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The impact of liquidity on bank lending: Case of Tunisia

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Abstract

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 funds 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.

The aim of this article is 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.

Key words : liquidity ; bank ; lending , Tunisia

1-Introduction

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

(**Calorimis ; al (2014) ; De Nicolo (2016) ; Chiaramonte ; Casu (2017) ; Chiaramonte (2018) ; Bowman (2019)**) as policy makers have introduced rules 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 consequence can continue lending to households ; small and medium sized enterprises (SMEs) and corporates even during stressed periods (**Boissay ; Collard (2016) ; Bressan (2018)**).

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For example; in order 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 consequent to real economy. Banks could also adjust the composition of loan portfolios towards shorter maturities; in order 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 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 the bank lending using a large sample of US banks holding companies. They document a consistent evidence of a lower loan growth for banks that rely more deposits. The quantile regression which dissects the lending behavior of banks at the right tail of loan growth distribution point out the leveraged effect of funding liquidity is larger in high loan growth of banks.

Besides **Anaron and al (2021)** found that liquidity balance rule increased the volume of lending by Deutch banks relative to other banks located 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...2017). The empirical results by GMM estimators to control 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 discover 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 strong internal and persistent impact on bank lending which 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 non performing loans in the Middle East and North Africa (MENA) region.

Berger and Bouwman (2009) three steps 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). 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)** analyses 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 lead to an increase or decrease in bank lending ; given that banks have a number of ways to manage liquidity .

For example in order to meet stricter liquidity requirements ; banks could increase stable funding (via increased deposit taking or by issuing new equity) and balance sheet size ; possible 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 including and resultant negative consequence for the real economy . Banks could also adjust the composition of loan portfolio toward shorter maturities ; in order to improve liquidity without changing balance sheet size .

Banks with adequate funding liquidity are less likely to experience liquidity crunches . By consequent ; banks may restraint to originate credits to satisfy with the liquidity requirements to maintain greater liquidity . Literature on bank liquidity risk also document the precautionary motivates for bank to ration credits (**Allen , Gale (2004) ; Gale and Yorulmazer (2013)**) suggest that banks may be worry about lending ; then respond by hording 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 are 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 leading that NSFR type ones does , otherwise NSFR type on leads to a smaller reduction of the bank's lending .

De Young and Kang (2016) examine 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) investigate the whether 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 show that even when there exist other ways to satisfy the regulation besides holding only resources ; banks still hold an excess amount of liquidity under 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

$$TLA_{i,t} = b_0 + b_1 ROA_{i,t} + b_2 ROE_{i,t} + b_3 NIM_{i,t} + b_4 Size_{i,t} + b_5 ALA_{i,t} + b_6 CD_{i,t} + b_7 CAPI_{i,t} + b_8 CEAI_{i,t} + b_9 CFC_{i,t} + b_{10} Tdeposits_{i,t} + b_{11} TPIB_{i,t} + b_{12} TINFI_{i,t} + E_{i,t}$$

i =bank ; t = time

b_0 = constant

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

$E_{i,t}$ = error term

TLA = total loans / total assets = 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 its 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 ; Garciacabo ; 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 have a significant impact on bank lending

H2: bank liquidity don’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 represent 3.45% on average of total assets . The standard deviation is low . There is a small difference between banks in term 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 term of credits .

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

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

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

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

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

-T deposit (mean = 0.7918) . The total deposit represent 79.18% on average of total assets . There is a big difference between banks in term 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 years because 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 term 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 calculate for each independent variable .

A high VIF indicates that associate independent variable is highly collinear with the other variables in the model

VIF is inferior to 5 there is no problem of multicollinearity

D- Hausman test

It is useful to choice between fixed effect model and random effect model.

Fixed effect model is the statistical model in which the model parameters are fixed . In a panel data where longitudinal observations is for the same subject ; fixed effects represent the subject or specify means . In the panel data analysis ; the term fixed effect estimator ; also known as the within estimator ; it is used to refer to an estimator for the coefficients in the regression model including those fixed effects (on time invariant intercept of each subject)

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

Random effect model it 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 which assumes the data being analysed are drawn from a hierarchy of different populations whose different relate to that of hierarchy . (**Makanile and Pastory (2022)**).

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

E-Estimations and interpretations of model

Table5: 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

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

Besides there is a positive relationship between NIM and TLA (if NIM increase by 1% ; TLA increase by 1.8270%) . The increase of net interest margin has a positive impact on bank lending. This relationship is statistically significant at 1% . There is positive relationship between size and TLA (if Size increase by 1% , TLA will increase by 1.2560%) . The increase of 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 lending money due to economies of scales may be enjoyed by the bank when large size bank might have lower cost 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 increase 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 result found by **Rababah(2015), 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 influence bank lending.

According to financial fragility crowding ; **Berger and Bowman (2009)** are 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 are 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 the store enough liquidity . **Roulet (2018)** find s that capital ratio induce negative impact on retail lending in the post 2008 financial crisis .

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

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

Customer deposits are crucial for bank lending as they supply most of the raw materials for banks to grant loan and generate profits for the banks (**Rose , Hudgins (2013)**)

The commercial banks act as intermediary by accepting the deposit from the deposits and use the fund to grant loans to the deficit unit in the financial market .

There is positive relationship between CD and TLA (if TLA increase 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 increase by 1% TLA decrease by 0.1572%) . The increase of assets liquids has a negative impact on bank lending . This result is similar to result found by (Anarou and al (2021) ; Tran (2020) ; Okhara (2020) , Miyajima (2020) but contrary to 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 funds availability for loans . Since loans are illiquid assets ; an increase in the volume of loans and advances means an increase an illiquid assets in the asset of 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 of economic growth has a positive impact on bank lending . This relationship is similar to 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 on the community (**Dian et al (2020)**) . A strong economic conditions creates more demand for goods and services which leads to more investment in different sectors ; hence increase the per capital income as well the saving .

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

Inflation allow 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 reserves requirements . Reserve requirements indicate that 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 . (**Bressen (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 ; then develop framework for assessing liquidity on banking in addition to more stringent capital adequacy rules .

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

The aim of our article is 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) have a positive effect on bank lending , whereas (total credits / total deposits) have a negative impact on bank lending .

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