINF	0.1031	0.1271	0.1602	-0.5512	1.000

Table 4: VIF

Variable	VIF	1/VIF
T deposit	2.25	0.44
CAP	2.34	0.42
TINF	1.93	0.518
Size	1.68	0.59
ROE	1.59	0.6289
TPIB	1.54	0.6493
ROA	1.46	0.6849
TLA	1.32	0.75
CFC	1.29	0.7751
CEA	1.18	0.84740
Nim	1.14	0.8771

Variance inflation factor (VIF) is a measure of the amount of multicollinearity test in a set of multiple regression variables. Mathematically the VIF for a regression model variable is equal to the ratio of the or all model variance to the variance of a model that includes only that simple independent variable. This ratio is calculated for each independent variable.

A high VIF indicates that the associate independent variable is highly collinear with the other variables in the model. VIF is inferior to 5 there is no problem with multicollinearity

D- Hausman test

It is useful to choose between the fixed effect model and the random effect model.

The fixed effect model is the statistical model in which the model parameters are fixed. In panel data where longitudinal observations are for the same subject; fixed effects represent the

E-Estimations and interpretations of the model

Table 5: estimation results of model 1 (random effect)

TLA	Coefficient	Z	Z<P
ROA	0.4183	0.53	0.648
ROE	-0.0715	-0.51	0.725
NIM	1.8270***	3.25	0.005
Size	1.2560***	3.06	0.003
CAP	1.8554***	3.17	0.0025
CEA	-0.1884	-0.63	0.585
CFC	-0.6367	-1.17	0.289
T deposit	0.1785**	2.25	0.048
CD	0.0427**	2.15	0.053
ALA	-0.1572**	2.23	0.054
TPIB	0.2718***	4.45	0.051
TINF	2.57	1.82	0.000
Constant	0.3246	1.85	0.074

(***) significant at 1%

(**) significant at 5% $R^2=0.45$ $F=0.05$ $Z=t$ student

subject or specific means. In the panel data analysis; the term fixed effect estimator; also known as the within estimator; is used to refer to an estimator for the coefficients in the regression model including those fixed effects (on the time-invariant intercept of each subject)

The assumption is that if the p value is inferior to 0.05 all coefficients of the model are not equal to zero.

The random effect model is also called a variance component model. It is the statistical model where the parameters are random. It is a kind of hierarchical linear model that assumes the data being analyzed are drawn from a hierarchy of different populations whose differences relate to that of hierarchy. (Makanile and Pastory (2022)).

In our case p value = 0.2875 we choose a random effect model.

-There is a positive relationship between ROA and TLA (if ROA increases by 1% TLA increases by 0.4183%). The increase of return on assets has a positive influence on bank lending. This relationship is contrary to the result found by Ghariabeh and Farooq (2022). Also, there is a negative relationship between ROE and TLA (if ROE increases by 1% TLA decreases by 0.0715%). The increase in return on equity hurts bank lending.

Besides, there is a positive relationship between NIM and TLA (if NIM increases by 1%; TLA increases by 1.8270%). The increase in net interest margin has a positive impact on bank lending. This relationship is statistically significant at 1%. There is a positive relationship between size and TLA (if Size increases by 1%, TLA will increase by 1.2560%). The increase in size has a positive impact on bank lending.

This relationship is statistically significant at 1%. Bank size is measured as the natural log of total assets. The bank size used to measure the ability of banks to lend money due to economies of scale may be enjoyed by the bank when large size banks might have lower costs of production and information; thus it will indirectly facilitate the bank lending. (Adzis; al (2018)

There is a positive relationship between CAP and TLA (if CAP increases by 1%; TLA will increase by 1.85%). The increase of capital has a positive impact on bank lending. This relationship is statistically significant at 1%. This result is similar to the result found by Rababah(2015), and Miyajima (2020). Thus capital adequacy assures the availability of funds and strength to lend hence the ability to give more loans at competitive interest rates.

Berropsides; Edges (2010); Carbon and al (2013) documented a positive effect of bank capital on bank lending. There are 2 stands of theories on how capital influences bank lending.

According to financial fragility crowding; Berger and Bowman (2009) argue that shareholders are more reluctant to offer loans when they invest more money in their bank. They also become more cautious with their investment decisions. Thus more capitalized banks may supply fewer loans their less capitalized banks. The impact of capital on bank lending is positive according to the risk absorption theory.

In this Vein holding a large capital buffer improves the risk-bearing capacity and protects banks against potential losses (Coval; Thakor (2005)); Repullo (2004); Kim and Shon (2017) claim that banks with more capital only expand their lending aggressively after store enough liquidity. Roulet (2018) finds that capital ratio induces a negative impact on retail lending in the post-2008 financial crisis.

There is a negative relationship between CEA and TLA (if CEA increases by 1% TLA will decrease by 0.1884%). The increase in operating costs harms bank lending There is a negative relationship between CFC and TLA (if CFC increases by 1%; TLA will decrease by 0.6367%). The increase in CFC harms bank lending.

There is a positive relationship between the T deposit and TLA (if the T deposit increases by 1% TLA will increase by 0.1785 %). The increase in deposits has a positive impact on bank lending. This relationship is similar to the result found by Rababah (2015); Adzis and al (2018); Yitayaw (2021); and Sharma and Gounder (2021).

Customer deposits are crucial for bank lending as they supply most of the raw materials for banks to grant loans and generate profits for the banks (Rose, Hudgins (2013)). Commercial banks act as intermediaries by accepting the deposits from the deposits and using the funds to grant loans to the deficit unit in the financial market.

There is a positive relationship between CD and TLA (if TLA increases by 1% CD will increase by 0.0427%). The increase of credits by deposits has a positive impact on bank lending.

There is a negative relationship between ALA and TLA (if ALA increases by 1% TLA decreases by 0.1572%). The increase in assets liquids harms bank lending. This result is similar to the result found by (Anarou and al (2021); Tran (2020); Okhara (2020), and Miyajima (2020) but contrary to the result found by (Gharabieh and Farooq (2022)).

Liquidity describes the ability of a bank to convert its assets into cash with minimum losses (Mac Donald; Koch (2006)). Theoretically, the high proportion of liquid assets held by the bank will directly reduce the fund's availability for loans. Since loans are illiquid assets; an increase in the volume of loans and advances means an increase in illiquid assets in the asset portfolio of a bank (Yitayaw (2021)).

There is a positive relationship between TPIB and TLA (if TPIB increase by 1% TLA increase by 0.2718%). The increase in economic growth has a positive impact on bank lending. This relationship is similar to the result found by Alkhazaleh (2017), Rizky (2020)

Good economic conditions will certainly increase economic growth. Banks are reluctant to provide loans to the public because of the unstable financial conditions in the community (Dian et al (2020). Strong economic conditions create more demand for goods and services which leads to more investment in different sectors; hence increasing the per capita income as well as the savings.

There is a positive relationship between TINF and TLA (if TINF increase by 1%; TLA will increase by 2.57%). The increase in inflation has a positive impact on bank lending.

Inflation allows borrowers to pay lenders back with money worth less than when it was originally borrowed; which benefits borrowers. When inflation causes higher prices; the demand for credit increases; raising interest rates; which benefits lenders.

Conclusion

Banks are subject to legal reserve requirements. Reserve requirements indicate the amount of funds that a depository institution must hold in reserve against specified deposit liabilities; in the form of vault cash or deposits with federal reserve banks. The required reserves include those funds fulfilling the legal requirement; while additional balances to the required reserves are classified as excess reserves. (Bresson (2018)).

Also, banks experience funding liquidity problems when facing the day up of capital markets. This relates to the liquidity channel of financial transmission through which market funding liquidity shocks are propagated to bank lending and the real economy (De Haan; Ven Dan End (2013))

In the aftermath of the financial crisis; regulators recognize the need to strengthen the liquidity management and financial

stability of banks; and then develop a framework for assessing liquidity in banking in addition to more stringent capital adequacy rules.

To comply with these new standards; banks have to improve their capital buffers; and change the structure of their balance sheet improving the liquidity of their assets and the stability of their funding (Roulet (2018)). Our article aims to

investigate the impact of liquidity on bank lending in Tunisia over the period (2005...2022). we used a method of panels static for the sample of 12 banks.

We found that liquidity has a significant impact on bank lending. The ratio of (liquid assets/total assets) has a positive effect on bank lending, whereas (total credits/total deposits) harm bank lending.

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