

The Impact of Inflation on Bank Liquidity: Case of Tunisia

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Abstract

Liquidity is important in banking industry. It enhances the capacity of bank to achieve his goal of profitability and solvency. Also the economic condition such inflation is important for evaluating the perspectives of bank growth. In this article we studied the impact of inflation on banking liquidity in Tunisia. We used a sample of 11 banks for the period (2005...2020). By applying a method of panel static we found that inflation has a negative and significant impact on bank liquidity.

Keywords: *Liquidity, Bank, inflation, Panel*

1-Introduction

Liquidity in banking refers to the ability of a bank to meet its financial obligations as they come due. It can come from direct cash holdings in currency or on account at the Federal Reserve or other central bank. More frequently, it comes from acquiring securities that can be sold quickly with minimal loss. This basically states highly creditworthy securities, comprising of government bills, which have short term maturities.

If their maturity is short enough the bank may simply wait for them to return the principle at maturity. For short term, very safe securities favor to trade in liquid markets, stating that large volumes can be sold without moving prices too much and with low transaction costs.

Nevertheless, a bank's liquidity condition, particularly in a crisis, will be affected by much more than just this reserve of cash and highly liquid securities. The maturity of its less liquid assets will also matter. As some of them may mature before the cash crunch passes, thereby providing an additional source of funds..

On the other hand inflation is the persistence increase of price and goods and services. It influences the customers and the banking industry. In this article we studied the impact of inflation on the bank liquidity in Tunisian context. We adopt a methodology of 3 sections. The first section is devoted to literature review; the second section is related to empirical study. We finish by a conclusion.

2-Literature review

A-Bank liquidity

Bank liquidity refers to the latter meaning but also depends on the former. A bank is liquid if it can repay borrowers when due, meet deposit withdrawals, and satisfy draws on lines of credit that it has extended without paying inordinately in funding markets or selling assets at fire-sale prices. Moreover, because banks provide funding to each other, liquidity problems at one bank can quickly spillover to other banks.(bpi.com)

In a specific term, liquidity can be described as a bank or firm's ability to meet the cash demand of its policy and contract that it holds with minimal or no loss (Bank,2004). In other words, the liquidity profile of a bank is a function of its assets and liabilities (Chorafaa, 2007). Banks in their course of managing a variety of assets and liabilities face a variety of risks, such as market risk, credit risk, operational risk, reputational risk, liquidity risk and a 2 host of others in their day-to-day operations (Greuning & Bratanovic, 2003).

Interestingly, liquidity concept and its risks described by Belo (2000) as very vital for the smooth and efficient functioning of all financial and capital market institutions and invariably for the survival and stability of the financial system are yet to be given due attention as much as given to the market risk or credit risk. However, recent global financial crunch as a result of liquidity problems in the international financial markets had spurred the management of banking institutions, regulators, supervisors and the policymakers to change their lukewarm attitudes and give prominent and special attentions to liquidity and its risk management in banking industry (Vento and Ganga, 2009)

B- Inflation

In economics, **inflation** is an increase in the general price level of goods and services in an economy. When the general price level rises, each unit of currency buys fewer goods and services; consequently, inflation corresponds to a reduction in the purchasing power of money. The opposite of inflation is deflation, a sustained decrease in the general price level of goods and services. The common measure of inflation is the **inflation rate**, the annualized percentage change in a general price index

An increase in the supply of money is the root of inflation, though this can play out through different mechanisms in the economy. A country's money supply can be increased by the monetary authorities by:

- Printing and giving away more money to citizens
- Legally devaluing (reducing the value of) the legal tender currency
- Loaning new money into existence as reserve account credits through the banking system by purchasing government bonds from banks on the secondary market (the most common method)

In all of these cases, the money ends up losing its purchasing power. The mechanisms of how this drives inflation can be classified into three types: demand-pull inflation, cost-push inflation, and built-in inflat (investpedia.com)

C-The relationship between bank liquidity and inflation

Qehaja and al (2022) studied a sample of banks in 28 European union members for the period (2008..2020) . They found that inflation has a positive impact on bank liquidity .

Nguyen and Vo (2021) studied 17 commercial banks listed on the vitenamisse stock exchange

for the period (2006..2020) . They found that inflation has a positive impact on bank liquidity . **Mahmood and al (2019)** studied a sample of banks in Pakistan for the period (2000...2017) . They found that inflation has a non significant impact on bank liquidity

Also **El Chaarani (2019)** studied 183 banks from 8 countries for the period (2014...2016) . He found that inflation has a positive impact on bank liquidity.

Some authors imply that increase of the inflation rate will decrease the purchasing power of individuals ; so they need more money to buy the same products .

As a result the demand for loans will increase and this bank liquidity will decrease (Trencia and al (2015).

Zaghdoudi and Hakimi (2017) studied 10 Tunisian banks for the period (1980—2015) . They found that inflation has a negative impact on bank liquidity

Sheefeni and Nyambe (2015) studied a sample of banks in Namibia for the period (2001---2014) . They found that inflation has a negative impact on bank liquidity . Besides **Al Homaidi and al (2019)** studied 37 commercial banks listed in Bombay stock exchange for the period (2008...2017) . They found that inflation has a positive impact on bank liquidity .

Assfaw (2019) studied 7 commercial banks in Ethiopia for the period (2011...2017) . He found that inflation has a positive impact on bank liquidity . Lin and Mai (2018) studied 18 commercial banks for the period (2006...2016) in Malaysia . They found that the relationship between inflation and bank liquidity is positive .

Majrehu and al (2019) studied a sample of banks in Balkan region for the period. The found that inflation has a negative impact on bank liquidity .

Rouan and Sargan (2015) ; Sopan and Dutta (2018) showed that banks should maintain high liquidity while inflation rates fall and vice versa because it helps maintain the stability of the economic and the flow of liquidity in the system . The degree of liquidity constraint depends on the actual value of money ; which in term ; depends on the inflation rate (Adelpo ; Eloghing ; Taruinjama (2016) , Dogdig (2020) ; Semonova ; Vitkova (2019) .

3-Empirical study

A-Sample

We studied a sample of 11 banks for the period (2005...2020)

B-Econometric method

We used a panel static because it control :

1-More accurate inference of model parameters. Panel data usually contain more degrees of freedom and more sample variability than cross-sectional data which may be viewed as a panel with $T = 1$, or time series data which is a panel with $N = 1$, hence improving the efficiency of econometric estimates (e.g. Hsiao et al., 1995)

2- Greater capacity for capturing the complexity of bank behavior than a single cross-section

or time series data.

3- Constructing and testing more complicated behavioral hypotheses.

C-Models

Model 1

$$AL_{i,t} = b_0 + b_1 RO_{i,t} + b_2 ROE_{i,t} + b_3 NIM_{i,t} + b_4 CEA_{i,t} + b_5 CFC_{i,t} + b_6 TL_{i,t} + b_7 CAP_{i,t} + b_8 Tdeposits_{i,t} + b_9 TPIB_{i,t} + b_{10} TIN_{i,t} + E_{i,t}$$

Model 2

$$CD_{i,t} = b_0 + b_1 RO_{i,t} + b_2 ROE_{i,t} + b_3 NIM_{i,t} + b_4 CEA_{i,t} + b_5 CFC_{i,t} + b_6 TL_{i,t} + b_7 CAP_{i,t} + b_8 Tdeposits_{i,t} + b_9 TPIB_{i,t} + b_{10} TIN_{i,t} + E_{i,t}$$

B_0 = constant

B_1, b_2, \dots, b_{10} : paramters to be estimated

i = bank t = time

E = Error term

We will test the following hypotheses : **H0: The impact of inflation is significant on bank liquidity**

H1: The relationship between inflation and bank liquidity is not significant

D-Specification of variables

Variable	Measure
ALA	Asset liquid / total assets
ROA	Net profit / total assets
ROE	Net profit / Total equity
NIM	Net interest margin / total assets
CEA	Operating costs / total assets
CFC	Financial expenses / total credits
TLA	Total credit / total assets
CAP	Total capital / total assets
T deposit	Total deposits / total assets
TPIB	Economic growth
TINF	Rate of inflation
CD	Total credits / total deposits

E-Statistiques descriptive

Table 1: Descriptive statistics

Variables	Observations	Mean	Standard deviation	Minimum	Maximum
ALA	176	0.0285	0.0225	0.0028	0.10426

TLA	176	1.193	0.1142	0.12	0.9817
ROA	176	0.775	0.0094	0.000881	0.0975
ROE	176	0.012	0.0631	0.0029	0.2976
NIM	176	0.111	0.0131	0.0063	0.16391
Size	176	0.026	0.92	12.52	18.29
CAP	176	0.53	0.0632	0.0086	0.48
CEA	176	0.1051	0.026	0.000237	0.35
CFC	176	0.032	0.0153	0.01849	0.1689
T deposit	176	0.7657	0.1181	0.099	0.916
TPIB	176	0.022	0.0361	-0.1051	0.064
TINF	176	0.061	0.0163	0.0340	0.0854

F-Multicollinearity test

Table 2: Mulicollinarity test

	ALA	CD	TLA	ROA	ROE	NIM	Size	CAP
ALA	1.000							
CD	0.0730	1.000						
TLA	-0.0844	-0.01949	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	-0.3575
CAP	-0.0715	0.6962	0.1346	0.2912	-0.1852	0.0615	-0.3575	1.000
CEA	0.2036	0.0159	-0.0661	-0.0267	0.075	-0.0641	0.1277	-0.0076
CFC	-0.0378	-0.0258	-0.0117	-0.0076	-0.047	-0.1476	0.1384	-0.227
T deposit	-0.2358	-0.5547	0.0531	0.0169	0.3814	-0.0117	0.4336	-0.61
TPIB	0.0604	0.0589	-0.1125	0.0679	-0.0117	-0.0250	-0.2505	0.0123
TINF	-0.198	-0.0893	0.3496	-0.0374	0.2111	0.043	0.4291	-0.1064

Table 3: suite of correlation between variables

	CEA	CFC	Tdeposit	TPIB	TINF
CEA	1.000				
CFC	0.3142	1.000			
Tdeposit	-0.1459	-0.1598	1.000		
TPIB	-0.1394	-0.2233	-0.0303	1.000	
TINF	0.031	0.1271	0.1602	-0.5512	1.000

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

Table 4 : VIF

Variable	VIF	1/ VIF
T deposit	2.20	0.4542
CAP	2.13	0.4689
TINF	1.90	0.5260
Size	1.67	0.5992
ROE	1.56	0.6422
TPIB	1.53	0.6519
ROA	1.43	0.6720
TLA	1.31	0.762
CFC	1.27	0.788
CEA	1.17	0.825
NIM	1.2	0.89021

Variance inflation factor (VIF) is a measure of the amount of multicollinearity of multiple regression variables .

VIF inferior to 5 there is no problem of multicollinearity

G-Estimation of model 1

Fixed effects

ALA	Coefficient	t	p>t
ROA	-0.148	-1.05	0.295
ROE	0.023	-1.01	0.313
NIM	0.03059	0.34	0.731
Size	0.0036	1.37	0.173
CAP	0.057	1.28	0.203
CEA	0.062	1.38	0.169
CFC	-0.079	-0.86	0.390
Tdeposit	-0.011	-0.60	0.552
TLA	-0.00105	-0.07	0.942
TPIB	0.013	0.37	0.725
TINF	-0.177	-1.82	0.0710
Constant	-0.0076	-0.76	0.795

Random effects

ALA	Coefficient	t	p>t
ROA	-0.149	-1.06	0.291
ROE	-0.028	-1.20	0.228
NIM	0.024	0.27	0.785
Size	0.0052	2.14	0.032
CAP	0.023	0.56	0.574
CEA	-0.065	1.45	0.148
CFC	-0.108	-1.20	0.229
Tdeposit	-0.025	-2.35	0.036
TLA	-0.00305	-2.22	0.028
TPIB	0.0133	0.36	0.718
TINF	-0.202	-2.11	0.035
Constant	-0.013	-0.46	0.648

Hausman test : it is used for choosing between fixed effect and random effect .

A Hausman statistic is constructed as a function of the difference between the two estimators. The sampling distribution of the Hausman statistic determines how big a difference is too big to be compatible with the null hypothesis of correct specification. One performs a Hausman test by comparing the Hausman statistic to a critical value obtained from its sampling distribution, and rejecting the null hypothesis of correct specification if the Hausman statistic exceeds its critical value. The large sample distribution of the Hausman statistic is straightforward to derive; a high-level analysis appears below. This distribution simplifies usefully when one of the compared estimators is efficient under the null, as originally proposed by Jerry Hausman (1978).

$$\text{Chi } 2 (11) = -19.62$$

Prob >Chi2= 0.075 superior to 5% we choose random effect

I-Estimation of model 2

Fixed effects

CD	Coefficient	t	p>t
ROA	1.43	0.30	0.764
ROE	-0.25	-0.32	0.753
NIM	1.34	0.45	0.656
Size	0.149	1.68	0.095
CAP	8.48	5.54	0.000
CEA	0.313	0.21	0.837

CFC	-2.43	-0.78	0.435
Tdeposit	-0.88	-1.31	0.191
TLA	0.89	1.84	0.068
TPIB	1.10	0.89	0.374
TINF	-3.25	-0.94	0.3240
Constant	-1.78	-1.79	0.075

Random effects

CD	Coefficient	t	p>t
ROA	-1.59	-0.33	0.742
ROE	0.22	0.31	0.758
NIM	-0.2074	-0.07	0.945
Size	0.01656	0.32	0.751
CAP	6.020	6.94	0.000
CEA	0.26	0.17	0.862
CFC	-1.22	-0.44	0.657
Tdeposit	-1.43	-3.05	0.002
TLA	0.8943	2.37	0.018
TPIB	0.9364	0.73	0.468
TINF	-1.18	-0.38	0.701
Constant	0.8031	1.000	0.318

Hausman test

Chi 2 (11) = 29.67

Prob > Chi 2= 0.0016 inferior to 5% we choose fixed effects

G-Interpretations of model (1)

-There is a negative relationship between ALA and ROA (if ROA increase by 1% ALA decrease by 0.149%). The increase of return on assets has a negative impact on bank liquidity .

-There is a negative relationship between ALA and ROE (if ROE increase by 1% ALA decrease by 0.028%) . The increase of return on equity has a negative impact on bank liquidity .

-There is a positive relationship between NIM and ALA (if NIM increase by 1% ALA will increase by 0.024%) . The increase of net interest margin has a positive impact on bank liquidity

-There is a positive relationship between Size and ALA (if Size increase by 1% ALA will increase by 0.0052%) . The increase of size has a positive impact on bank liquidity . The result is similar to result found by El Chaarani (2019), Rahhrour and Benilles (2022), Obeidat

and al (2022) but contrary to result found by (Ahmed and Rasool (2017) ; Nguyen and Vo (2021) ; Yitayaw (2021) , Madghari and Oubdi (2022) , Lin and Mi (2018)

-There is a positive relationship between CAP and ALA (if CAP increase by 1% ALA will increase by 0.023%) . The increase of capital has a positive impact on bank liquidity . This result is similar to result found by (Ahmed and Rasool (2017), Morina and Qarri (2021), Rahhrour and Benilles (2022); Obeidat and al (2022, Gjorgi and Goran (2019)) but contrary to result found by El Chaarani (2019) , Nguyen and Vo (2021) , Yitayaw (2021) .

Singh and Sharma (2016) ; Vodova (2016) have also found that bank capital has a positive impact on bank's liquidity through its ability to absorb risk . On the other hand ; the financial fragility crowding out theory predicts that higher capital reduces liquidity creation and lower capital tends to favor liquidity creation (Diamond and Rajan (2001)).

-There is a positive relationship between CEA and ALA (if CEA increase by 1% CEA will increase by 0.065%) . The increase of operating costs has a negative impact on bank liquidity .

-There is a negative relationship between CFC and ALA (if CFC increase by 1% ; ALA will decrease by 0.1084%) . The increase of financial expenses to total credits has a negative impact on bank liquidity

-There is a negative relationship between Tdeposit and ALA (if Tdeposit increase by 1% ; ALA will decrease by 0.025%) . The increase of deposits has a negative impact on bank liquidity

- There is a negative relationship between TLA and ALA (if TLA increase by 1% ; ALA will decrease by 0.0035%) . The increase of credit to total assets has a negative impact on bank liquidity

-There is a positive relationship between TPIB and ALA (if TPIB increase by 1% ; ALA will increase by 0.0133%) . The increase of economic growth has a positive impact on bank liquidity . This result is similar to result found by (Ahmed ; Rasool (2017), Nguyen and Vo (2021), Rahhrour and Benilles (2022), Shah and al(2018), Gorji and Goran (2018)) but contrary to result found by Yitayaw (2021), Mahmoud and al (2019); Madghari and Oubaidi (2022); Morina and Qarri (2021) ; EL Mehdi and Abderrasoul (2014)

-There is a negative relationship between TINF and ALA (if TINF increase by 1% ; ALA will decrease by 0.202%) . The increase of inflation has a negative impact on bank liquidity . This result is similar to result found by Mahmood and al (2019) but contrary to result found by Ahmed and Rasool (2017), EL Chaarani (2019) , Nguyen and Vo (2021) .

K-Interpretations of model (2)

There is a positive relationship between CD and ROA (if ROA increase by 1% ; CD increase by 1.43%).The increase of return on assets has a positive impact on bank liquidity . This result is similar to result found by El Chaarani (2019)

There is a negative relationship between CD and ROE (if ROE increase by 1% CD decrease by 0.025%) .The increase of return on equity has a negative impact on bank liquidity .

There is a positive relationship between NIM and CD (if NIM increase by 1% CD will

increase by 1.34%) .The increase of net interest margin has a positive impact on bank liquidity

There is a positive relationship between Size and CD (if Size increase by 1% ; CD increase by 0.149%) .The increase of size has a positive impact on bank liquidity .

There is a positive relationship between CAP and CD (if CAP increase by 1% ; CD increase by 8.48%).The increase of capital has a positive impact on bank liquidity .This result is similar to result found by El Chaarani (2019)

There is positive relationship between CD and CEA (if CEA increase by 1% , CD increase by 0.313%).The increase of operating costs has a positive impact on (total credits / total deposits)

There is negative relationship between CFC and CD(if CFC increase by 1 % CD will decrease by 2.43%)

There is a negative relationship between T deposit and CD (if Tdeposit increase by 1% CD will decrease by 0.88%). The increase of deposits has a negative impact on (Total credits / total deposits)

There is positive relationship between TLA and CD (if TLA increase by 1% ; CD will increase by 0.89%) .The increase of total loans / total assets has a positive impact on bank liquidity

There is positive relationship between TPIB and CD(if TPIB increase by 1% ; CD will increase by 1.10%). The increase of economic growth has a positive impact on bank liquidity . This result is similar to result found by El Chaarani (2019)

There is negative relationship between TINF and CD (if TINFincrease by 1% ; CD will decrease by 3.25%) . The increase of inflation has a negative impact on bank liquidity . This result is contrary to result found by El Chaarani (2019)

Conclusion

The inflation indicates the persistence increase of price of goods and services . In banking industry ; the purchase power of customers will decrease in response of inflation . Therefore capacity of lending will decrease and this influence the money of bank .

In this article we studied the impact of inflation on bank liquidity in Tunisia for the period (2005..2020) . We found that inflation has a negative and significant impact on two measures of liquidity (Assets liquids / total assets) ,(Total credits / Total deposits) .

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