
Real-Time Analysis of Liquidity's Impact on Bank Lending in Tunisia

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Mohamed Aymen Ben Moussa¹, Chedia Hedfi²

Abstract:

Purpose: This paper explore the relationship between liquidity and bank lending in Tunisia.

Design/Methodology/Approach: The analysis is performed through a panel model in a sample of 11 banks in Tunisia over the period (2005-2022).

Findings: Our principal finding is that liquidity has a significant effect on bank lending. The increase of bank liquidity ameliorate the possibility of credits by banks.

Practical Implications: The findings inform to regulators, investors, and customers the importance of bank liquidity in the policy of bank lendings. 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.

Originality/Value: This research is original in the Tunisian context and helps the investors to make their decisions when they borrow or finance their investments. To comply with the 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

Keywords: Banks, liquidity, lending, panel analysis.

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¹Doctor in Finance, Faculty of Management in Afif, University Shaqraa, Saudia Arabia

²Doctor in Accounting, Faculty of Economic Sciences and Management of Tunis, Shaqraa University, Tunisia, e-mail: moussaaymen495@gmail.com;

1. Introduction

Lending is the principal activity of bank. Also the 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 of academics (Calorimis *et al.*, 2014; De Nicolo, 2016; Chiaramonte and Casu, 2017; Chiaramonte, 2018; Bowman, 2019) as policy makers have introduced rules requiring 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 the households, small and medium sized enterprises (SMEs) and corporates even during stressed periods (Boissay and Collard, 2016; Bressan, 2018).

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 *et al.*, 2021; Thalassinou *et al.*, 2013; 2015).

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.

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

Besides Anaron *et 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 (2007-2017). 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.

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 a indirect feed back 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.

In Berger and Bouwman work (2009) a 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). In the next 2 steps a system of a 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 *et 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 *et 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 *et 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), and 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) and De Haan and van den End (2013b), management of cash holdings and liquid securities.

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 export 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.

2. Data Sources and Methodology

2.1 Data Sources and Description

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

The Specification of the model:

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

Where:

i=bank; t= time;

b0= constant;

b1, b2,, b12= parameters to be estimated;

Ei,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. 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 and Sindhaska, 2018);

ROE = net income / total equity. Is a measure of how efficiently shareholder capital is being used to generate profit;

NIM = net interest margin / total equity. It 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 et 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, Garciasabo, 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 hypotheses:

H1: bank liquidity have a significant impact on bank lending.

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

2.2 Resaerch Methodology

Table 1 presents the descriptive statistics.

Table 1. Descriptive statistics

Variable	Observations	Mean	St 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

Source: Own study.

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 terms 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 Various.

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

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
Tdeposit	-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

Source: Own study.

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

Source: Own study.

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

Source: Own study.

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. If VIF is inferior to 5 there is no problem of multicollinearity.

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

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 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 because the p value = 0.2875 we choose a random effect model.

3. Empirical Results and Dicsussion

3.1 Estimations and Interpretations of the 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 result found by Ghariabeh and Farooq (2022). Also there is negative relationship between ROE and TLA (if ROE increases by 1% TLA decreases by 0.0715%). The increase of return on equity has a negative impact on bank lending.

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

Note: (***) significant at 1%, (**) significant at 5%, $R^2 = 0.45$, $F = 0.05$, $Z = t$ student.

Source: Own study.

Besides there is a positive relationship between NIM and TLA (if NIM increases by 1% TLA increases 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 increases 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 lover cost of production and information, thus it will indirectly facilitate the bank lending (Adzis *et 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 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 and Edges (2010), and Carbon *et 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) argued 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 and Thakor (2005), Repullo (2004), and Kim and Shon (2017) claim that banks with more capital only expand their lending aggressively after the store of enough liquidity. Roulet (2018) finds 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 increases 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 increases 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 *et 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 loan and generate profits for the banks (Rose and 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 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 of assets liquids has a negative impact on bank lending. This result is similar to result found by Anarou *et al.* (2021), Tran

(2020), Okhara (2020), Miyajima (2020) but contrary to result found by Gharabieh and Farooq (2022).

Liquidity refers to a bank's ability to convert its assets into cash with minimal losses (McDonald and Koch, 2006). Theoretically, a high proportion of liquid assets held by a bank directly reduces the funds available for lending. Since loans are illiquid assets, an increase in the volume of loans and advances leads to a higher share of illiquid assets in the bank's asset portfolio (Yitayaw, 2021).

There is a positive relationship between TPIB and TLA (if TPIB increases by 1% TLA increases 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), and 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 condition 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 increases 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.

4. 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 wen 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 and 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).

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