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THE IMPACT OF LIQUIDITY AND CREDIT RISKS ON THE BANK STABILITY

Tijani Amara
Mohamed Mabrouki

Abstract

The global financial crisis has induced a series of failures of most conventional banks. This study investigates the main sources of banking fragility. We use a sample of 49 banks operating in the Tunisian over the period 2006-2015 to analyze the relationship between credit risk and liquidity risk and its impact on bank stability. Our results show that credit risk and liquidity risk do not have an economically meaningful reciprocal contemporaneous or time-lagged relationship. However, both risks separately affect bank stability and their interaction contributes to bank instability. These findings provide bank managers with more understanding of bank risk and serve as an underpinning for recent regulatory efforts aimed at strengthening the joint risk management of liquidity and credit risks.

Keywords:

Credit risk ; Liquidity risk ; Bank stability ; Z-Score

1. Introduction

The daily financial crisis results from mortgage losses resulting in the depletion of bank capital positions. The banking crises are dropping stock prices and therefore the instability of the financial and real economy (Martin, 2017). The preconditions for this crisis are predicting from 2001, to create stability in financial markets by providing liquidity to banks and other financial institutions. The loan market between the big banks and even the lender's funds make use of non-bank financial institutions such as investment banks. This encourages the immediate effect of lowering borrowing rates (Anthony et al 2010). The series of credit shocks indicate that this phenomenon is associated with the phenomenon of non-liquidity, so it is important to consider the main sources of bank failure such as liquidity risk and credit

risk, these two risks increase separately. The impact of their interactions depends on the risk of the Bank and can aggravate or mitigate the risk of default (Bjorn et al, 2014).

What is the relationship between liquidity risk and credit risk in a context of stable banks?

There is a link between credit risk and liquidity risk. The first is considering a cost on profit. Thus, the risk of default increases the liquidity risk due to the lowering of cash flows (Diamond et al. 2005). The relationship between the two risks is positive and contributes to bank instability, the idea of a positive relationship focuses on the period of financial crises (Cevik et al, 2012). Liquidity and credit risks have positive correlations. However, because of asymmetries of information on the loan market, banks have been exposing to credit risk. The interaction between credit and liquidity risks leads to bank failure. In the same context, liquidity-related problems automatically reinforce the links between credit and liquidity risks (Acharya et al, 2010). Some authors see that the relationship between liquidity risk and credit risk is positive and that amplifies other categories of risk such as the risk of bankruptcy, because of the very often-environmental events. The environment exerts these harmful effects banks as well as businesses and the market, which leads to the fragility and instability of the results. In addition, on the other hand, some other authors see that the relationship between these two risks is negative. The impact of their interactions depends on the risk of the Bank and can aggravate or mitigate the risk of default. (Acharya, H. Mehran, A. V. Thakor 2016, E. Gatev, T. Schuermann, P. E. Strahan (2009), Gorton and Metrick, 2011, Imbierowicz and Rauch, 2014, Falco Fecht, Wolf Wagner 2009). Each risk category has a significant impact on the Bank's default rate and there is a positive relationship between the two risks. The increase in credit risk increases the liquidity risk. The years 2007-2008, represent the cause of mistrust between the banks. As a result, credit risks in portfolios can cause a market freeze on liquidity (Imbierowicz and Rauch 2014). The lower liquidity of the assets increases the instability of the banks and consequently the external autonomy. Therefore, normal liquidity has no influence on stability. First, increasing liquidity ensures stability while facilitating the transfer of risk from the Bank and increasing profits. On the other hand, an increase in the liquidity of assets in times of crisis, ensures instability, on the other hand, the instruments of credit derivatives increase the possibilities of the banks for the cover against the credit risk. Risk transfer is higher in the absence of crises. The transfer is concentrating by risk taking on the primary markets. In general, stability decreases when liquidation opportunities are in crisis.

The bank can therefore take a number of risks that will cause the probability of default to rise (W. Wagner 2017).

It is therefore important to examine the relationship between liquidity and credit risk for Tunisian banks during the period 2006-2015, which is the period of the recent crisis. This document is intending to express the nature of the relationship between liquidity risk and credit risk, which may be a positive, negative relationship by the simultaneous equation. Second, we examine the impact of both

2. The liquidity and credit risk: The theoretical concepts

2.1. The reciprocal relationship between liquidity risk and credit risk

According to Imbierowicz and Rauch (2014), during the 1950s and 1960s, a significant amount of documents implemented bank liquidity and credit risks. The main sources of risk is given by the bank's microeconomic research in the classical theory of financial intermediation represented by Bryant (1980) as well as the extensions of D.W. Diamond, R.G. Rajan, (2005). These researchers take into account bankruptcies of borrowers and massive withdrawals of funds. Both are supposed to reduce the gain of a bank. According to the theory relation between liquidity and credit risk, they are positively correlating. This hypothesis is supporting mainly by the theoretical literature of intermediate finance modeled essentially by Bryant (1980), Diamond (2005). Based on these models, liquidity and credit risks are positively related. They simultaneously contribute to bank instability. "The idea of a positive relationship between liquidity and credit risk is supported by a whole new body of literature that also focuses on the financial crisis. Goldstein and Pauzner (2005), Falco Fecht, Wolf Wagner (2009), Stuart et al 2012), E. Gatev et al (2009), these researchers evaluate from a theoretical point of view, the results which show that the liquidity at an impact on credit risk.

Several theoretical and empirical results argue that, all bankruptcies are largely causing by liquidity and credit risks. Apparently, the Swiss Monetary Bank UBS did not differentiate between liquid and illiquid assets and the respective term financing and thus ignored the credit risks of the assets. Although, this evidence is only anecdotal, it could be a sign that the joint occurrence of liquidity and credit risks plays a huge role for banks and their stability.

«Regarding the assumption of the relationship between liquidity risk and credit risk:

H1: the relationship between liquidity risk and credit risk is a positive relationship.

2.2. The impact of liquidity risk and credit risk on banking stability

Ameni et al (2017), see that, the empirical literature used by I. Munteanu (2012, and Deyoung and Torna (2013), argue that banking activities through excessive investment as well as weak equity and macroeconomic mismanagement credit risk is fundamental and important in the stability of banks, and they do not know the role of liquidity risk in bank stabilization.Mr. Brunnermeier et al (2009) explain that, the increase in capital funds can generate liquidity risks, but also the solvency of banks, and show that banks should have a deposit of liquid assets to cope with liquidity risks. The interaction between credit and liquidity risks and the influence on the stability of banks AN Berger et al (2013) empirically show that the Bank crisis. The year 2007 was preceded by a substantial liquidity creation of US banks. Vazquez and Federico (2015) analyze the relationship between the liquidity structure and the advantage effect of banks and the impact on their stability during the financial crisis. They showed that banks with a weak liquidity structure (high level of liquidity risk) and a strong leverage effect before the crisis were the most exposed to the risk of bankruptcy ". In addition, point out that, in the context of a debt renewal issued by companies, the deterioration of the state of liquidity on the market entails an interaction between the two liquidity and credit risks and the impact takes the form of an increase in the liquidity and credit risk premium at the same time. This interaction between liquidity and credit risks is reflecting in the instability and failure of businesses and banks.

Dongheon Shin, Baeho Kim (2015), explore the impacts of credit and liquidity risks on the probability of borrower default on Nigerian banks. The study used the Pearson correlation, also indicates that there is an impact of liquidity and credit risks on the bank default probability. The role of the bank as a liquidity provider is very important in times of crisis, which leads to instability of the banks. Banks that failed during the recent financial crisis suffer from liquidity shortages just before the real default. The study shows that banks that have failed or nearly failed are those that have attracted deposits by offering high interest rates. Indirectly, the results indicate that the combined presence of liquidity and credit risks could push banks to default. Imbierowicz, (2014) show that the combined presence of liquidity and credit risks threatens the stability of many banks. Therefore, these two categories of risk play an important role for the banks as well as their stability. There are internal and external factors considered as explanatory variables. These variables are measuring using the

Z-score, which is considering a measure of bank stability that assesses the degree of insolvency. According to Dongheon Shin, Baeho Kim (2015), banks with an explicit or implicit state guarantee an increase in risk taking. These results imply that banks are increasing their credit and liquidity risks together. The rise in liquidity risk and credit risk decreases bank stability during periods of crises. The literature supports this idea is the work of Imbierowicz, (2014); H. Nikomaram, M. Taghavi, S.K. Diman (2013). These empirical results argue that control variables consider the effects of asset return (ROA) and banking stability. The ROA has a positive but also significant effect on bank stability at a 1% level. In addition, the liquid banks are more solvent. This result is close to that recorded by Srairi (2013), which finds a negative effect of ROA on bank stability. However, size has a negative and significant effect on bank stability at a level of 1%. Alfred L. Norman, David W. Shiner. (1994), Andrea Buraschi, Davide Menini (2002), Angelo Baglioni and Andrea Monticini (2010) conclude that the size of the Bank decreases bank stability. Large banks are likely to increase asset risk. Based on the theoretical studies our second and third hypothesis stating that:

H2: Separately, liquidity risk contributes more than credit risk to bank stability.

H3: in combination, liquidity risk contributes more than credit risk to bank stability.

3. Presentation of econometric models and data

3.1. Econometric modeling

***Modeling the relationship between liquidity risk and credit* risk**

We used the simultaneous equation model of Imbierowicz and Rauch 2014. This model expresses the credit risk based on liquidity and credit risk liquidity to be the nature of the credit risk. The relation between these two risks by the generalized method of moments (GMM).

To examine the reciprocal relationship between the two so-called risks we used the approach of Love and Zicchino (2006). The simultaneous equation is as follows:

$$(1)\ CR_{i,t} = C + \beta_1 LR_{i,t} + \sum_{j=1}^{J} \beta_j Banks_{i,t}^{j} + \sum_{l=1}^{L} \beta_l Macro_t^l + \varepsilon_{i,t} \quad (1)$$

$$(2)\ LR_{i,t} = C + \beta_1 CR_{i,t} + \sum_{p=1}^{P} \beta_p Banks_{i,t}^{p} + \sum_{q=1}^{Q} \beta_q Macro_t^q + \varepsilon_{i,t} \quad (2)$$

With i = 1, 2, 3, ..., N is the banking individuals and t = 1, 2, 3, ..., T is the time period.
⟦RC⟧ _ (i, t) and ⟦RL⟧ _ (i, t) are respectively the credit risk and the liquidity risk of the bank i at the date t.
⟦Bank⟧ _ (i, t) ^ j and ⟦Bank⟧ _ (i, t) ^ p, are the control variables or the internal variables,
⟦Macro⟧ _t ^ l and ⟦Macro⟧ _t ^ q, represent the external variables.

Z-score modeling

Separate Z-score modeling

Our study consists in examining secondly the effect of the two separate risks on the stability of the Tunisian banks, which admits the following formulation by the method (GMM):
The empirical specification of this model is that proposed by Imbierowicz and Rauch (2014), that they express the two models as follows:

(1)

$$Z - score_{i,t} = \beta_0 + \beta_1 LR_{i,t} + \beta_2 Size_{i,t} + \beta_3 CAR_{i,t} + \beta_4 ROA_{i,t} + \beta_5 ROE_{i,t} + \beta_6 TCP + \beta_7 Infl_t + \beta_8 GDP_t + \varepsilon_{i,t} \quad (3)$$

(2)

$$Z - score_{i,t} = \beta_0 + \beta_1 RC_{i,t} + \beta_2 Size_{i,t} + \beta_3 CAR_{i,t} + \beta_4 ROA_{i,t} + \beta_5 ROE_{i,t} + \beta_6 TCP + \beta_7 Infl_t + \beta_8 GDP_t + \varepsilon_{i,t} \quad (4)$$

The Z-score function is expressed separately according to liquidity risk (RL) and credit risk (CR) and simultaneously by other control variables TB, CAR, ROA, ROE, TCP) and finally by external variables (the inflation rate, and the real GDP growth rate).

Associated Z-score modeling

Finally, our study examines the effect of the two associated risks on the stability of Tunisian banks. The empirical specification of this model is that proposed by Imbierowicz and Rauch (2014), that they express the model by the method (GMM) as follows:

$$Z - score_{i,t} = \beta_0 + \beta_1 LR_{i,t} + \beta_2 CR + \beta_3 Size_{i,t} + \beta_4 CAR_{i,t} + \beta_5 ROA_{i,t} + \beta_6 ROE_{i,t} + \beta_7 TCP + \beta_8 Infl_t + \beta_9 GDP_t + \varepsilon_{i,t} \quad (5)$$

The Z-score function is expressed simultaneously as a function of liquidity risk (LR) and credit risk (CR) and the other control variables TB, CAR, ROA, ROE, TCP) and finally by external variables (the rate inflation rate, and real GDP growth rate).

1.1. Source data and descriptive statistics

The objective of this study is to determine the impact of liquidity and credit risks on the stability of Tunisian banks. To do this, we selected a sample of eight commercial banks over a 10-year period from 2006 to 2015 based on Panel data. We choose this period since it includes the period of the financial crisis, political changes, etc.

Imbierowicz and Rauch (2014) show that the combined presence of liquidity and credit risks threatens the stability of many banks. Therefore, these two categories of risk play an important role for banks, as well as their stabilities. There are internal and external factors considered as explanatory variables. These variables are measuring using the Z-score, which is considering a measure of bank stability that measures the degree of insolvency. This ratio can be explaining as follows:

$$Z - score = \frac{(U + K)}{\sigma} \quad (6)$$

With: U: average performance of the bank's assets (ROA). K: the capital ratio. σ: The standard deviation of ROA that is defined, as an indicator of the volatility of returns. When Z-score increases, the probability of bankruptcy of banks decreases. Table 1 presents the different variables and their measures:

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Table 1

Variables and their measures

Independent variables	**Measures**
Control variables	
Crédit Risk	$\frac{\text{Impaired loans}}{\text{Gross loans}}$
CAR ; la banque est en bonne santé si CAR > 0 et le plus élevée possible	$\frac{\text{Capital}}{\text{Assets}}$
ROA : Return on Assets	$\frac{\text{Net Income}}{\text{Total Assets}}$
ROE : Return on Equity	$\frac{\text{Net Income}}{\text{Total Equity}}$
Banks Size	Logarithm of total Assets
LR	$\frac{\text{Liquid assets}}{\text{Total Assets}}$
TCP	$\frac{\text{Loans}_{t} - \text{Loans}_{t-1}}{\text{Loans}_{t-1}}$
External variables	
Inflation rate	Consumer Price Index
GDP	GDP Relative real Growth GDP

From Table 2, we find that the distribution of our studied variables is significantly different from a normal distribution, since most of the Skewness coefficients are non-zero and the Kurtosis indicator is much larger than 3. This confirms that, the distribution is asymmetric with the exception of the variable, inflation rate, which is less than 3, which indicates that the majority of the variables have an asymmetric distribution and a spread to the right.

Tableau 2

Descriptive statistics for variables.

	Number of observations	*Mean*	*Standard Deviation*	*Skewness*	*Kurtosis*	*J-B*	*Probability J-B*
ZSCORE	80	1.87E+14	1.65E+15	8.661004	76.01299	18300.58	0.000000
TNF	80	0.045040	0.009195	0.075492	1.956755	3.703853	0.156935
TCPIB	80	0.030600	0.021537	-0.851287	3.592191	10.83149	0.004446
LGR	80	0.094076	0.209292	2.680994	19.45545	985.9616	0.000000
SIZE	80	15.00425	1.116885	-1.922846	5.831693	76.02609	0.000000
ROE	80	0.105920	0.270302	-3.170940	32.98196	3130.457	0.000000
ROA	80	0.121825	1.152842	0.027530	20.29732	997.3348	0.000000
LR	80	0.051113	0.089959	6.423920	47.94061	7282.419	0.000000
CR	80	0.111362	0.511912	5.843871	36.32148	4156.416	0.000000
CAR	80	0.028669	0.014633	2.148400	9.666378	209.6769	0.000000

Source : Output EVIEWS 10.

J.B: denotes the test of normality of Jarque-Bera.

TCPIB: GDP growth rate

LGR: loan growth rate

Through the correlation matrix, we can verify the existence or not of a problem of multi-collinearity. According to the table 3, we note that the Z-score function comes from a positive relationship with the liquidity risk. Capital adequacy ratio, GDP growth rate, bank size, and loan growth rate are negatively correlated with credit risk. The coefficient of correlation between these two risks is 0.1058, which encourages a growing relationship between risks. All correlation coefficients are less than 0.6. It indicates that there is a presumption of absence of multicollinearity problems

Table 3

The Correlation Matrix

	Zscore	lr	cr	car	roe	roa	tnf	tcpib	tb	tcp
Zscore	1.0000									
Lr	0.0235	1.0000								
Cr	-0.1628	0.1058	1.0000							
Car	0.1106	0.0266	-0.2101	1.0000						
Roe	-0.0720	0.1494	0.0041	0.0433	1.0000					
Roa	-0.0978	-0.0685	-0.0164	-0.0962	-0.0458	1.0000				
Tnf	-0.1437	-0.0288	-0.0306	-0.0748	0.1869	0.0603	1.0000			
Tcpib	0.0844	0.1211	0.0093	0.0326	-0.1244	0.0638	-0.1437	1.0000		
Tb	0.0993	-0.2040	-0.3851	-0.2705	-0.0591	0.0507	0.0620	-0.1089	1.0000	
Tcp	0.0862	0.1614	-0.0424	0.0187	0.0893	0.0075	-0.1965	0.0270	-0.2507	1.0000

Source : STATA output

4. Results and discussions

4.1. The relationship between liquidity risk and credit risk

The estimation of the model (1) and (2) is necessary for expressing the relationship between credit risk and liquidity risk. Table 4 presents the relationship between credit risk as a

dependent variable and the relationship between credit risk and liquidity risk in the following two tables: liquidity risk as an independent variable**.**

Table 4

Estimation of the first model (1)

Cr	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Lr	.882827	1.551465	0.57	0.569	-2.157989	3.923643
Car	-10.25606	3.931725	-2.61	0.009	-17.9621	-2.550019
Roe	-.1483221	.4156547	-0.36	0.721	-.9629903	.6663462
Roa	-.0000101	.0004798	-0.02	0.983	-.0009505	.0009302
Tnf	-3.549187	6.137103	-0.58	0.563	-15.57769	8.479314
Tcpib	-3.080329	3.842076	-0.80	0.423	-10.61066	4.450001
Tb	-.2170104	.051206	-4.24	0.000	-.3173722	-.1166485
Tcp	-.530117	.3142745	-1.69	0.092	-1.146084	.0858496
cons	3.980088	.9057784	4.39	0.000	2.204795	5.755381

Source: STATA output

We find a non-significant positive relationship between the two-said risks. The ratio of capital, the size of the bank are variables that had better explain the variability of credit risk, P> | z | <1% (as a confidence level). The positive relationship indicates that an increase in credit risk is associated with an increase in liquidity risk. The impact of the positive relationship on banks amplifies the categories of bankruptcy risk and, consequently, the instability of Tunisian banks.

The results in Table 5 show a positive relationship between liquidity risk and credit risk. All variables are insignificant except return on equity that explains the variability of liquidity risk We can see that the relationship between credit risk and liquidity risk is positive. The positive relationship indicates that an increase in liquidity risk is associated with an increase in credit risk. The impact of the positive relationship on banks amplifies the categories of bankruptcy

risk and, consequently, the instability of Tunisian banks. Finally, we validate our first assumption that there is a positive relationship between liquidity risk and credit risk.

Table 5

Estimation of the second model (2)

N	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Lr |						
Cr	.0052154	.0091655	0.57	0.569	-.0127486	.0231795
Car	.0051133	.3165435	0.02	0.987	-.6153006	.6255272
Roe	.1532639	.0262096	5.85	0.000	.101894	.2046337
Roa	-.0000161	.0000368	-0.44	0.663	-.0000882	.0000561
Tnf	-.4314732	.4700095	-0.92	0.359	-1.352675	.4897285
Tcpib	.4854127	.2909305	1.67	0.095	-.0848005	1.055626
Tb	-.0039398	.0043867	-0.90	0.369	-.0125375	.0046579
Tcp	.0149822	.0245764	0.61	0.542	-.0331866	.063151
_cons	.0804496	.0780466	1.03	0.303	-.072519	.2334182

Source: STATA output

The results in Table 5 show a positive relationship between liquidity risk and credit risk. All variables are insignificant except return on equity, which explains the variability of liquidity risk. We can see that the relationship between credit risk and liquidity risk is positive. The positive relationship indicates that an increase in liquidity risk is associated with an increase in credit risk. The impact of the positive relationship on banks amplifies the categories of bankruptcy risk and, consequently, the instability of Tunisian banks. Finally, we validate our first assumption that there is a positive relationship between liquidity risk and credit risk.

4.2. The impact of separate liquidity and credit risks on bank stability

The estimation of the two models (1) (2) is considering necessary to have the impact of liquidity risk in (1) and the credit risk in (2) on the stability of banks in the following two tables:

Table 6

Estimation of the first model (1)

Zscore	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Lr	6.738354	49.05911	0.14	0.891	-89.41573	102.8924
Car	-48.55775	244.8637	-0.20	0.843	-528.4817	431.3662
Roe	-4.126175	13.9821	-0.30	0.768	-31.53059	23.27824
Roa	.0055979	.0171308	0.33	0.744	-.0279778	.0391736
Tnf	-96.36462	187.632	-0.51	0.608	-464.1166	271.3873
Tcpib	186.6948	148.465	1.26	0.209	-104.2913	477.6809
Tb	.1239032	4.870668	0.03	0.980	-9.42243	9.670237
Tcp	5.371718	9.318411	0.58	0.564	-12.89203	23.63547
_cons	10.32413	76.13285	0.14	0.892	-138.8935	159.5418

Source: STATA output

According to this table, we can say that the majority of the variables are not significant: P> | z | > 0.5%, 1% and 10% respectively with a very strong dispersion of the parameters. None of the internal and external banking variables in our sample explains the variability of the Z-score function. (Ameni et al 2017), confirm that the relationship between banking stability and liquidity risk is positive. This reasoning applies even to the Tunisian context, which confirms that the liquid banks are the most stable. Liquidity allows banks to overcome unexpected problems and affects overall banking stability if the bank holds enough cash. As a result, the insufficient liquidity allows these banks to maintain their stability. The idea of non-significance of the parameters is the relevance or good liquidity risk management for Tunisian banks.

Table 7

Estimation of the second model (2)

Zscore	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Cr	-8.805306	4.014175	-2.19	0.028	-16.67294	-.9376672
Car	-455.7807	307.8952	-1.48	0.139	-1059.244	147.6829
Roe	-7.297365	11.85045	-0.62	0.538	-30.52382	15.92909
Roa	.0011214	.0171706	0.07	0.948	-.0325323	.0347751
Tnf	-80.02696	186.3398	-0.43	0.668	-445.2462	285.1923
Tcpib	171.6642	143.5901	1.20	0.232	-109.7672	453.0956
Tb	-5.28268	5.471099	-0.97	0.334	-16.00584	5.440478
Tcp	2.394713	9.466777	0.25	0.800	-16.15983	20.94926
_cons	103.4685	87.53005	1.18	0.237	-68.08728	275.0242

Source : STATA output

According to this table, we can say that the majority of the variables are not significant, P> | z | > 0.5%, 1% and 10%, respectively, and with a very strong dispersion of the parameters. None of the internal and external banking variables in our sample explains the variability of the Z-score function. (Ameni et al, 2017), confirm that the relationship between banking stability and credit risk is negative. This reasoning applies to the Tunisian context. Negative credit risk amplifies the categories of bankruptcy risk and therefore the failure of the financial system as a whole and bank instability.

So, both of these risks are insignificant thanks to the relevance and good management of credit risks. Liquidity risk is the indicator of banking stability. These results lead us to confirm our assumption that, separately, liquidity risk contributes more than credit risk to banks' stability.

4.3. The impact of associated liquidity and credit risks on bank stability

The estimate of this model consists of the liquidity risk impact in and the credit risk in on the stability of the banks in the following table:

Table 8

Estimate of the Z-score function.

Zscore	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]
Lr	29.94222	53.02641	0.56	0.572	-73.98764 133.8721
Cr	-2.777403	4.176816	-0.66	0.506	-10.96381 5.409006
Car	156.4354	181.9702	0.86	0.390	-200.2197 513.0904
Roe	-9.729687	14.22522	-0.68	0.494	-37.61062 18.15124
Roa	-.0129972	.0163452	-0.80	0.427	-.0450333 .0190389
Tnf	-155.7047	209.3606	-0.74	0.457	-566.0439 254.6345
Tcpib	71.16355	133.9604	0.53	0.595	-191.3939 333.721
Tb	2.039384	2.0403	1.00	0.318	-1.95953 6.038298
Tcp	8.024736	10.91631	0.74	0.462	-13.37084 29.42031
_cons	-15.89148	36.62636	-0.43	0.664	-87.67784 55.89487

Source : STATA output

Most variables are not significant, P> | z | > 0.5%, 1% and 10% respectively and with a very strong dispersion of the parameters.

All internal or control banking variables and external variables do not explain the variability of the bank stability function. (Ameni et al, 2017), confirm that, the relationship between banking stability and liquidity risks and is positive and negative regarding credit risk. This

reasoning applies even to the Tunisian context. The negative credit risk amplifies the categories of the risk of bankruptcy (L. Agnello, R.M. Sousa 2012). Our result suggests that as credit risk increases, the stability of banks decreases because higher loan rates are due to higher consumer credit risk demand and, hence, bank instability. On the other hand, liquidity risk has a positive impact on bank stability. This result confirms that the liquid banks are stable. Liquidity allows banks to overcome unexpected problems and affects overall banking stability if the bank holds enough cash. As a result, this insignificant result is dependent on the adequacy or good management of liquidity risk by the banks.

This is logical, because the insufficient liquidity does not allow these banks to maintain their stability. In addition, the positive coefficient of the interaction term variable appears to increase stability.

These results lead us to confirm our assumption that: in addition, liquidity risk contributes more than credit risk to banks' stability.

Banks with a weak liquidity structure (high level of liquidity risk) and strong leverage were most at risk of bankruptcy (Dominici Quint, Oreste Tristani 2017). In addition, in the context of debt renewal issued by companies, the deterioration of the liquidity situation on the market entails an interaction between the two liquidity and credit risks and the impact takes the form of an increase the liquidity and credit risk premium at the same time. This interaction between liquidity and credit risks is reflecting in the instability and failure of companies and banks (Vazquez and Federico 2015).

The Pearson correlation study also indicates that there is an impact of liquidity and credit risks on the bank default probability. The role of the bank as a liquidity provider is very important and generates stability for banks (Ikka Kiema, Esa Jokivuole 2014).

These empirical results argue that control variables consider the effects of asset return (ROA) and banking stability. The ROA has a negative but also insignificant effect on bank stability. In addition, the liquid banks are more solvent (Nikomaram 2013). This result is close to that recorded by Srairi (2013), which finds a negative effect of ROA on bank stability. However, size has a negative and non-significant effect on bank stability. Thus, the size of the Bank increases banking stability. Large banks are likely to reduce asset risk (A. Iqbal 2012).

5. Conclusion

Liquidity and credit risks are the two most important factors for bank survival. This work examines the effect of liquidity risk and credit risk on banking stability using a group of panel data from eight banks operating in Tunisia during the period 2006-2015. In addition, we have found that credit risk and liquidity risk do not have an economically significant, contemporaneous reciprocal relationship; furthermore, each risk category has a non-significant impact on bank stability. We have also documented that the interaction of the two risk categories has a non-significant impact on bank stability. As a result, the estimation results showed the importance of credit and liquidity risks in understanding Tunisian banking stability. The non-significance then indicates the importance of the actions of the surveillance and the good management vis-a-vis the risks. We can then expand our work by adding more risks than liquidity risk and credit risk or by using other econometric models.

References

A. IQBAL (2012), « Liquidity risk management: A comparative study between conventional and Islamic banks of Pakistan » *Global Journal of Management and Business Research*, 12 (5) (2012)

A.N. BERGER, P. MOLYNEUX, J.O.S. WILSON (2013), « Forthcoming in the Oxford Handbook of Banking » *(2nd ed.)* (2013)

ACHARYA, H. MEHRAN, A.V. THAKOR (2016), « Caught between Scylla and Charybdis? Regulating bank leverage when there is rent seeking and risk shifting » *Review of Corporate Finance Studies*, 5 (1) (2016)

ALFRED L. NORMAN, DAVID W. SHINER. (1994), «Risk, uncertainty, and complexity ". *Journal of Economic Dynamics and Control 18* (1994) 231-249. North-Holland

ANDREA BURASCHI, DAVIDE MENINI (2002), "Liquidity risk and specialness", *Journal of Financial Economics 64* (2002) 243–284

ANGELO BAGLIONI, ANDREA MONTICINI (2010), "The intraday interest rate under a liquidity crisis : The case of August 2007", *Economics Letters 107* (2010) 198–200

ANTHONY SAUNDERS LINDA ALLEN (2010), ouvrage «Risque de crédit, Mesure dans et sortir de la crise financière" ch2 "The Three Phases of the Credit Crisis » p 24-44

AMENI GHENIMI, HASNA CHAIBI, MOHAMED ALI BRAHIM OMRI (2017), « The effects of liquidity risk and credit risk on bank stability « : Evidence from the MENA region, *Borsa _ Istanbul Review* (2017), http://dx.doi.org/10.1016/j.bir.2017.05.002

BJÖRN IMBIEROWICZ, CHRISTIAN RAUCH, GRUENEBURG PLATZ (2014), »The relationship between liquidity risk and credit risk in banks «, *Journal of Banking & Finance 40* (2014) 242–256

BRYANT, J (1980) : A model of reserves, bank runs, and deposit insurance, *Journal of Banking and Finance* 4, 335-44

CEVIK ET TEKSOV (2012), « Back to the basics in banking? A micro-analysis of banking system stability » *Journal of Financial Intermediation,* 19 (3) (2012), pp. 387-417

D.W. DIAMOND, R.G. RAJAN(2005), « Liquidity shortages and banking crises » *Journal of Finance,* 60 (2) (2005), pp. 615-647

DOMINICI QUINT, ORESTE TRISTANI (2017), "Liquidity provision as a monetary policy tool : the ECB's non standard measures after the financial crisis", *Journal of International Money and Finance* (2017), doi : http:// dx.doi.org/10.1016/j.jimonfin.2017.09.009

DONGHEON SHIN, BAEHO KIM (2015), »Liquidity and credit risk before and after the global financial crisis : Evidence from the Korean corporate bond market «, *Pacific-Basin Finance Journal* 33 (2015) 38–61

D.W. DIAMOND, R.G. RAJAN(2005), « Liquidity shortages and banking crises » *Journal of Finance*, 60 (2) (2005), pp. 615-647

E. GATEV, T. SCHUERMANN, P.E. STRAHAN (2009), « Managing bank liquidity risk : How deposit-loan synergies vary with market conditions » *Review of Financial Studies*, 22 (2009), pp. 995-1020

VAZQUEZ, P. FEDERICO (2015), « Bank funding structures and risk: Evidence from the global financial crisis » *Journal of Banking & Finance*, 61 (2015), pp. 1-14

FALKO FECHT, WOLF WAGNER (2009); « The market ability of bank assets, managerial rents and banking stability », *Journal of Financial Stability 5* (2009) 272–282.
G. GORTON, A. METRICK (2011), « Securitized banking and the run on repo » *Journal of Financial Economics*, 104 (2011), pp. 425-451

I. GOLDSTEIN, A. PAUZNER (2005), « Demand deposits contracts and the probability of bank runs » *Journal of Finance*, 60 (2005), pp. 1293-1327

IKKA KIEMA, ESA JOKIVUOLE (2014) ; « does a leverage ratio requirement increase bank stability «, *journal of banking and finance* 39 (2014) 240-254.
54- IMBIEROWICZ ET AL. (2014), « The relationship between liquidity risk and credit risk in banks » *Journal of Banking and Finance*, 40 (2014), pp. 242-256

H. NIKOMARAM, M. TAGHAVI, S.K. DIMAN (2013), « The relationship between liquidity risk and credit risk in Islamic banking industry of Iran Management » *Science Letters*, 3 (2013), pp. 1223-1232

L. AGNELLO, R.M. SOUSA (2012), « How do banking crises impact on income inequality? » *Applied Economics Letters*, 19 (15) (2012), pp. 1425-1429

M. BRUNNERMEIER, A. CROCKET, C. GOODHART, A. PERSAUD, H. SHIN (2009), « The fundamental principles of financial regulation Geneva Reports on the World Economy 11 » (*International Center for Monetary and Banking Studies (ICMB)-Centre for Economic Policy Research* (CPER)) (2009)

MARTIN R. GOETZ (2017) ; « Competition and Bank Stability », *Journal of Financial Intermediation* (2017), doi : 10.1016/j.jfi.2017.06.001.

STUART I. GREENBAUM WASHINGTON. LOUIS ANJAN V. THAKOR. LOUIS ARNOUD, (2012), »Contemporary Financial Intermediation «, *Academic Press (2012) is an imprint of Elsevier 125,*

V. ACHARYA, H.S. SHIN, T. YORULMAZER (2010), « Crisis resolution and bank liquidity » *Review of Financial Studies*, 24 (2010), pp. 2166-2205

W. WAGNER (2017), « The liquidity of bank assets and banking stability » *Journal of Banking and Finance*, 31 (2017), pp. 121-139