THE RELATIONSHIP BETWEEN LIQUIDITY RISK AND PROBABILITY OF DEFAULT: EVIDENCE FROM THE EURO AREA

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Abstract

The main objective of this study is to analyze the type of relationship that exists between liquidity risk - measured with the liquidity coverage ratio and the net stable funding ratio - and the probability of default. The sample is composed of 575 listed and non-listed Eurozone banks and the methodology applied in the analysis is OLS regression based on panel data. The results show a relationship only between the liquidity coverage ratio and credit rating, while there is no relationship between the long-term liquidity measure and probability of default. In relation to the crisis, the results highlight divergent bank liquidity management only in the short time horizon.

Keywords: Probability of Default, Liquidity Risk, Rating

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1 Introduction

The crisis that began in July 2007 has highlighted gaps in the field of liquidity risk management. Banks have demonstrated the lack of good forecasting models to manage liquidity risk, which has led to a liquidity spiral and given rise to a sudden deterioration of bank balance sheets with consequent difficulties in finding new sources of liquidity on interbank markets. In response to the crisis, in December 2010, the Basel Committee issued new principles and guidelines on liquidity risk management. The Committee highlighted the importance of good liquidity risk management and defined two new ratios to measure liquidity risk: the liquidity coverage ratio as a measure of short-term liquidity risk and the net stable funding ratio to measure long-term liquidity risk.

Numerous contributions in literature have studied liquidity risk management using different measures of liquidity risk; few however have focused on the link between this risk and other risks taken by banks.

The aim of this paper is to understand the relationship between this significant risk and bank probability of default, which has once again become a much-debated topic. The study therefore addresses the following research questions:

1. Does a relationship exist between liquidity risk and probability of default?
2. How does a higher probability of default affect bank liquidity?
3. Has the financial crisis had a negative impact on bank liquidity?

This study contributes to the broad literature on risk management and particularly to research that analyzes the relationship between different bank risks. It is intended to at least partly reduce the gap in literature in the theme of liquidity risk and its relationship with other bank risks. While this is currently a relevant topic, most existing studies focus only on limited areas without considering the financial crisis. A key contribution of this research is the large sample of European banks and the relationship investigated. To the author's knowledge, no specific studies exist on the relationship between liquidity risk and the default probability of European banks.

The paper is structured as follows: section 2 presents the literature review, section 3 illustrates the analysis methodology and sample, section 4 presents the results, section 5 the robustness checks and the final section offers some conclusions.

2 Literature review

Liquidity risk management has always been an important theme in literature. Many authors (Saraceno, 1949; Caprara, 1954; Cutolo,1968; Cesarini, 1982; Baravelli, 1989; Ferrari, 1988; Fabrizi et al. 1990; Gabbi, 1992; Ruozi, 1994; Banja et al., 1999) have analysed bank liquidity, providing not only a definition but also expanding the different liquidity risk management techniques.

Following the financial crisis of 2007, scholars, international organizations and supervisory bodies such as the Basel Committee, CEBS and Bank of Italy, have taken a renewed interest in these themes.

Literature on the determinants of liquidity risk is relatively scarce. In general, liquidity risk is considered as a determinant of other risks such as credit risk (Cannata, 2001; Bissoondoyal-Bheenick and Treepongkaruna, 2011) or a determinant of bank performance (Brouke, 1989; Molyneux and Thornon, 1992; Barth et al., 2003; Kosmidou, 2008; Shen et al., 2009; Sharma and Gounder, 2012; Hamadi and Awedh, 2012; Arif et al., 2012). Generally, the authors highlight a negative relationship between liquidity risk and bank performance.

However, some studies focus on the causes of liquidity risk. Vodovà (2011), in a study on 22 banks during the 2006-2009 period, emphasises the determinants of liquidity risk measured with different balance sheet indices. The results show that the liquidity of Czech commercial banks is higher when capital adequacy is higher and when the interest rates on loans are higher. Furthermore, the liquidity measures identify a positive relationship with capitalization and with size, while they are negatively linked with inflation rate and GDP rate. The author finds that bigger banks present lower liquidity in line with the "too big to fail" theory, where it would seem that bigger banks are less motivated to hold liquidity since they rely on government intervention in case of shortages.

Rauche et al. (2009) study the determinants of liquidity risk and attempt to identify the determinants of liquidity creation. Their results highlight that the most important determinants are macroeconomic variables and monetary policy, while not showing a significant relationship between liquidity creation and bank specific variables such as size and performance. Finally, Bunda and Desquilbet (2008), in their study on 1107 commercial banks in 36 emerging economies, find that capitalization measured by the ratio between equity and total assets has a significant and positive relationship with all liquidity measures considered in their study and a significant relationship with inflation rate and growth rate.

Angora and Roulet (2011) underline the relationship between liquidity risk measured with two new liquidity indicators proposed by the Basel Committee (LCR and NSFR), some balance sheet indices (ROA, the natural logarithm of total assets, the ratio between loans to customers and total loans, etc.) and some macroeconomic indicators (GDP annual growth rate, the spread between the interbank rate and central bank policy rate, etc.). In general, the study highlights that the liquidity risk ratio has a negative relationship with most of the indicators analysed including size and the ratio between regulatory capital and total assets, while the liquidity measure has a significant and positive relationship with macroeconomic variables such as GDP and the central bank policy rate.

Bonfim and Kim (2011) in a study on European and North American banks in the 2002-2009 period illustrate how banks manage liquidity risk. In particular, using regression analysis based on panel data, the authors consider three different measures of liquidity risk and attempt to understand whether banks tend to take more risks in a crisis period and if they follow similar strategies in these periods. The authors also identify the determinants of liquidity risk. The results highlight that the type of relationship between liquidity risk and size, performance and the ratio between loans and deposits depends on the type of liquidity risk measure used. Bank size generally has a positive impact on bank liquidity, while the performance measure has an ambiguous relationship with liquidity risk.

Ahmed et al. (2011), in a study on a sample of six Pakistani banks, show that there is no significant relationship between liquidity risk, profitability and size, while underlining a significant relationship between liquidity risk and leverage and the measure of bank tangibility[1]. Giannotti et al. (2010), in a study on a sample of 675 Italian banks, also find that larger banks have lower liquidity exposure. The authors sustain that this strategy could be justified based on the theory that larger banks have a better reputation and so are less exposed to the liquidity risk. Finally, they highlight that in the Italian banking system there is no significant difference in terms of liquidity risk exposure between banks specializing in real estate lending and other banks, while the former are significantly affected by interbank market dynamics with regard to liquidity exposure. Nguyen et al. (2012), in a study on a sample of 47,684 banks in 113 different countries, analyze the relationship between liquidity risk and bank market power, showing that bigger banks, through lower capitalization and cost efficiency, endure a lower liquidity risk. They also find that listed banks usually hold more liquid assets than non-listed banks.

There are fewer studies on the relationship between credit rating and liquidity risk. In particular, the analyses usually consider the impact of liquidity risk on probability of default (Cannata, 2001; Bissoondoyal-Bheenicke and Treepongkaruna, 2011). These authors show that a lower liquidity risk is linked to higher credit rating. Bissoondoyal-Bheenicke and Treepongkaruna (2011), in a study on a sample of Australian banks, highlight the determinants of credit rating and demonstrate that liquidity risk can be included in these determinants, underlining a negative relationship between liquidity risk and credit rating.

Wong and Hui (2009) analyze the inverse relationship and find that an increase in probability of default leads to costumers withdrawing their deposits, with a possible bunk run, and the consequent increase of bank liquidity risk. Giordana and Schumacher (2012) in a recent study highlight the impact of the Basel III regulation on the probability of bank default. Specifically, the authors find that the liquidity coverage ratio (LCR) and the net stable funding ratio

[1] Bank tangibility is measured by the ratio of fixed assets to total assets.

(NSFR) are positively related with distance to default; higher liquidity standards therefore improve bank resilience to external shocks.

To our knowledge, no specific study exists on the impact of credit rating on liquidity risk; existing studies focus instead on the inverse relationship. This aspect therefore represents a key contribution to literature. In this study, we test the following hypotheses:

H_1: A relationship exists between liquidity risk and bank probability of default

H_2: If bank probability of default increases, bank liquidity risk also increases

Bunda and Desquilbet (2008), in the aforementioned study highlight that the financial crisis of 2000 had a significant and negative impact on the liquidity ratio and that banks face higher liquidity risk exposure during a financial crisis. Vadovà (2011), in his study on Czech banks, also underlines that the financial crisis has a negative impact on one of the four measures of bank liquidity used in the analysis. In accordance with these studies, our third research hypothesis is:

H_3: During a financial crisis banks have a higher exposure to liquidity risk

This study contributes to literature in three different aspects: to our knowledge, a specific study on the relationship between liquidity risk and probability of default of European banks during the financial crisis does not yet exist. Furthermore, the liquidity coverage ratio and the net stable funding ratio have not been extensively tested in literature. Finally, the sample composed of listed and non-listed Eurozone banks can be considered a point of strength of this research since previous studies are based on a limited sample of banks in one or a few countries and frequently focus on listed banks only.

3 Methodology and Sample

The initial sample was composed of 1080 European banks for each year. Only 60 of these banks are listed, 31 are delisted and the remaining 989 banks are unlisted; this confirms the low recourse of European banks to the stock market. Although the liquidity coverage ratio and the net stable funding ratio can be measured for all 1080 banks, a rating is available for only 575 banks, which therefore constitute our sample. The author's choice to focus only on the Euro area is dictated by the desire for as homogeneous a sample as possible in terms of bank characteristics and the territory in which they operate. The observations for each year are 547 (2006), 555 (2007), 561 (2008), 566 (2009) and 570 (2010).

3.1 Variables

The dependent variables used in the empirical analysis concern liquidity risk. Based on previous studies (Giannotti et al., 2010; Van den End, 2010; Angora and Roulet, 2011; Giordana and Schumacher, 2012), the net stable funding ratio and the liquidity coverage ratio are the two dependent variables considered, which are the two liquidity measures proposed by the Basel Committee (2010).

The liquidity coverage ratio (LCR) is a short-term ratio and is measured as follow:

$$LCR = \frac{High\ quality\ liquid\ asset}{Net\ cash\ outflows\ (t+30)} \geq 100 \quad (1)$$

The second measure of bank liquidity is the net stable funding ratio (NSFR), which is a measure of structural liquidity (with a one-year time horizon) and is calculated as follows:

$$NSFR = \frac{Available\ amount\ of\ stable\ funding}{Required\ amount\ of\ stable\ funding} > 100 \quad (2)$$

A high value of these ratios means high bank liquidity.

Appendix 1 and 2 show the term considered to quantify the two liquidity ratios proposed by the Basel Committee (2010).

The difficulty of including all terms required by the Basel Committee, which entails a precise calculation, is a main limitation of this method. However, the use of these two measures instead of the balance sheet indices usually used in literature can more effectively indicate bank liquidity risk.

The independent variable is the credit rating that quantifies the probability of default. The credit rating is transformed into a quantitative measure based on studies by Cannata (2001), Bissoondoyal-Bheenicke (2005), Kisgen (2006), Borensztein et al. (2007), Gillard (2009), Gopalan et al. (2009) and Bissoondoyal-Bheenicke and Treepongkaruna (2011). For each rating, a point from 1 to 22 is allocated: 1 corresponds to a lower rating (D) and thus a higher probability of default, while 22 corresponds to the best rating (AAA) and thus a lower probability of default. Table 1 illustrates the rating scale.

In addition to the independent variables, some control variables are also used in this study:

- Bank size measured with the natural logarithm of total assets (SIZE) and frequently used in literature (Shen et al., 2009; Giannotti et al., 2010; Ahmed et al., 2011; Bonfim and Kim, 2011; Angora and Roulet, 2011; Vodovà, 2011; Nguyen et al., 2012)
- Bank specialization (SPEC) that measures to what extent a bank is specialized in lending, considering net loans as a percentage of total assets (Bonfim and Kim, 2011; Angora and Roulet, 2011).

A performance index (NIM): the net interest margin of banks (Bonfim et al., 2011; Sharma and Gounder, 2012; Lin et al., 2012; Hamadi and Awedh, 2012);

Table 1. The rating scale

Number	Fitch Rating	S&P Rating	Moody's Rating	Classification
21	AAA	AAA	Aaa	Investment upgrade
20	AA+	AA+	Aa1	
19	AA	AA	Aa2	
18	AA-	AA-	Aa3	
17	A+	A+	A1	
16	A	A	A2	
15	A-	A-	A3	
14	BBB+	BBB+	Baa1	Investment downgrade
13	BBB	BBB	Baa2	
12	BBB-	BBB-	Baa3	
11	BB+	BB+	Ba1	Speculative upgrade
10	BB	BB	Ba2	
9	BB-	BB-	Ba3	
8	B+	B+	B1	Speculative downgrade
7	B	B	B2	
6	B-	B-	B3	
5	CCC+	CCC+	Caa1	
4	CCC	CCC	Caa2	
3	CCC-	CCC-	Caa3	
2	CC+	CC+	Ca	
1	D	D	D	Default

All bank-specific data were obtained from the Bankscope database for the period 2006-2010.

With regard to the macro-economic variables, which have the aim of explaining bank liquidity taking into account the economic and political system, we consider:

- GDP growth rate (GDP) (Bunda and Desquilbet, 2003; Shen et al., 2009; Angora and Roulet, 2011; Vodovà, 2011)
- The crisis (DUMMY): to consider the crisis we use a dummy variable equal to 0 during the pre-crisis period (2006-2007) and equal to 1 during the crisis period (2008-2010) (Vadovà, 2011).

3.2 Descriptive statistics

Table 2 summarizes the variables used in the OLS regression.

Table 2. The variables

Variables	Description	Expected sign
DUMMY	The dummy variable is equal to 1 in the 2008-2010 period and equal to 0 otherwise	*Significant*
GDP	Gross growth rate of GDP	+
NSFR	Net stable funding ratio	
LCR	Liquidity coverage ratio	
SIZE	Natural logarithm of total assets	+
SPEC	The measure of the specialization in bank lending activity	-
NIM	Net interest margin	+

The descriptive statistics of the variables used in the analysis are shown in Table 3.

Table 3. Descriptive Statistics

Variable	Average	Median	Minimum	Maximum	Std. Dev	Asymmetry	Kurtosis
DUMMY	0.600	1.000	0.000	1.000	0.489	-0.408	-1.833
SIZE	13.658	13.122	8.537	21.512	2.140	1.015	0.794
NIM	2.657	2.6780	-25.545	12.189	1.025	-4.213	139.280
SPEC	62.398	65.778	0.051	98.797	17.941	-1.074	1.169
LCR	0.538	0.301	0.001	11.172	0.787	5.843	51.287
NSFR	2.130	1.688	0.039	75.146	2.281	14.890	360.339
GDP	0.023	0.809	-8.227	10.522	3.086	-0.612	-0.627
RATING	16.806	17.000	8.000	27.000	1.616	-0.457	6.331

The table presents the descriptive statistics of the variables used in the analysis: bank size (SIZE), the financial crisis dummy (DUMMY_CRISIS), the measure of performance (NIM) the measure of bank specialization (SPEC), liquidity coverage ratio (LCR) and net stable funding ratio (NSFR).

Before implementing the empirical analyses, the correlation was verified between the independent and control variables used in the survey. The analysis of these correlations appears to support the hypothesis that each independent variable has its own specific information value in explaining bank liquidity risk (Table 4).

Table 4. Correlation Table

	DUMMY	SIZE	NIM	SPEC	LCR	NSFR	GDP	RATING
DUMMY	1							
SIZE	-0.010	1						
NIM	-0.123	-0.405	1					
SPEC	-0.047	-0.024	0.228	1				
LCR	0.017	-0.039	0.010	-0.378	1			
NSFR	0.041	-0.151	-0.153	-0.520	0.178	1		
GDP	-0.445	0.021	-0.038	-0.047	-0.014	0.013	1	
RATING	-0.059	0.038	-0.192	-0.244	-0.063	0.122	0.038	1

The table presents the descriptive statistics of the variables used in the analysis: bank size (SIZE), the financial crisis dummy (DUMMY_CRISIS), the measure of performance (NIM) the measure of bank specialization (SPEC), liquidity coverage ratio (LCR) and net stable funding ratio (NSFR).

3.3 Methodology

In terms of methodology, the OLS regression is estimated using panel data. The regression aims to investigate the relationship between liquidity risk and credit rating:

$$LIQUIDITY\_RATIO = \alpha + \beta_1 RATING_{i,t} + \beta_2 NIM_{i,t} + \beta_3 SPEC_{i,t} + \beta_4 SIZE_{i,t} + \beta_5 GDP_t + \beta_6 DUMMY + \varepsilon \quad (3)$$

The $LIQUIDITY\_RATIO_{i,t}$ can assume two different ratios: $LCR_{i,t}$ and $NSFR_{i,t}$ which are the two liquidity measures of bank *i* in the year *t*, α is a constant, $RATING_{i,t}$ is the credit rating of bank *i* at time *t*, $SIZE_{i,t}$ indicates the size of bank *i* in the year *t*, $NIM_{i,t}$ is a measure of performance of bank *i* at time *t*, $SPEC_{i,t}$ measures to what extent bank *i* is specialized in lending in the year *t*, considering net loans as a percentage of total assets, GDP_t is the growth rate of the gross domestic product at time *t*, DUMMY is the dummy variable related to the financial crisis that is equal to 0 during 2006-2007 and equal to 1 during 2008-2010.

4 Results

Table 5 presents the regression results obtained for the first liquidity measure (LCR).

Table 5. The liquidity risk determinants: *LCR*

	Coefficient	*Std. Error*	*T ratio*	*p-value*	
Const	0.638	0.144	4.407	0.00001	***
RATING	-0.039	0.006	-6.460	<0.00001	***
SIZE	0.057	0.004	13.060	<0.00001	***
GDP	0.007	0.003	2.346	0.01907	**
DUMMY	0.076	0.024	3.136	0.00174	***
SPEC	-0.011	0.0005	-19.367	<0.00001	***
NIM	0.067	0.0133	5.109	<0.00001	***
R-squared	0.222297	Adjusted R-squared			0.219811

The equation presents an Adjusted R-squared of 0.22 and the model therefore shows a modest ability to explain the variance of the dependent variable.

All variables show a significant relationship with the short-term liquidity measure (LCR). In particular, the size measure presents a positive relationship with LCR, in line with Vodovà (2011), Bonfim and Kim (2011) and Nguyen et al. (2012), while the specialization measure shows a negative relationship with the LCR, in line with the aforementioned authors.

The crisis dummy variable has a significant relationship with the dependent variable and thus short-term liquidity risk management changes considerably during the financial crisis, in line with Vadovà (2011).

With regard to the independent variable, namely credit rating, the results underline a significant negative relationship with the LCR. This could imply that banks with higher credit rating are less inclined to hold liquidity in the short time horizon, perhaps because they believe they are less exposed to liquidity risk in the short-term.

Table 6 highlights the results of the regression that uses the net stable funding ratio (NSFR) as a dependent variable.

Table 6. The liquidity risk determinants: *NSFR*

	Coefficient	*Std. Error*	*T ratio*	*p-value*	
Const	7.484	0.322	23.220	<0.00001	***
RATING	-0.004	0.013	-0.354	0.72324	
SIZE	-0.170	0.009	-17.327	<0.00001	***
GDP	0.005	0.007	0.781	0.43455	
DUMMY	0.013	0.054	0.249	0.80328	
SPEC	-0.054	0.001	-41.403	<0.00001	***
NIM	0.209	0.029	7.064	<0.00001	***
R-squared	0.568495	Adjusted R-squared			0.567115

The equation presents an Adjusted R-squared of 0.57 and the model therefore shows a good ability to explain the variance of the dependent variable. With regard to the bank specific variables, in contrast with Vodovà (2011), Bonfim and Kim (2011) but in line with Angora and Roulet (2011), liquidity creation is negatively related to the size measure; these results may be due to the fact that larger banks need less liquidity in the long time horizon. The specialization measure also underlines a negative relationship with the dependent variable, indicating that banks specialized in lending activities present lower long-term liquidity.

With regard to the dummy variables, the results show a non-significant relationship with the liquidity measure; this means that long-term liquidity management remained unchanged during the crisis, in contrast with Bonfim and Kim (2011).

Considering the independent variable, Table 6 shows a non-significant relationship between NSFR and bank probability of default, in contrast with previous results. This could imply that credit rating is only related to the short-term liquidity measure, while liquidity management over a long time horizon is unrelated to credit rating.

In conclusion, the findings show that bigger banks that are more specialized in lending activities have lower liquidity, both in the short and long time horizon. In terms of the hypotheses of this study, these can only be accepted in part since credit rating affects only one of the two measures considered in the analysis. In particular, the results show that a change in credit rating affects short-term liquidity

management. When considering the crisis, the findings underline that this has an impact only on the short-term liquidity measure and thus the third hypothesis can also only be accepted in part and in terms of the LCR. In light of the results obtained, we sustain that banks with higher credit rating (lower probability of default) are more likely to manage liquidity in the short term and that liquidity management changed during the 2007 financial crisis. This is perhaps due to the willingness of banks to control the liquidity problem to a greater extent in the short term.

In line with recent studies (Sharma and Gounder, 2012; Lin et al., 2012; Hamadi and Awedh, 2012), the empirical findings also highlight a negative relationship between liquidity risk and bank performance measured by net interest margins. Indeed, the positive sign highlights that a higher net interest margin is linked with higher liquidity availability and hence lower liquidity risk.

5 Robustness checks

A number of checks were undertaken to assess the robustness of the empirical results. More specifically, some variations to equation (3) were estimated in order to assess the robustness of the results in terms of the relationship between liquidity risk and bank specific features.

In addition to the crisis dummy variable, a country dummy variable was also considered, assigning a value of 1 to Italian banks and 0 otherwise. The results show a non-significant relation with both the liquidity coverage ratio and the net stable funding ratio.

Finally, we estimated equation (3) aggregating panel data by stacking cross sections rather than by stacking time series. Once again, the main results hold.

With regard to the performance index, other measures such as ROA and ROE were also used. The results obtained are the same although the adjusted R-squared is higher when using the net interest margin.

With reference to liquidity risk, the different balance sheet indices proposed by literature, such as the ratio between liquid assets and total assets or the ratio between net loans and customer deposits, were considered although we chose to use the two ratios proposed by the Basel Committee in 2010, believing that these will become the two official measures of liquidity risk.

6 Conclusions

In the last year, the liquidity risk management theme has again become a much-debated topic. The aim of this study is to investigate the relationship between liquidity risk and probability of default.

The results underline that a relationship between bank probability of default and its liquidity risk exposure effectively exists. In particular, the study highlights that banks with better credit rating are more likely to manage liquidity as well as hold more liquidity in the short term. This could be due to the fact that banks that are associated with a lower default probability are also believed to be safer and more stable, and can therefore hold higher cash levels.

With regard to the long time horizon, the analysis shows that credit rating does not affect the level of liquidity held by banks.

In considering the 2007 financial crisis, the study underlines that only short-term liquidity changed, while with regard to the long time horizon, the bank's *modus operandi* remained unchanged by the crisis.

The results obtained from this study are significant in that no other studies on this specific topic exist in literature and the analysis demonstrates bank reactions to the financial crisis in terms of liquidity management.

The annex 1 and 2 show the main items consider to calculate the liquidity risk measures: liquidity coverage ratio and net stable funding ratio. The values are taken from the Bankscope database, but some items are not available, and this is the main limitation of the methodology.

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Appendix 1. The Liquidity Coverage Ratio

Cash	Cash	100
Qualifying marketable securities from sovereigns, central banks, public sector entities, and multi-lateral development banks	Governament Bonds	100
Qualifying central bank receivables	Reserves	100
In addition, the Committee will gather data on the following instruments to analyze the impact of this standard on the financial sector: Qualifying corporate bonds rated AA or higher Qualifying	Proxy not implemented	
Corporate bonds rated A- to AA-Qualifying covered bonds rated AA or higher Qualifying covered bonds rated A- to AA	Proxy not implemented	
Cash outflow oltre i 30 giorni		
Retail deposits Stable deposits	Deposits	Minimum 7,5
Less stable retail deposits (additional categories to be determined by jurisdiction)	Deposits	Minimum 15
Stable, small business customers	Deposits	Minimum 7,5-15
Non-financial corporates, no operational relationship	Deposits	75
Funding from repo of illiquid assets and securities lending/borrowing transactions illiquid assets are lent out	Proxy not implementd	
Cash inflow oltre i 30 giorni		
Amounts receivable from retail counterparties	Total retail deposits	100
Amounts receivable from wholesale counterparties	Banks'deposits	100

Source: Authors' elaboration on Basel Committee on Banking Supervision (2013)

Appendix 2. The Net Stable Funding Ratio

Avaiable stable funding (fonti)		
Tiers 1 and 2 capital instruments	Total Capital	100
Stable deposits of retail and small business customers (nonmaturity or residual maturity , 1 year)	Customer deposit	85
Less stable deposits of retail and small business customers (nonmaturity or residual maturity , 1 year)	Customer deposit	70
Wholesale funding provided by non-financial corporate customers (non-maturity or residual maturity , 1 year	Proxy not implemented	
Required stable funding (usati)		
Debt issued or guaranteed by sovereigns, central banks, BIS, IMF, EC, non-central government, multilateral development banks	Government Bond	5
Unencumbered non-financial senior unsecured corporate bonds (or covered bonds) rated at least AA, maturity $ 1 year	Proxy not implemented	
Unencumbered listed equity securities or non-financial senior unsecured corporate bonds rated at least A-, maturity 1 year Gold	Proxy not implemented	
Loans to non-financial corporate clients having a maturity , 1 year	Loans to customer	85
All other assets	Other assets	100

Source: Authors' elaboration on Basel Committee on Banking Supervision (2010)