The Impact of Liquidity Regulation Announcements on the CDS Market of Large European Banks

Giorgia Simion[1], Ugo Rigoni[2], Elisa Cavezzali[3], and Andrea Veller[4]

Department of Management, Ca' Foscari University of Venice
San Giobbe, Cannaregio 873, 30121 Venice, Italy

Abstract

Following the recent financial crisis, the Basel Committee on Banking Supervision (BCBS) undertook a negotiation process that led up to a liquidity reform package known as the new Basel III liquidity framework. This paper aims to assess the reaction of creditors to announcements by the BCBS on liquidity regulation. Using an event study on Credit Default Swap (CDS) data of large European banks over the 2007-2015 period, we find evidence of a negative CDS market reaction to regulatory events, with CDS spreads widening, indicating that creditors increased expectations of a credit event. Results also show that creditors were less sensitive to liquidity regulation announcements in banks with higher capital and liquidity funding ratios. In contrast, creditors were more sensitive to liquidity regulation announcements in banks with higher bad loans. However, the negative impact of low asset quality is positively moderated by provisions against future expected losses. An important managerial implication of this research is that if banks correctly adjust their asset-liability mix, they could limit potential side effects of the Basel III liquidity regulation.

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[1] Tel.: +39 333 8289778. E-mail address: giorgia.simion@unive.it
[2] Tel.: +39 041 2348770. E-mail address: rigons@unive.it
[3] Tel.: +39 041 2346931. E-mail address: elisa.cavezzali@unive.it
[4] E-mail address: andrea.veller@unive.it

1. Introduction

This study examines the Credit Default Swap (CDS) market reaction to announcements by the Basel Committee on Banking Supervision (BCBS) on liquidity regulation, a key milestone in the new Basel III framework.

Since the financial crisis outbreak in summer 2007, liquidity and funding risk[5] started to play a central role in the field of banking regulation, which until then was almost exclusively focused on capital ratios (Santos and Elliot, 2012). The lack of a regulation specifically focused on liquidity proves that this issue was not a major concern by policy makers prior to the crisis. However, following the turmoil, the common idea that a well capitalized bank was always able to raise funds became weak: banks, despite meeting the regulatory capital requirements, experienced serious funding difficulties owing to their excessive reliance on unstable, low quality sources of funding, erroneous asset-liability management and risky off-balance sheet positions (ECB, 2013). Consequently, banks became illiquid and unable to meet their debt obligations (i.e. insolvent), raising significant concerns on liquidity risk.

As a response of the vulnerabilities arose during the crisis, the BCBS undertook a negotiation process of *new, international standards* to address the previously underestimated role of liquidity risk (Calomiris et al., 2012). During this negotiation period, which went on from February 2008 to June 2015, several amendments were released prior to the final version of the new liquidity reform package[6].

This paper is the *first* to empirically analyse the impact of the gradual release of official documents by the BCBS (2008-2015) concerning liquidity regulation on the CDS market of large European banks, which reflects creditor expectations of default risk. As a first stage, we run an event study to estimate cumulated abnormal spread changes (CASs) around announcement days, testing then their statistical significance. As a second stage, we conduct a regression analysis aimed

[5] Liquidity risk is the "*ability to finance cash outflows at any given point in time"* (King, 2013b, p. 4145), while funding risk "*refers to a bank's ability to raise funds in the desired amount on an ongoing basis*" (King, 2013b, p. 4145). As it appears evident, these two types of risk are closely interrelated. To lighten reading, we will use the liquidity risk word, assuming implicitly also funding risk.

[6] For further details, please see Table 2.

at identifying the main determinants of CASs to investigate the heterogeneous response of investors.

Results show that creditors perceived the introduction of tighter liquidity regulation as reducing bank probability to survive, with CDS spreads widening. However, as an interesting result, the effect is mitigated when banks are well-capitalised and with stronger structural liquidity. On the other hand, the effect is amplified when banks have high bad loan ratios, not covered by loan-loss provisions.

Surprisingly, while there are several papers dealing with regulatory events and their impact on the market (e.g., Dann and James, 1982; James, 1983; Allen and Wilhelm, 1988; Wagster, 1996; Mamun et al., 2004; Yildirim et al., 2006; Armstrong et al., 2010; Bhat et al., 2011; Kolasinski, 2011; Georgescu, 2014), the studies on bank liquidity regulation are scant (Bruno et al., 2015). Furthermore, among these few pieces of research, to the best of our knowledge, there is no empirical paper focusing on creditors and examining the complete series of announcements by the BCBS that led up to the international liquidity standards.

Our paper contributes to prior literature is several ways. From an academic point of view, it provides new knowledge on a relatively scarcely researched topic. It sheds light on the interconnection between bank liquidity risk management and credit risk, providing a starting point for more rigorous formalizations of this important relationship a through theoretical framework. The relevance of this aspect is particularly important if we consider that liquidity risk and bank financial stability have been central issues during the financial crisis.

From a practitioner point of view, this paper helps policy markers and bank managers to better understand how financial institutions would respond to liquidity rules according to their specific characteristics. This may provide an important tool for banks to mitigate the negative repercussions of the adoption on profitability (Härle at al., 2010) and business activity (Allen et al., 2012). In addition, this research supports the impact assessment of Basel III, increasing knowledge on the international harmonization of liquidity rules.

In this framework, examining creditors of European banks is particularly interesting, since they are excluded from Deposit Insurance Schemes. The lack of protection, together with the hard period that the banking system was experiencing, should have raised creditors' concern on bank soundness and insolvency risk. European financial institutions constitute a peculiar setting in this respect since they are expected to be most strongly influenced by Basel III (Dietrich et al., 2014) due to their weaker funding position during the crisis as compared to international peers. Therefore, we expect creditors of large European banks to be considerably affected by the introduction of the new liquidity standards.

The remainder of this paper is structured as follows. Next section provides an overview of Basel III liquidity requirements. Section 3 briefly reviews major studies on this topic. Section 4 develops the different hypotheses to be tested. Thereafter, section 5 describes the data and methodology used for the empirical analysis. Section 6 presents the findings. Finally, section 7 concludes.

2. Background on Basel III liquidity requirements

During the financial crisis, the inaccurate banks' liquidity management and funding structure became a central issue when liquidity risk clearly arose on banks' balance sheets (ECB, 2013). In this difficult period, banks faced significant liquidity outflows and shortages as a result of their excessive overreliance on highly volatile funding sources (i.e. wholesale market), erroneous planning of maturity transformation, excessive dependence on low quality assets that quickly turned to be illiquid and high liquidity risk exposure from off-balance sheet activities. As a consequence, banks hoarded liquidity for security reasons and reduced their lending activity both to other financial intermediaries and to the real economy. This contributed to the credit fall, resulting in a significant drying-up of liquidity funding in several markets (Strahan, 2012). In this context, the European Central Bank (ECB) adopted extraordinary measures, providing two Longer Term

Refinancing Operations (LTROs)[7] with three-year maturity. These non-standard monetary transactions supported and helped Eurozone banks to meet their debt obligations and liquidity needs (ECB, 2011).

In light of the inaccurate and ineffective liquidity risk management during the crisis (ECB, 2013), the BCBS issued in December 2009 a proposal to deal with the increasing concerns on liquidity risk. This Consultative Document was released after a series of previous attempts to deal with this issue, which involved other press releases in the period 2008-2009[8]. This proposal framework aimed to strengthen the financial system stability by increasing the resilience of international active banks to deal with acute liquidity stress scenarios and promoting the international harmonization of liquidity risk regulation (BCBS, 2009). To this purpose, the Consultative Document introduced two separate but complementary standards on banks' balance sheet: the *Liquidity Coverage Ratio* (LCR) and the *Net Stable Funding Ratio* (NSFR), which address liquidity and funding risk, respectively. The LCR is designed to help banks in facing short-term liquidity shocks, mitigating the risk of substantial liquidity outflows due to an excessive dependence on volatile sources of funding. This standard requires maintaining a minimum amount of "*unencumbered, high-quality liquid assets that can be converted to cash to meet needs for a 30 calendar day time horizon under severe liquidity stress conditions specified by supervisors*" (BCBS, 2010, p. 3). In contrast, the NSFR was introduced to "*promote longer-term funding of the assets and activities of banking organizations by establishing a minimum acceptable amount of stable funding based on the liquidity of an institution's assets and activities over a one-year horizon*" (BCBS, 2010, p. 22). This index mitigates the maturity mismatch between assets and liabilities by promoting the use of stable, long-term funding sources and penalizing instead short-term wholesale funding, one of the central issues of the financial crisis.

Following the proposal, in December 2010 the final version of the new liquidity standards was

[7] In this respect, the European Central Bank (ECB) conducted two three-year Longer Term Refinancing Operations (LTROs), characterized by fix rate and full allotment: the first on 21st December 2011 that introduced in the market €489 billion to 523 credit institutions and the second on 29th February 2012 that provided €529 billion.

[8] Further details will be provided in paragraph 5.2.1..

released by the BCBS, in which the LCR was partially relaxed and the NSFR maintained substantially unchanged. Despite some revisions on the ratios, the reaction of the banking community to this press release was of enormous dissent. In that period, European banks were experiencing the terrible repercussions of the sovereign debt crisis and perceived the adoption of the liquidity requirements as punitive. Overall, the document received strong criticisms, especially among European banks, which compared to their international peers (e.g. US and Japan) were clearly in a weaker funding position and thus less prepared to fulfil the new standards.

Thereafter, a series of revisions and adjustments were made by the BCBS as a response to banks' comments and impact assessments. This resulted in a softening up of the initial version of the guidelines and the gradual introduction[9] of the liquidity standards to avoid, or at least contain, potentially negative effects on credit market (Bruno et al., 2015). In light of this, additional amendments were released that went on subsequent years and that ended in June 2015 with the release of the final document on the NSFR introducing some minor revisions on the index. Relying on the official publications by the BCBS, the LCR was introduced in January 2015 for a minimum amount of 60 per cent and will gradually increase until 2019 (ECB, 2013), year in which the minimum level will reach 100 per cent. The NSFR instead will be introduced in January 2018, requiring bank to maintain a minimum level of 100 per cent.

Overall, the new Basel III liquidity requirements are expected to increase banks' liquidity buffers, lower maturity imbalances, contain the interconnection of financial markets and, last but not least, reduce systematic liquidity risk (ECB, 2013).

Importantly, all member nations of the BCBS[10] have to introduce in their respective countries the liquidity standards. Bank failure to comply with these reforms would incur into financial penalties and in the worst case the cancellation of the banking licence.

[9] This concerns specifically the Liquidity Coverage Ratio (LCR).
[10] The Member Nations represented on the Basel Committee of Banking Supervision (BCBS) are Belgium, Canada, France, Germany, Italy, Japan, Luxembourg, the Netherlands, Spain, Sweden, Switzerland, the United Kingdom, and the United States. For further details, see <http://www.bis.org/bcbs/membership.htm>.

3. Literature Review

3.1. Bank Regulation and Market Effect

The market reaction arising from changes in bank regulation have been studied by several researches and can be dated back to the 80s, when the first single-country papers on this field appeared in the literature. These studies mainly focused on the US market, exclusively analysing equity investors.

In this respect, Dann and James (1982) examined shareholders' wealth effects of three events occurred in the period 1973-1978 concerning the removal of interest rate ceiling on deposits. By analysing a sample of US saving and loan (S&L) institutions, they found a significant reduction in the market value of stocks following the rule change.

Thereafter, James (1983) undertook a similar study, extending the analysis to commercial banks in US, and found significant intra-industry heterogeneous effects owing to ceiling changes.

Other deregulations, following to these rule reforms, lead to the 1980 Depository Institutions Deregulation and Monetary Control Act (DIDMCA) analysed by Allen and Wilhelm (1988). The authors found a substantial impact of the DIDMCA passage on the competitive structure of banks. Institutions that were member of the Federal Reserve System (FRS) resulted to profit more from the passage as compared to non-FRS institutions.

The first multi-country study, shifting to a more international environment, is that of Wagster in 1996. He conducted an event study to examine how the competitiveness of international banks was affected by the introduction of the 1988 Basel Capital Accord. His empirical results reveal that the capital regulation failed to eliminate the cost-funding advantages of Japanese banks, thus missing to reduce the competitive inequalities among nations within this sector.

Since the beginning of the 21st century, a series of management studies started to examine the key events leading to the introduction of the US Gramm-Leach-Bliley-Act (GLB)[11] in 1999. Among

[11] "*The GBL Act repealed the Glass-Steagall Act of 1933 and the Bank Holding Company Act of 1956 and allowed banks, brokerage firms, and insurance companies to merge*" (Mamun et al., 2004, p. 333).

others, important are the works of Mamun et al. (2004) and Yildirim et al. (2006) that found a significant reduction in the systematic riskiness of the financial industry around the event days of the passage, concluding that this sector has positively benefitted from the GLB Act.

In addition to the US context, more recent research on bank regulation and investors' reaction has started to examine also the European market and banking system. To this regard, Armstrong et al. (2010) analysed the series of announcements (2002-2005) related to the adoption of IFRS standards in the European stock market. They showed that banks with lower pre-adoption information quality reacted positively to the standard, consistent with the expected rise in the quality of accounting information.

Thereafter, in the face of the 2007-2008 turmoil and the resulting weakening of the financial system, which led shareholders and creditors to question about bank solvency, research started to examine also bondholders. This was motivated by the fact that creditors became increasingly exposed to lose money and thus more sensible to credit risk as compared to the pre-crisis period. Consequently, this figure became object of analysis in several related researches.

Among these studies, Georgescu (2014) examined how credit and equity market participants reacted to the relaxation of fair value accounting in 2008. By conducting an event study on stock, bond and CDS data on European banks, he discovered that bondholders and shareholders display heterogeneous responses.

Another recent paper, which extended previous works by looking at both credit and equity market participants, is the paper by Bhat et al. (2011). The authors investigated how bond and stock prices responded to a series of announcements that led up to the mark-to-market accounting rule change and found a positive bond and stock price reaction surrounding the event days.

3.2. Government Interventions and Market Effect

Following the outbreak of the crisis, other research has evaluated the impact of government interventions aimed at increasing stability of the financial system and restoring investor confidence

in the market. Regulation and government interventions are actions that are not on the same level, however the studies display the reaction of creditors (and also shareholders) to safeguard measures, which is object of interest in this research.

Veronesi and Zingales (2010) carried out an event study to analyse the costs and benefits of the US government intervention announced in October 2008, according to which the nine largest US banks were planned to receive huge capital injections. They found that the government intervention significantly raised banks' claim, benefiting mostly bondholders, which gained around $121bn. Despite this increase in value, the plan involved a substantial redistribution of wealth at the expense of taxpayers that lost between $21–$44 bn.

Another interesting paper is the one by King (2009). The author examined how creditors and shareholders reacted to the introduction of rescue packages for six countries in the period 2008-2009. To this purpose, first he carried out an event study at the country-level to assess the average effect of the announcements associated with the introduction of the rescue package and second at the bank-level, by differentiating institutions according to the type of support received (e.g. capital injection, asset purchase etc.), with the goal to investigate potential heterogeneous effects. Overall, he concluded that government interventions mainly favoured bondholders at the expense of shareholders for almost all countries under examination.

In addition to the previous work, King (2013a) conducted another related study with the aim to analyse potential contagion and competition effects following the government bailout measures occurred in 2008. His results, from a sample of 63 banks belonging to five countries, show a strong contagion effect for bondholders, expressed by a reduction in CDS spreads for both the banks subject to the intervention and their foreign competitors. In contrast, a mixed effect was found for shareholders.

In sum, research on bank regulation and market effect emerged in the 80s in the US market, mainly focusing on shareholders. Thereafter, studies shifted to the European setting, starting to recently examine the figure of bondholders, which became increasingly expose to bare losses

following the crisis. Furthermore, other related studies examined the role of government intervention and its effect on credit and equity market participants.

Overall, the literature highlights significant redistribution of resources owing to rule changes. The purpose of this paper is to analyse how creditors responded to the introduction of the new liquidity standards. For this reason, we next turn the attention to the studies that examined the effect of the Basel III liquidity framework.

3.3. Recent Studies on Basel III liquidity standards

One of the central aspects discussed in the literature is the impact of the new liquidity standards on bank asset-liability management, since long-term funding[12] is costly and holding more high quality liquid assets yields low returns (Dietrich et al., 2014). King (2013b) analysed a sample of 549 banks in 15 countries to investigate their compliance with the NSFR at the end of 2009 and identify the best procedure to meet the index in case the ratio falls below the minimum threshold. By analysing various strategies, the author found that the most cost-efficient proceeding is to increase the maturity of wholesale funding and the amount of high-rated securities, thus affecting interest spread between assets and liabilities. However, this strategy is expected to narrow down net interest margins by an average amount of 75 basis points.

As a result of the downward pressures on lending margins, some studies (e.g. Härle at al., 2010) foresee a reduction in the return on equity (ROE) index, a standard measure of bank profitability. Other research instead does not confirm this negative relationship, illustrating the potential benefits of the adoption. Dietrich et al. (2014), examining the drivers and outcomes of the NSFR prior to its introduction (1996-2010), show that the funding ratio does not significantly impact a set of bank profitability variables. The authors interpret this finding as evidence that there are well-balanced business models able to raise profits despite the disadvantages of the higher short-term funding costs related to the implementation of the index.

[12] Under the assumption of a positively sloped yield curve.

The aspect of business models is in fact another relevant topic analysed by researchers, who started looking at banks not merely as a portfolio of assets and liabilities but as an entity able to adjust its activities to the new liquidity regime. Allen et al. (2012) claim that the impact of the Basel III reform could be less harmful than the banking industry fears. However, in order to have such a favourable result, substantial structural adjustments are required, which represent a significant challenge for financial institutions in the transition period towards the adoption. The authors predict that bank business models will shift toward a liability-oriented assets management, primarily focused on stable and long-term funding sources. Importantly, they highlight that bank failure to implement the necessary changes may make the *cure worst than the disease*, increasing substantially bank costs. Overall, it is generally agreed that banks with a more diversified funding structure, as is the case of investment banks, are more likely to experience difficulties in meeting the liquidity standards since they generally rely on funding sources (e.g. wholesale debt) penalized by Basel III criteria (Allen et al., 2012; Dietrich et al., 2014).

In contrast to prior research, our paper takes a different view examining the short-term effect of liquidity regulation on the financial market. An assessment of the long-term impact would be hard to implement accurately since the liquidity standards have not been fully adopted yet and can only be computed for a very short time. Therefore, only an event study approach can be used to examine how creditors perceived that the regulation would affect bank soundness. Moreover, the market analysis can capture all public information conveyed to investors and examine the overall effect of liquidity regulation, without making simplifying assumptions or conjectures on bank operating reactions.

To the best of our knowledge, there is only one working paper by Bruno et al. (2015) that examine the market effect of Basel III. The authors found a negative share price reaction around the days leading to the liquidity reform, suggesting that shareholders believe that the adoption decreases bank profitability. In addition, they reported a heterogeneous market reaction based on bank country of origin and specific bank characteristics. However, Bruno et al. (2015) did not consider creditors,

which might have different incentives as compared to shareholders. The issue is particularly important since creditors in Europe are excluded from Deposit Insurance Schemes. Therefore, given the vulnerabilities emerged during the recent financial crisis, which strongly hit European banks, the lack of protection schemes is likely to have raised their concern on bank soundness, supporting the idea of a significant reaction to the liquidity rules.

Overall, this research is the *first* empirical analysis that aims to assess creditor reaction, proxied using changes in CDS spreads, to regulatory announcements that led up the liquidity portion of the new Basel III package.

4. Hypothesis development

To the extent that liquidity regulation provides new information to investors, we expect a significant market reaction to the announcements. A positive reaction would suggest that creditors viewed the introduction of the liquidity rules as reducing the risk of default for banks, with the CDS spread narrowing around the event days. A negative reaction would instead show that creditors perceived the standards as increasing the risk of default, with the CDS spread widening following the regulatory events.

Several studies in the literature support the former hypothesis of a positive response. The regulation is in fact designed to reduce the contagion risk of liquidity shortages (BCBS, 2010), improving banking system soundness and reducing bank credit risk. In support of this argument, Dietrich et al. (2014) show that high NSFR banks display lower earnings volatility. Hong (2014) find a negative relationship between NSFR and bank failure for a sample of US financial institutions, although no similar effect is reported for the LCR. Finally, Banerjee and Mio (2014) highlight the contagion-limiting effect of liquidity rules. Specifically, they document that a tougher liquidity regulation decreases bank interconnectedness, mitigating the transmission of shocks and strengthening the stability of financial institutions.

The above research supports the beneficial effects of liquidity regulation on bank soundness and explains why creditors may respond positively reducing their perceived default risk.

Despite these arguments, other related research predicts a negative reaction. This view is mainly driven by the high cost and potential "dark side" effects of holding liquid assets, as required by Basel III. Myers and Rajan (1998) illustrate that bank with more liquid assets have a higher value in liquidation for creditors but they are also more exposed to unfavourable behaviour by borrowers that may act against creditors' interests. Moreover, as supported by some research findings, the low-yielding liquidity and higher cost of long-term funding may substantially harm bank profitability (Härle at al., 2010; King, 2013b). If creditors view the new liquidity standards as detrimental for bank soundness, they should respond negatively increasing their perceived default risk following the regulatory events.

Beside understanding the overall effect of the regulation, it is reasonable to expect that not all financial institutions will respond equally. Because the liquidity rules are first realized at the bank level (BIS, 2016), it is worth understanding whether bank-specific characteristics, especially the risk dimensions closely related to the liquidity standards, influence the CDS market reaction.

Specifically, our testable hypotheses about the heterogeneity of creditor response are the following:

H1. Creditors of banks with higher liquidity funding ratios react positively to liquidity regulation announcements.

The idea that banks with liquid assets and stable funding sources better withstand with liquidity shocks stands at the heart of the liquidity reform (BCBS, 2010) and is further confirmed by prior literature (Cornett et al., 2011). Research on the recent crisis supports this argument, highlighting that bank liquidity funding structure is a central factor in explaining bank default risk and showing that financial institutions with stronger structural liquidity in the pre-turmoil period were less likely

to fail afterward (Bologna, 2001; Vazquez and Federico, 2012). Importantly, holding more liquid assets also improves bank creditworthiness, increases access to external funds and reduces bank funding costs (Sironi, 2003). The above arguments match the intuition behind the implementation of the LCR and NSFR. We therefore believe that bank characterized by a stronger funding system and more liquid assets are more likely to fulfil the new standards. As a consequence, their creditors should be less sensitive to the introduction of stricter liquidity regulations.

H2. Creditors of banks with higher capital ratios react positively to liquidity regulation announcements.

Whereas examining the exposure of well-capitalized banks to regulatory policies on liquidity is a relatively scant research topic[13], several studies tested the impact of leverage on bank CDS spread and cost of debt (Flannery and Sorescu, 1996; Sironi, 2003; Di Cesare and Guazzarotti, 2010). It is commonly agreed that higher capital ratios lower leverage, decreases funding costs, thereby reducing the probability of bank default. We therefore expect that highly capitalized banks are in a better funding position to meet the tighter liquidity standards without facing financial distress. There are several reasons that support such an argument: (1) capitalized banks are less likely to suffer from increased funding costs due to the adoption since we presume that they have a more resilient and stable funding structure, (2) they are perceived as less risky by investors and therefore have more easily accessible funds (Ratnovski, 2013), and (3) they automatically increase bank NSFR through more equity[14] so that they have less need for costly balance sheet adjustments.

Overall, we predict creditor reaction to be smaller for bank with higher capital ratios because investors, anticipating the benefits of lower leverage, reduce expectations of a credit event.

[13] To the best of our knowledge there is only one paper by Dietrich et al. (2014) that analysed the determinant of NSFR and found a positive relationship between bank capital level and the liquidity ratio.
[14] Equity stands at the numerator of NSFR and has a ASF-factor of 100%.

H3. Creditors of banks with higher bad loans react negatively to liquidity regulation announcements. This effect is positively moderated by a bad loan coverage ratio.

Low-quality asset banks are clearly in a weaker position to accommodate the new standards. Bad loans are in fact penalised by Basel III criteria as they automatically lower the NSFR[15] (BCBS, 2014c) and implicitly harm the LCR, not being by definition High Quality Liquid Assets (HQLA). Hence, these banks are expected to face higher pressures to adjust their asset-liability portfolio composition and greater uncertainty on future performance. A recent study by Hong et al. (2014) confirm that banks with low asset quality have higher credit risk and are prone to default. Because they are perceived as riskier, they also face higher funding costs and fund-raising problems, thus making the adjustment process toward the adoption more challenging. Overall, creditors of banks with higher bad loan ratios are expected to raise their perceived default risk following the regulatory events. Nevertheless, we believe that this effect is positively moderated by the amount of allowances set aside by banks to cover non-performing loans. Indeed, the risk of a credit event decreases as the cushion against expected losses increases. If investors correctly evaluate this information, the negative reaction should be less pronounced for banks with a higher bad loan coverage ratio.

5. Data and Methodology

5.1. Data

For the purpose of this study, we use the daily change in the CDS spread as proxy for the effect on bank creditors. A growing body of research supports this choice, measuring debtholders' reaction employing CDS data instead of bond data (King, 2009; Veronesi and Zingales, 2010; Andres et al., 2016). This provides several advantages. First, banks generally issue different types of bonds, which in turn have different characteristics (e.g. maturity and liquidity). Combining them to assess

[15] Non-performing loans are assigned a RSF-factor of 100%.

the overall impact of an event may be challenging. Contrary to the bond market, only one derivative contract is required for each bank. Second, CDS contracts are generally more liquid than bonds (Veronesi and Zingales, 2010) and therefore provide much more reliable data. Finally, whereas bond spreads incorporate information not related to default risk, CDS spreads are a direct measure of credit risk.

For these reasons, individual bank CDS contracts are selected from Markit Ltd., one of the most reliable and widely used data provider on CDS, which employs rigorous data cleaning proceedings to construct their composite spreads. For the period from July 2007-June 2015[16], we gather daily observations on 5-year CDS contracts[17] denominated in Euro and written on senior unsecured debt with mod-modified restructuring clause[18].

Banks are selected as the largest European financial institutions according to asset size. We first look at the list of significant banks under the Single Supervisory Mechanism (SSM) Framework Regulation. This allow us to classify, based on bank's size, the most representative financial institutions under the SSM. Then, we integrate the above list with that of the remaining countries, which do not participate in the SSM: Denmark, Norway, Sweden, Switzerland and UK.

To be included in the final database, bank CDS must satisfy a series of liquidity criteria. We arbitrarily select the threshold according to prior research (Andres et al., 2016), with the main goal to get a correct balance between the need of having a representative dataset and reliable observations. The selection criteria we apply are the following: CDS data have to be observable for each day of the event window, for at least 50 per cent of the trading days of the estimation window[19] and the percentage of zero spread change should not exceed 50 per cent of the estimation window.

[16] Not all banks have observable data from the whole investigated period. More in details, Deutsche Apotheker- und Ärztebank EG has available data from September 2007 until September 2014. DNB Bank ASA from November 2011. DZ Bank AG Deutsche Zentral- Genossenschaftsbank has observable CDS until September 2014. Erste Group Bk AG from August 2008. Eurobank Ergasias, S.A. from August 2008. FCE bank until September 2014. Lloyds Bank Plc until October 2013. Piraeus Bank SA until September 2014. Finally, Permanents TSB Plc from July 2007.

[17] 5-year CDS contracts are the most liquid derivative contracts, commonly used in prior related research.

[18] CDS derivative contracts are regulated by the International Swap and Derivative Association (ISDA) and are traded Over the Counter (OTC). The ISDA determines the restructuring clause and which form of bank debt restructuring represents a credit event. CDS on European banks currently follow the Modified-Modified Restructuring convention.

[19] These two time intervals will be defined in paragraph 5.2.2.

The data collection process result in an unbalanced[20] panel of 50 banks from 15 European countries, i.e. Austria, Belgium, Denmark, French, Germany, Greece, Ireland, Italy, Norway, Portugal, Spain, Sweden, Switzerland, the Netherland and the UK. Table 1 shows the banks of this study together with their number of observations.

For the same time period, we also collect data on the iTraxx Europe 5-year index[21], our proxy for the market portfolio. This index is made up of the most liquidity 5-year CDS contacts of European financial and non-financial institutions.

As a last step, we gather from Bankscope accounting information on bank consolidated financial statements to construct bank-specific variables.

[insert Table 1 here]

5.2. Methodology

5.2.1 Event dates

We define an event date as the exact day on which new information regarding bank liquidity regulation becomes available on the market. In line with this statement and previous studies on regulatory events (Yildirim et al., 2006), each date corresponds to the release of an official document by the BCBS concerning liquidity regulation[22]. If the publication occurred on public holidays, the first available trading day is selected as event date.

To identify the events of this study, we apply the following procedure. Based on the public information available on the BIS[23] website, we consider all the documents in the BIS section labelled "Basel Committee - Liquidity"[24], which includes all publications of the BCBS concerning liquidity since 1992. Thereafter, we refine the above list by selecting only the proposals,

[20] The number of financial institutions changes among events and thus through time as some of them did not satisfy the requirements for each of the 12 events under examination.
[21] Specifically, we used the series 23, version 1 of the iTraxx Europe 5-year index.
[22] If two documents on liquidity regulation are released on the same day, the two publications belong to the same event.
[23] BIS stands for Bank for International Settlements.
[24] See <http://www.bis.org/list/bcbs/tid_128/index.htm>.

amendments and final documents on liquidity regulation exclusively related to the Basel III framework. Through this process, we identify 11 events in the period 2008-2015.

We further examine all the BCBS press releases available on the BIS website[25] in order to check that significant publications on liquidity are not missing in the analysis. This lead us to add an additional event concerning the release of an Annex in July 2010, which contains key agreements on the liquidity reform.

To complete the selection of event dates, we carry out a research on Lexis Nexis Academic to verify that the events we focus on really conveyed new information to the public, thus making investors informed of the liquidity rules. This proceeding also allows us to examine potential anticipatory effects. More in detail, we conduct a search on major international magazines (e.g. Financial Times, International New York Times, International Herald Tribune) over a span of a week before and after each event, using a wide rage of keywords[26] to assess international media coverage of the Basel III liquidity framework. This process confirms our selection and does not show the release by the press of information on the events prior to their official announcements by the BCBS.

Overall, we select 12 events related to the new liquidity regulation and covering the period between February 2008 and June 2015. Table 2 defines each event date and provides a brief description.

Finally, each author independently categorizes the events in two classes: (1) those that tightened the liquidity requirements and (2) those that loosen them conditional to prior events and disclosed information. Table 3 document our final event categorization.

[insert Table 2 here]

[insert Table 3 here]

[25] See <http://www.bis.org/list/press_releases/said_7/index.htm>.
[26] Specifically, we rely on the following main keywords: liquidity regulation, Basel III, liquidity risk, funding risk, NSFR, LCR, liquidity and funding management, Basel Committee, Bank for International Settlements.

5.2.2. Event study

To investigate creditor reaction to regulatory events on liquidity, we adopt an event study methodology. This technique allows quantifying the impact of liquidity regulation announcements on bank CDS spreads.

Based on prior literature (MacKinlay, 1997), we estimate abnormal CDS spread changes (ASC) following a series of steps. We first compute spread changes, which reflect the interday variation in the premium, by making the difference in the logarithm of the CDS spread between two consecutive trading days. Formally, this can be represented as:

$$\Delta S_{i,t} = ln(S_{i,t}) - ln(S_{i,t-1}) \quad (1)$$

where $S_{i,t}$ and $S_{i,t-1}$ is the spread level (in basis points) at time *t* and *t-1*, respectively.

The choice to use the difference in the logarithm instead of the absolute difference is driven by the fact we expect a market reaction that is proportional to banks' initial level of credit risk. In such circumstances, the absolute difference is considered as less appropriate measure (Andres et al., 2016).

Thereafter, we define abnormal changes in CDS spreads as the difference between the realized and the normal spread change over the event window:

$$ASC_{i,t} = \Delta S_{i,t} - E[\Delta S_{i,t} \mid \Omega_t] \quad (2)$$

where $ASC_{i,t}$, $\Delta S_{i,t}$ and $E[\Delta S_{i,t} \mid \Omega_t]$ correspond to the abnormal, realized and normal spread change for contract *i* at time *t*, respectively. Note that the normal spread change, i.e. the spread that would be observed if the event did not occur, is conditioned by past CDS changes, identified by the information set Ω_t at time *t*.

While the realized spread change is computed using equation (1), the normal spread change is obtained applying a standard market model (MacKinlay, 1997)[27]. This is expressed by the following equation:

[27] Note that the spread change of the market index is obtained by applying the same computation used for the CDS spread changes. Specifically, the spread change of the market index is set as the difference in the logarithm of the market index spreads between two consecutive trading days.

$$\Delta S_{i,t} = \alpha_i + \beta_i \Delta S_{index,t} + \epsilon_{i,t}$$

$$E[\epsilon_{i,t}] = 0 \quad VAR[\epsilon_{i,t}] = \sigma^2_{\epsilon_i} \tag{3}$$

where $\Delta S_{index,t}$ is the spread change of the CDS market index, proxied by the iTraxx Europe 5-year index, and $\epsilon_{i,t}$ is the error term. We then estimate via an OLS[28] regression the parameters α_i, β_i and $\sigma^2_{\epsilon_i}$ of equation (3) over a 150-day estimation window, ending 3 day before the announcement.

Finally, according to equation (2), we compute the abnormal spread change (ASC) of contract *i* on the event date *t* as follows:

$$ASC_{i,t} = \Delta S_{i,t} - \hat{\alpha}_i + \hat{\beta}_i \Delta S_{index,t} \tag{4}$$

In order to capture potential anticipated or postponed market reactions, we focus on the following event windows: 5-day (-2; +2), 3-day (–1; +1), 2-day (0; +1) and one-day (0; 0)[29]. Cumulative abnormal CDS spread changes (CASs) for these event windows is calculated by adding abnormal CDS spreads, obtained via equation (4), within the event period.

After the computation of CASs for each bank-event combination, we test the hypothesis of a market reaction statistically different from zero using several parametric and non-parametric test statistics. Because the introduction of the liquidity standards resulted from a series of press releases that occurred over several years, we draw our inference from the analysis first on the single events and second on all 12 events taken together.

With reference to the analysis on the single events, we run the Boehmer et al. (1991) test, which is robust to event-induced volatility, the widely used Wilcoxon sign rank (1945) test and finally, as a robustness check, the recent generalized sign test proposed by Kolari and Pynnonnen (2011), which is robust to return serial correlation, event-induced volatility and cross sectional correlation.

With reference to the analysis on all events, we construct equally-weighted CDS portfolios since they are free from potential cross-sectional correlation due to the clustering of events (MacKinlay,

[28] Before running the model, we check that the OLS assumptions were satisfied. Specifically, we run the Box–Pierce, Lilliefors (Kolmogorov-Smirnov) and Breusch-Pagan tests. As some regressions resulted to have heteroskedasticity issues, we use the hsk-wls procedure for heteroskedasticity correction of the estimates.

[29] As a robustness check, we also include other event windows.

1997). Because we recognize some events as tightening and loosing liquidity regulation, in the same spirit of Armstrong (2010), we multiply by -1 the announcements associated to weaker liquidity rules. This technique allows us to correctly estimate the overall CDS market reaction to tighter liquidity regulation. The intuition behind it is related to the fact that a positive reaction to events that reduced the requirements suggests that creditors benefitted from loosing regulation. Therefore, it would be inappropriate to aggregate the raw CASs for both event categorizations.

We run two test statistics on CDS portfolios, the standard t-test and the Wilcoxon sign rank (1945) test.

Finally, as a robustness check, we estimate CASs adopting a factor model, which includes the most important determinants of CDS changes identified by prior literature (Collin-Dufresne, 2001; Ericsson et al., 2009)

5.2. Regression analysis

As a second step, we examine the determinants of heterogeneous market reaction to regulatory events by running the following regression:

$$CAS_{i,j}^{t_1 t_2} = \alpha + \sum_k \beta_k BANK_{i,k} + \sum_n \gamma_n time\_dummy_n + \sum_j \lambda_j CONTROLS_{i,j} + \varepsilon_{i,j}^{t_1 t_2} \quad (5)$$

where the dependent variable is the cumulative abnormal spread change for bank *i* and event *j* over the event window $(t_1;\ t_2)$ and $BANK_{i,k}$ is a vector of bank-specific accounting variables. In line with prior literature (Ricci, 2015), for each event we associate the latest available accounting variable[30]. Finally, we include a set of time dummies to capture different phases of the financial crisis ($time\_dummy_n$) and some controls ($CONTROLS_{i,j}$).

With reference to bank capitalization, we consider the *TIER1* regulatory capital ratio, i.e. the ratio between regulatory bank equity capital and total risk-weighted assets. According to our hypothesis, we expect that higher bank capital ratios have a positive effect on creditor reaction to regulatory announcements, decreasing their expectations of a credit event. Therefore, H1 is confirmed if the

[30] For example, considering an event occurred in 2008, we associated accounting variables measured from the bank annual report of 2007.

TIER1 coefficient is negative and statistically significant at least at the 10% confidence interval, reflecting a narrowing in CDS spreads.

With reference to bank liquidity, we construct two indicators: the Liquidity Coverage Ratio (*LCR*) and the Net Stable Funding Ratio (*NSFR*). As previously stated, the actual ratios cannot be accurately obtained from annual reports: we therefore derived reasonable proxies from Bankscope datase. More in detail, the former variable (*LCR*) is defined as liquid assets[31] to deposits and short-term funding, while the latter one (*NSFR*) is defined as the ratio of equity[32] and long term funding[33] to total year-end assets[34]. Consistently with our hypotheses, we assume creditors in banks with higher liquidity funding ratios to react positively to liquidity regulation announcements, i.e. they decrease their perceived default risk more than investors in less liquid banks do. Consequently, H2 is confirmed if the *LCR* and *NSFR* coefficients are statistically significant, with a negative sign.

With reference to asset quality, we construct the ratio of impaired loans to gross loans (*NPL_GL*) and the ratio of loan loss reserves to impaired loans (*LLR_NPL*) to capture the moderating effect of bad loans coverage. We expect creditors of banks with higher bad loans ratios to respond negatively to liquidity regulation announcements, increasing their perceived default risk. However, we believe that this effect is positively moderated by the amount of provisions covering expected losses. In line with this statement, H3 is confirmed if the coefficients of the *NPL_GL* and the interaction term between *NPL_GL* and *LLR* are significant, with a positive and negative sign, respectively.

Beside our interest variables, we include three time dummies: *GLOBAL* indicates the global crisis period (15/09/2008-01/05/2010), *SOVEREIGN* captures the sovereign debt crisis (02/05/2010-21/12/2011) and finally *post_LTRO* reflects the period after the two Longer Term Refinancing Operations (from 22/12/2011) by the European Central Bank (ECB) that provided huge capital injection to financial institutions.

[31] Liquid assets include trading securities and at FV through income, loans and advances to banks, reverse repos and cash collateral, cash and due from banks and mandatory reserves.

[32] Equity includes also pref. shares and hybrid capital accounted for as equity.

[33] Total long term funding includes pref. shares and hybrid capital accounted for as debt, senior debt maturing after 1 year, subordinated borrowing and other funding.

[34] We also try to implement more rigorous proxies for the two liquidity ratios based on prior research (i.e. Dietrich et al., 2014). However, this attempt significantly reduces the number of observations because some accounting items are not available in Bankscope for all banks and whole period under investigation. For this reason, we decide to construct the variables based on a simplified but reasonable definition of the liquidity rules.

Finally, we introduce some controls. Bank profitability, expressed by the return on average assets (*ROAA*) ratio, generally considered an important driver of bank risk (Sironi, 2003). Stricter regulation (*STR_REG*), measured through a dummy variable that takes value 1 when we expect the announcement tightens liquidity regulation and zero otherwise, which control for the different event classification. To account for bank country of origin, we also define a dummy for banks located in Greece, Ireland, Italy, Portugal and Spain (*GIIPS*), which have been most strongly hit by the financial crisis and investors in these countries increasingly worried about bank default risk (Kiesel et al., 2015). Table 6 report descriptive statistics of the regressions.

We control for the absence of multicollinearity among regressors by checking both the cross sectional correlations among variables and the values of the Variance Inflation Factor (VIF). We further account for potential cross-sectional correlation among residuals computing clustered standard error based on bank country of origin [35] (Armstrong, 2010; Bruno et al., 2015).

As a robustness check, we repeat the regression analysis using the CASs estimated through the multifactor model (Andres et al., 2016).

6. Results

6.1. Results from the event study analysis

Table 4 reports results of the event study conducted on each of the 12 events under examination. When looking at the BMP and Wilcoxon sign rank tests, we document significant CDS spread changes for almost all events. However, once we account for potential cross sectional correlation among abnormal spread changes using the generalized rank test (Kolari and Phynonnen, 2011), the number of significant cumulative abnormal spread changes substantially reduces. More in detail, there is strong evidence that Event 5 caused a significant positive reaction in the CDS market, indicating that creditors benefited from an easing of liquidity regulation. Regarding instead the events that are expected to strengthen the regulation, we document that the first announcements by

[35] In addition to the standard OLS regression with standard error clustered at the country level, we also run pooled panel regression with standard error clustered at the bank level (Thomson, 2011) and results remain substantially the same.

the BCBS, i.e. Event 1, 3, 4, 6, were the most informative ones for investors that react mainly negatively, with positive signs prevailing over negative ones.

Three main considerations emerge from Table 4: first, we document substantial variation in CASs, which suggests heterogeneous reaction among investors. Second, creditor response to liquidity regulation announcements seems to be more relevant for events that strengthen the regulation. Third, the largest effect occurred in Event 3, with an estimated widening in CDS spreads equal to about 0.166, which corresponds to an average rise of 18%.

Table 5 shows the results for the event study conducted first on the aggregated events under examination and second on the subsample of events exclusively related to liquidity. Because the Basel Committee's reforms introduced both capital and liquidity rules, some announcements on liquidity coincide with the release of documents on capital. We therefore account for this potential confounding effect by running the analysis over the event days referring only to liquidity and not also to capital. The liquidity only events are the following: Event 1, 2, 3, 7, 8, 10, 12 [36].

As shown in Table 5, the coefficient of CAS(0, 0) is positive and always statistically significant (at the 1% confidence level) both when using the parametric and the more robust non-parametric statistic test. Importantly, this result holds in the subsample of events related only to liquidity rules, suggesting that the effect is not driven by potentially confounding announcements [37]. As we enlarge the event window, the CAAS becomes not significant. This may be explained by three main reasons: (1) the main effect occurred on the event days (i.e. day zero), (2) the univariate analysis hides potential bank heterogeneous reactions and (3), concerning the liquidity only events, the exclusion of important announcements that had extensive international media coverage has likely reduced the impact on the market.

As shown in Table 10 and 11, results remain substantially unaltered when CASs are estimated using the factor model.

[36] We also exclude Event 11 (December 9, 2014) because, although it does not coincide, it is closed to the release of a document on capital requirements (December 11, 2014).

[37] Since we have an unbalanced panel, the portfolio analysis is also conducted on the 36 banks for which we have data for all events. The results from this analysis remain substantially equal to the whole sample analysis and we do not document significant differences between the two.

Overall, there is evidence of a significant negative market reaction to tighter liquidity regulation, indicating that creditors perceived the new rules as increasing the probability of a bank default.

[insert Table 4 here]

[insert Table 5 here]

6.2. Results from the regression model

Table 8 reports results from the regression analysis explaining the CASs estimated over various event windows.

Regarding liquidity, the coefficients for the *LCR* and *NSFR* variables are negative and almost always statistically significant. This means that higher liquidity holding and more stable funding sources caused a positive response in bank creditors, with CDS spreads narrowing. This is consistent with prior literature illustrating the beneficial effects of stronger funding structures (Bologna, 2001; Cornett et al., 2011; Vazquez and Federico, 2012) and with our first hypothesis.

With reference to capitalization, the coefficient for *TIER1* is always negative and statistically significant at the 1% per cent level. This finding suggests that creditors of well-capitalized banks reduced more their perception of credit risk following the regulatory events and provides strong support for our second hypothesis, in consistence with past studies (Sironi, 2003; Di Cesare and Guazzarotti, 2010; Ratnovski, 2013, Dietrich, 2014). Benefiting from low leverage, more capitalized banks are in fact in a better funding position to meet the liquidity standards and thus are less sensitive to liquidity regulation announcements.

With reference to asset quality, we observe that the coefficient for bad loans, i.e. *NPL_GL*, is positive and statistically significant in all event windows except the largest one. This indicates that creditors in banks with a higher portion of non-performing loans perceived the liquidity requirements as detrimental for bank soundness, with CDS spreads widening. In the same event windows, the coefficient of the interaction term with bad loan coverage is negative and statistically significant at least at the 10% level, showing that the negative impact of bad loans on bank CDS

spreads is positively moderated by the amount of provisions set aside to cover impaired loans. This result supports our third hypothesis and shows the importance of loss coverage to mitigate potentially negative effects of liquidity rules on bank credit risk.

Focusing on the time dummies, it is worth noting that the coefficient for *Post_LTRO* is always lower than that for *GLOBAL*. Following the first LTRO, financial institutions received huge capital injections, which should have help them to fulfil the standards. Coherently with this argument, we observe that the introduction of liquidity rules is accompanied by a less pronounced increase in CDS spreads in the period after the adoption of extraordinary measures by the ECB.

With reference to our control variables, abnormal spread changes seem to be higher for more profitable banks (the *ROAA* coefficient is positive and statistically significant in three out of four event windows), probably reflecting higher bank-risk taking (Sironi, 2003). The dummy reflecting tightening liquidity requirements (the *STR_LIQ*) is positive and always statistically significant, consistently with our univariate analysis (see Table 5). Interestingly, bank located in the periphery of the Eurozone (expressed by the *GIIPS* variable) experienced a positive CDS market reaction, with CDS spreads narrowing.

Overall, the model shows that the introduction of stricter liquidity regulation caused a negative response in bank creditors. In addition, market discipline was in place over the investigated period, with creditors perceiving banks with stronger balance sheets as less risky to default. These results are consistent with prior literature on the negative effect of Basel III (BCBS, 2016). However, they also suggest that if banks correctly adjust their asset-liability mix, they could limit potential side effects of the adoption, similarly to Allen et al. (2012).

To account for potential confounding effects, the regression analysis is then run over the event dates exclusively related to liquidity. Table 9 documents results for the subsample of liquidity only events. We can immediately observe that the sign of the statistically significant variables of interest does not change, further confirming our hypotheses and suggesting that the effect is not driven by potentially confounding events on capital. Nevertheless, with respect to the previous model (Table

6), the significance level of some variables weaken. However, this can be reasonably explained by the loss of information due to the exclusion of important announcements on liquidity.

As shown in Table 12 and 13, results remain substantially unaltered when CASs are estimated using the factor model.

[insert Table 8 here]

[insert Table 9 here]

7. Conclusions

The Basel III liquidity framework constitutes a fundamental change in the field of banking regulation as it introduced for the first time *global liquidity standards* to deal with the risks emerged during the recent financial crisis. As far as we are aware, this is the first paper investigating the reaction of bank creditors to the gradual release of documents occurred over the 2008-2015 period, which led up the liquidity rules. To this purpose, we conducted a two-step analysis employing daily CDS data of large European banks. As a first step, we applied an event study to measure cumulated abnormal spread changes (CAS) around the announcement days, and as a second step we run a regression analysis to identify the main determinants of the heterogeneous responses of creditors to regulatory events on liquidity.

Our main finding from the event study analysis is that creditors perceived liquidity regulation as increasing bank probability to default. This is consistent with the strand of literature that illustrates the negative effects of tighter liquidity regulation (King, 2013; Härle et al. 2010; BCBS, 2016).

Our main results from the regression analysis highlight that creditors of banks with more stable funding sources, higher liquid asset and capital ratios react positively to liquidity regulation, confirming that market discipline was in place during the examined period. In contrast, creditors of banks with higher bad loans react negatively to liquidity regulation. Importantly, this latter effect is positively moderated by loan loss provisions. Results from the second-stage analysis are important

indications of the relevance of bank balance-sheet strength to mitigate potential side effects of the adoption.

This research has important theoretical and practical implications. From a theoretical perspective, it may provide greater insight and new knowledge on the market effect of liquidity regulation, an area that is relatively unexplored in the literature on banking regulation. Moreover, this study sheds light on the increasingly important relationship between bank liquidity and insolvency risk, hoping to provide a first step for future more rigorous formalizations of it.

From a practitioner point of view, this analysis increases knowledge on the effect of Basel III, supporting regulators in assessing the effectiveness of the liquidity rules in pursuing their intended goal. In addition, it may guide banks to correctly adjust their balance sheet so as to mitigate potential undesired repercussions following the adoption (Härle at al., 2010).

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APPENDIX

Table 1. List of European banks sorted by country

Country	Bank Name	GIIPS	Observations
AUSTRIA	Erste Group Bank AG	No	1,774
	Raiffeisen Zentralbank Österreich Aktiengesellschaft	No	2,065
BELGIUM	KBC Bank NV	No	2,065
DENMARK	Danske Bank A/S	No	2,065
FRANCE	BNP Paribas	No	2,065
	Crédit Agricole SA	No	2,065
	Société Générale SA	No	2,065
	Dexia Credit Local SA	No	2,065
GERMANY	Bayerische Landesbank	No	2,065
	Commerzbank AG	No	2,065
	Deutsche Apotheker- und Ärztebank EG	No	1,748
	Deutsche Bank AG	No	2,065
	DZ Bank AG- Deutsche Zentral-Genossenschaftsbank	No	1,885
	Landesbank Baden-Württemberg	No	2,065
	Landesbank Hessen-Thüringen Girozentrale	No	2,065
GREECE	Alpha Bank SA	Yes	2,065
	Eurobank Ergasias SA	Yes	690
	National Bank of Greece SA	Yes	2,065
	Piraeus Bank SA	Yes	1,864
IRELAND	Permanent TSB Plc	Yes	760
	Bank of Ireland – Governor and Company of the Bank of Ireland	Yes	2,056
	Allied Irish Bank	Yes	1259
ITALY	Intesa SanPaolo	Yes	2,065
	Banca Monte dei Paschi di Siena	Yes	2,065
	Banco Popolare SC	Yes	2,064
	Banca Popolare di Milano SCarL	Yes	2,065
	Mediobanca – Banca di Credito Finanziario SpA	Yes	2,065
	UniCredit SpA	Yes	1,832
NORWAY	DNB Bank ASA	No	925
PORTUGAL	Banco Comercial Português SA	Yes	2,065
	Caixa Geral de Depósitos, SA	Yes	2,061
SPAIN	Banco de Sabadell SA	Yes	2,065
	Banco Bilbao Vizcaya Argentaria SA	Yes	2,065

	Banco Popular Español SA	Yes	1,984
	Banco Santander SA	Yes	2.025
	Bankinter SA	Yes	2,065
SWEDEN	Swedbank AB	No	2,060
	Nordea Bank AB	No	2,065
	Svenska Handelsbaken AB	No	2,065
SWITZERLAND	Credit Suisse Group AG	No	2,065
	UBS AG	No	2,065
THE NETHERLANDS	Rabobank Nederland	No	2,065
	ING Bank NV	No	2,065
UK	HSBC Bank Plc	No	2,065
	HBOS Plc	No	2,063
	Barclays Bank Plc	No	2,065
	Standard Chartered Bank	No	2,065
	Royal Bank of Scotland Plc	No	2,065
	FCE Bank	No	1,885
	Lloyds Bank Plc	No	1,634

This table shows the banks in the study sorted by country. Yes/No denotes whether a financial institution is located in a GIIPS (i.e. Greece, Italy, Ireland, Portugal and Spain) country or not. For each bank is reported on the right side the number of observations (daily CDS spreads) available in the period from July 2007-June 2015.

Table 2. Key events leading to the introduction of liquidity regulation as part of Basel III

Event	*Calendar Date*	*Event description*
1	February 21, 2008	The BCBS releases *Liquidity Risk: Management and Supervisory Challenge*. This document summarizes the key findings of the Working Group of Liquidity (WGL)'s report, which includes preliminary observations on bank challenges to liquidity risk management in stress scenarios and provide a review of the liquidity regimes of member states.
2	June 17, 2008	In response to banks' lack of basic principles of liquidity during the crisis, the BCBS issues *Principles for Sound Liquidity Management and Supervision* (Consultative Document), a guidance for a correct management and control of liquidity risk. This proposal is an expansion of a previous version of the principles that was published in 2000. The key features of the guidance includes: the establishment of a liquidity risk tolerance, the development of accurate and robust funding plans, tests on liquidity stress scenarios, a regular assessment of liquidity risk management by supervisors, the maintenance of an appropriate level of liquidity buffer and the increase of public disclosure.
3	September 25, 2008	The final version of *Principles for Sound Liquidity Risk Management and Supervision* is released by the BCBS. This final guidance does not present substantial changes from the proposal.
4	December 17, 2009	The BCBS releases *International Framework for Liquidity Risk Management Standards and Monitoring* (Consultative Document) with the purpose of increasing banks' ability to face liquidity stress scenarios and promoting the international harmonization of liquidity regulation. To this purpose, two liquidity standards are presented, the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR).
5	July 26, 2010	The Group of Governors and Heads of Supervision (GHOS) meets to review the capital and liquidity reform package presented in the 2009 Consultative Document. The agreements reached by the oversight body are summarized in the issued *Annex*, which includes a more favourable definition of qualifying liquid assets and a recalibration of some liability items related to the LCR. Concerning instead the NSFR, a more favourable treatment of retail vs. wholesale funding is described.
6	December 16, 2010	The BCBS publishes *Basel III: International Framework for Liquidity Risk Measurement, Standards and Monitoring*, which sets out the rules and schedules agreed with the GHOS to implement the new Basel III liquidity framework. Importantly, the LCR is partially relaxed in accordance with the previously released *Annex*, while the NSFR maintained substantially unchanged.
7	January 07, 2013	The BCBS issues *Basel III: The Liquidity Coverage Ratio and liquidity risk monitoring tools*. This document presents the full text of the revised LCR. Main changes include the enlargement of the assets eligible as HQLA, which are in the numerator of the ratio, and some recalibrations of the rates related to cash inflow and outflows, which instead are in the denominator of the index, with the aim to better capture banks' experience in difficult times.
8	July 19, 2013	The BCBS releases *Liquidity coverage ratio disclosure standards* (Consultative Document). This proposal develops disclosure requirements for the LCR. All internationally active banks of member states are expected to apply these disclosure requirements, publishing their LCR according to a common template.
9	January 13, 2014	Two important documents are published by the BCBS: *Liquidity Coverage Ratio disclosure standards*, which finalises the disclosure requirements for the LCR and the consultative document *Basel III: the Net Stable Funding Ratio*. This latter proposes some revisions on the NSFR to avoid unintended consequences on banks, changing the weighting factor of some items in the ratio by putting more attention to short-term, volatile sources of funding. Furthermore, more alignment between the two liquidity standards, i.e. LCR and NSFR, is provided.
10	October 31, 2014	The final version of the revised NSFR is issued by the BCBS. The *Basel III: the Net Stable Funding Ratio* maintains the main features of the proposal framework with some minor changes related to the categories of the Required Stable Funding (RSF), which corresponds to the denominator of the ratio.
11	December 9, 2014	The BCBS releases *Net Stable Funding Ratio disclosure standards* (Consultative Document). Based on this proposal, all internationally active banks of member states are expected to apply the disclosure requirements of the NSFR, reporting the ratio according to a common template. This should support market participants to assess the level of bank funding risk.
12	June 22, 2015	The final document *Net Stable Funding Ratio disclosure standards* is issued by the BCBS. This document present minor changes from the proposal framework.

This table provides a brief description of the events under examination. Information is taken from the official website of the Bank of International Settlements (BIS) (<http://www.bis.org/index.htm>) and a series of documents issued by the BCBS (i.e., BCBS 2008a, 2008b, 2008c, 2009, 2010, 2013a, 2013b, 2014a, 2014b, 2014c, 2014d, 2015).

Table 3. Regulatory Events and Classification

Event	*Date*	*Tightened/ Loosed liquidity requirements*
1	February 21, 2008	Tightened
2	June 17, 2008	Tightened
3	September 25, 2008	Tightened
4	December 17, 2009	Tightened
5	July 26, 2010	Loosed
6	December 16, 2010	Tightened
7	January 07, 2013	Loosed
8	July 19, 2013	Tightened
9	January 13, 2014	Loosed
10	October 31, 2014	Tightened
11	December 9, 2014	Tightened
12	June 22, 2015	Tightened

Table 4. CDS market reaction to each event (Market Model)

	CAAS	*(Pseudo) Median*	*p-Value BMP test*	*p-Value Wilcoxon sign-rank test*	*p-Value G-rank test*	*No. of Obs*
Event1						
(0,+3)	-0.003325374	-0.004766663	0.507	0.788	0.980	43
(0,+2)	-0.01777776	-0.02428453	0.161	0.008***	0.472	43
(0,+1)	0.013471628	0.004195557	0.084**	0.283	0.549	43
(0,0)	0.012516024	0.012643375	0.000***	0.002***	0.216	43
(-1,0)	-0.022807614	-0.023534528	0.000***	0.000***	0.2225	43
(-1,+1)	-0.02185201	-0.03048104	0.017**	0.000***	0.253	43
(-2,+2)	-0.063173085	-0.071351243	0.000***	0.000***	0.049**	43
(-1,+3)	-0.038649012	-0.039502444	0.020**	0.000***	0.288	43
Event2						
(0,+3)	0.01351929	0.007480784	0.068*	0.207	0.769	44
(0,+2)	0.000273389	-0.001750941	0.496	0.598	0.796	44
(0,+1)	-0.009812381	-0.010946813	0.002***	0.002***	0.328	44
(0,0)	0.008674019	0.008109696	0.003***	0.000***	0.275	44
(-1,0)	0.00319322	0.003616799	0.513	0.401	0.757	44
(-1,+1)	-0.01529318	-0.014712617	0.000***	0.002***	0.366	44
(-2,+2)	-0.003859409	-0.007806327	0.177	0.168	0.559	44
(-1,+3)	0.008038492	0.002322059	0.299	0.640	0.967	44
Event3						
(0, +3)	0.1149207	0.1292832	0.000***	0.000***	0.191	44
(0, +2)	0.166399	0.1573109	0.000***	0.000***	0.051*	44
(0,+1)	0.098444673	0.09623109	0.000***	0.000***	0.066*	44
(0,0)	0.036912143	0.032296379	0.000***	0.000***	0.088*	44
(-1,0)	0.02776197	0.021965283	0.001***	0.002***	0.459	44
(-1,+1)	0.0892945	0.088238812	0.000***	0.000***	0.136	45
(-2,+2)	0.166466103	0.152360793	0.000***	0.000***	0.082*	44
(-1,+3)	0.106028792	0.121951905	0.000***	0.000***	0.249	44
Event4						
(0,+3)	0.02685569	0.02573933	0.000***	0.000***	0.059*	47
(0,+2)	0.01824576	0.0172804	0.000***	0.000***	0.097*	47
(0,+1)	0.010793921	0.007010804	0.000***	0.000***	0.281	47
(0,0)	0.00045259	-0.003668624	0.163	0.005***	0.422	47
(-1,0)	0.006965403	-0.000531363	0.386	0.694	0.896	47
(-1,+1)	0.017306735	0.010707296	0.000***	0.000***	0.289	47

(-2,+2)	0.019630976	0.015684165	0.000***	0.000***	0.183	47
(-1,+3)	0.033368508	0.029986101	0.000***	0.000***	0.048**	47
Event5						
(0,+3)	-0.06734231	-0.07093104	0.000***	0.000***	0.045**	47
(0,+2)	-0.06951166	-0.07259905	0.000***	0.000***	0.044**	47
(0,+1)	-0.072536787	-0.073658403	0.000***	0.000***	0.037**	47
(0,0)	-0.013711473	-0.014458642	0.000***	0.000***	0.222	47
(-1,0)	-0.022467941	-0.023591625	0.000***	0.000***	0.065*	47
(-1,+1)	-0.081293256	-0.082843935	0.000***	0.000***	0.023**	47
(-2,+2)	-0.087095481	-0.090402043	0.000**	0.000***	0.025**	47
(-1,+3)	-0.076098782	-0.079998779	0.000***	0.000***	0.033**	47
Event6						
(0, +3)	0.0525239	0.05056578	0.000***	0.000***	0.052*	47
(0, +2)	0.03874857	0.03599156	0.000***	0.000***	0.094*	47
(0,+1)	0.029007961	0.023385866	0.000***	0.000***	0.189	47
(0,0)	0.011872354	0.005877116	0.014**	0.008***	0.626	47
(-1,0)	-0.000467986	-0.005671869	0.436	0.119	0.653	47
(-1,+1)	0.016667621	0.010659103	0.006***	0.006***	0.537	47
(-2,+2)	0.015965334	0.013717786	0.018**	0.013**	0.497	47
(-1,+3)	0.040183562	0.038288544	0.000***	0.000***	0.091*	47
Event7						
(0, +3)	-0.02348527	-0.01499504	0.023**	0.037**	0.516	47
(0, +2)	-0.02247834	-0.01653599	0.003***	0.005***	0.360	47
(0,+1)	-0.0225372	-0.019054332	0.000***	0.001***	0.293	47
(0,0)	-0.015523083	-0.01206886	0.000***	0.001***	0.265	47
(-1,0)	-0.018017048	-0.016061784	0.000***	0.000***	0.163	47
(-1,+1)	-0.025031165	-0.022965042	0.000***	0.000***	0.182	47
(-2,+2)	-0.022916956	-0.015253382	0.030**	0.050*	0.516	47
(-1,+3)	-0.025979236	-0.019197108	0.003***	0.006***	0.374	47
Event8						
(0,+3)	-0.01875879	-0.01879081	0.000***	0.000***	0.210	49
(0,+2)	-0.01080068	-0.01027948	0.006***	0.002***	0.360	49
(0,+1)	-0.005065828	-0.004437887	0.155	0.099*	0.730	49
(0,0)	-0.001276596	-0.001971206	0.331	0.119	0.740	49
(-1,0)	-0.002910442	-0.002001618	0.333	0.424	0.917	49
(-1,+1)	-0.006699675	-0.005130719	0.180	0.198	0.808	49
(-2,+2)	-0.008075789	-0.005927135	0.105	0.121	0.734	49
(-1,+3)	-0.020392635	-0.019586878	0.001***	0.000***	0.308	49
Event9						

(0,+3)	0.003741499	0.004988203	0.166	0.022**	0.476	48
(0,+2)	0.007559659	0.009020138	0.013**	0.000***	0.250	48
(0,+1)	0.011024484	0.011950092	0.000***	0.000***	0.119	48
(0,0)	0.002815549	0.003029223	0.082*	0.011**	0.506	48
(-1,0)	0.006926591	0.010856387	0.116	0.001***	0.426	48
(-1,+1)	0.015135525	0.019006599	0.004***	0.000***	0.229	48
(-2,+2)	0.006140535	0.012760666	0.305	0.019**	0.551	48
(-1,+3)	0.007852541	0.011515583	0.120	0.004***	0.417	48
Event10						
(0,+3)	0.00374149	-0.001919329	0.670	0.638	0.476	45
(0,+2)	0.00755965	-0.005495031	0.813	0.184	0.250	45
(0,+1)	0.00856945	0.004209172	0.144	0.126	0.735	45
(0,0)	0.01844661	0.012476761	0.000***	0.000**	0.225	45
(-1,0)	0.03307902	0.026937831	0.000***	0.000***	0.146	45
(-1,+1)	0.02320187	0.017486601	0.004***	0.001***	0.401	45
(-2,+2)	0.01811771	0.015753018	0.041*	0.019**	0.504	45
(-1,+3)	0.01609135	0.013302735	0.047**	0.031**	0.602	45
Event11						
(0,+3)	0.02469933	0.001079815	0.096*	0.911	0.852	45
(0,+2)	0.0381436	-0.02836666	0.000***	0.000***	0.307	45
(0,+1)	0.02279245	0.011135016	0.009***	0.009***	0.520	45
(0,0)	0.01409571	0.004027118	0.067*	0.196	0.721	45
(-1,0)	0.004040715	-0.007299633	0.719	0.120	0.689	45
(-1,+1)	0.01273745	0.00014722	0.170	0.982	0.977	45
(-2,+2)	0.04185485	0.027849055	0.001***	0.001***	0.369	45
(-1,+3)	0.01464433	-0.009401658	0.254	0.287	0.872	45
Event12						
(0,+3)	-0.0224277	-0.02297626	0.000***	0.000***	0.342	45
(0,+2)	-0.02836066	-0.02836666	0.000***	0.000***	0.195	45
(0,+1)	-0.03302357	-0.035234885	0.000***	0.000***	0.093*	45
(0,0)	0.00719346	-8.06E-05	0.938	0.911	0.913	45
(-1,0)	0.003372429	-0.003498387	0.603	0.502	0.936	45
(-1,+1)	-0.0368446	-0.039814635	0.000***	0.000***	0.152	45
(-2,+2)	-0.01354739	-0.012603109	0.075*	0.037**	0.679	45
(-1,+3)	-0.02624873	-0.027387375	0.000***	0.000***	0.268	45

This table displays the results of the event study over various event windows for each of the 12 announcements by the BCBS concerning liquidity regulation. CASs are estimated adopting a standard Market Model (MacKinlay, 1997). The statistical significance of cumulated average abnormal spread changes (CAAS) is tested using the Boehmer et al. (1991) test, the Wilcoxon signed-rank (1945) test and the generalized rank test (Kolari and Phynnonen, 2011). Under the null hypothesis of the test, the CAAS change equals zero, whereas under the alternative hypothesis the average diverges from zero. ***,**,* denote that estimates are statistically significant at the 1, 5 and 10% levels.

Table 5. Aggregated CDS market reaction (Market Model)

ALL EVENTS	*CAAS*	*t-test*	*Median*	*p-Value Wilcoxon sign-rank test*
(-2, +2)	0.01642743	0.191	0.0188058	0.151
(0, 0)	0.01127544	0.003***	0.01091867	0.004***
(-1, +1)	0.0141423	0.231	0.008708421	0.301
LIQUIDITY ONLY EVENTS				
(-2, +2)	0.01555319	0.553	0.0037301	0.812
(0, 0)	0.01399839	0.021**	0.01266803	0.031**
(-1, +1)	0.008119724	0.630	0.002771961	0.812

This table displays the results of the event study over various event windows for announcements by the BCBS concerning liquidity regulation. CASs are estimated adopting a standard Market Model (MacKinlay, 1997). *ALL EVENTS* denotes all 12 announcements concerning liquidity regulation. *LIQUIDITY ONLY EVENTS* denotes Event 1, 2, 3, 7, 8, 10, 12. The statistical significance of cumulated average abnormal spread changes (CAAS) is tested using the standard t-test and the Wilcoxon signed-rank (1945) test. Under the null hypothesis of the test, the CAAS change equals zero, whereas under the alternative hypothesis the average diverges from zero. ***,**,* denote that estimates are statistically significant at the 1, 5 and 10% levels.

Table 6. Descriptive Statistics

	Mean	*Median*	*Max*	*Min*	*Standard deviation*
LCR (%)	33.690	45.510	80.590	11.960	22.542
NSFR (%)	23.790	22.240	39.900	10.990	9.676
TIER1 (%)	10.790	10.500	16.260	6.940	2.951
NPL_GL (%)	5.43	3.80	16.34	0.67	4.864
LLR_NPL (%)	58.11	55.52	88.26	39.92	14.718
NPL_GL LLR_NPL (%)*	2.95	2.17	10.39	0.268	2.506
GLOBAL	0.167	0.000	1.000	0.000	0.373
SOVEREIGN	0.167	0.000	1.000	0.000	0.373
Post_LTRO	0.500	0.000	1.000	0.000	0.500
ROAA	0.002	0.002	0.009	-0.006	0.005
GIIPS	0.400	0.000	1.000	0.000	0.490
STR_REG	0.750	1.000	1.000	0.000	0.433

This table reports descriptive statistics of the explanatory variables of regression model (5). Variables are all winsorized at the 1st and 99th percentiles.

Table 7. Correlation Matrix

	LCR	*NSFR*	*TIER1*	*NPL_GL*	*LLR_NPL*	*NPL_GL* LLR_NPL*	*GLOBAL*	*SOVEREIGN*	*Post_LTRO*	*ROAA*	*GIIPS*	*STR_REG*
LCR	1.00											
NSFR	-0.115	1.00										
TIER1	-0.032	-0.295	1.00									
NPL_GL	-0.369	-0.178	0.174	1.00								
LLR_NPL	-0.042	0.271	-0.333	-0.291	1.00							
NPL_GL LLR_NPL*	-0.380	-0.155	0.123	0.952	-0.074	1.00						
GLOBAL	0.116	0.094	-0.399	-0.273	0.169	-0.259	1.00					
SOVEREIGN	0.093	0.084	-0.091	-0.067	-0.080	-0.085	-0.204	1.00				
Post_LTRO	-0.296	-0.227	0.689	0.480	-0.241	0.472	-0.449	-0.451	1.00			
ROAA	0.012	0.154	-0.241	-0.439	0.215	-0.428	0.194	-0.094	-0.355	1.00		
GIIPS	-0.410	0.277	-0.254	0.418	0.278	0.455	0.016	0.012	-0.042	0.042	1.00	
STR_REG	0.068	0.032	-0.206	-0.152	0.134	-0.137	0.261	-0.259	-0.190	0.201	0.012	1.00

This table reports correlation coefficient of the explanatory variables of the regression model (5). Variables are all winsorized at the 1st and 99th percentiles.

Table 8. Bank CDS market reaction to liquidity regulation announcements (Market Model)– All events

ALL EVENTS	(1) *CAS(0; 0)*	(2) *CAS(0; +1)*	(3) *CAS(-1; +1)*	(4) *CAS(-2; +2)*
LCR	-5.8344e-05	-7.3223e-05	-3.1661e-04***	-1.8783e-04*
	3.9726e-05	8.8086e-05	9.9745e-05	1.0670e-04
NSFR	-2.7839e-04***	-5.4141e-04***	-4.3054e-04**	-3.0019e-04
	9.5634e-05	1.8599e-04	1.8708e-04	2.7346e-04
TIER1	-1.7175e-03***	-4.2208e-03***	-3.2354e-03***	-3.5646e-03***
	4.7927e-04	6.6425e-04	9.4563e-04	8.7707e-04
NPL_GL	3.8032e-03**	6.8289e-03**	5.9791e-03*	6.1821e-03
	1.6800e-03	3.4065e-03	3.4772e-03	4.0770e-03
LLR_NPL	5.8128e-05	2.5226e-04	1.0005e-04	1.8216e-04
	1.7217e-04	3.1216e-04	3.6172e-04	4.7568e-04
*NPL_GL*LLR_NPL*	-5.2339e-05*	-1.1085e-04**	-1.0409e-04*	-9.1971e-05
	2.6647e-05	5.5539e-05	5.8453e-05	7.4733e-05
GLOBAL	7.6994e-03	5.5345e-02***	7.1161e-02***	1.2854e-01***
	6.7643e-03	1.3221e-02	1.2431e-02	1.6125e-02
SOVEREIGN	3.8859e-05	5.9343e-03	9.5106e-03	3.5058e-02***
	4.4782e-03	6.6766e-03	6.7484e-03	1.2030e-02
Post_LTRO	1.2118e-03	2.7828e-02***	3.8489e-02***	7.6285e-02***
	4.6057e-03	7.3483e-03	8.6646e-03	1.1513e-02
ROAA	5.1910e-01	1.8410e+00***	1.4579e+00*	3.0963e+00**
	4.4269e-01	6.0390e-01	7.6708e-01	1.2581e+00
GIIPS	-3.4802e-03	-1.2148e-02***	-1.0550e-02**	-2.0925e-02**
	2.8578e-03	4.6268e-03	4.6533e-03	9.6593e-03
STR_REG	1.8021e-02***	3.2045e-02***	3.0997e-02***	4.1910e-02***
	4.5683e-03	7.5187e-03	8.4883e-03	1.0703e-02
Constant	9.7611e-03	-1.3888e-03	-8.1297e-03	-5.4984e-02
	1.7059e-02	2.5845e-02	2.8467e-02	3.7186e-02
Observations	501	501	501	501
Adjusted R-squared	0.121	0.199	0.194	0.264

This table reports the results from the regression analysis for 12 events concerning liquidity regulation. The estimation is an OLS regression with clustered standard errors at the country level. CASs are estimated adopting a standard Market Model (MacKinlay, 1997). *TIER1* is the ratio between primary regulatory capital and risk weighted assets. LCR is the ratio of liquid assets to deposits and short-term funding; *NSFR* is the ratio of equity and long-term funding in total assets; *NPL_GL* is the ratio between impaired loans and gross loans; *LLR_NPL* is the ratio between loan loss reserves and non-performing loans; GLOBAL is a dummy variable for the global crisis period (15/09/2008-01/05/2010); *SOVEREIGN* is a dummy variable for the sovereign debt crisis period (02/05/2010-21/12/2011); *Post_LTRO* is a dummy variable for the period following the two LTROs by the ECB (after 22/12/2011); *ROAA* is the return on average assets; *GIIPS* is a dummy variable for banks located in Greece, Ireland, Italy, Portugal and Spain; *STR_REG* is a dummy variable indicating the events expected to increase the regulation on liquidity. Regressors are all winsorized at the 1st and 99th percentiles. Standard errors clustered at the country level are reported in parenthesis. ***, **, and ∗ indicate statistical significance at 1%, 5%, and 10%.

Table 9. Bank CDS market reaction to liquidity regulation announcements (Market Model)– Liquidity only events

LIQUIDITY ONLY EVENTS	(1) *CAS(0; 0)*	(2) *CAS(0; +1)*	(3) *CAS(-1; +1)*	(4) *CAS(-2; +2)*
LCR	-7.7896e-05	4.5126e-02	-4.5717e-04***	-5.2124e-04***
	5.4963e-05	1.3470e-04	1.5121e-04	1.9551e-04
NSFR	-2.8570e-04**	-3.5917e-04	-1.0949e-04	-3.1883e-04
	1.2510e-04	3.8328e-04	3.6870e-04	2.4723e-04
TIER1	-2.4762e-03***	-5.7013e-03***	-4.4907e-03*	-2.3924e-03
	6.6025e-04	1.7280e-03	2.3998e-03	1.9709e-03
NPL_GL	3.6343e-03**	7.5530e-03*	6.7047e-03	2.1849e-03
	1.6867e-03	4.2362e-03	5.3873e-03	4.3743e-03
LLR_NPL	4.3377e-05	2.0401e-04	-6.1228e-05	-2.3836e-04
	1.9759e-04	3.6411e-04	4.6339e-04	4.5473e-04
*NPL_GL*LLR_NPL*	-5.5377e-05**	-1.3328e-04*	-1.2634e-04	-3.1702e-05
	2.6913e-05	7.1013e-05	9.4131e-05	7.9545e-05
GLOBAL	2.6240e-02**	9.8679e-02***	1.0656e-01***	1.9907e-01***
	1.0762e-02	2.6057e-02	2.8458e-02	3.2023e-02
SOVEREIGN	-	-	-	-
	-	-	-	-
Post_LTRO	3.0581e-03	1.4569e-02	2.5258e-02	3.9916e-02**
	6.3524e-03	1.3344e-02	1.8360e-02	1.9080e-02
ROAA	5.4275e-01	1.1345e+00	4.3765e-01	1.8899e+00
	6.8299e-01	9.2003e-01	1.1572e+00	1.5976e+00
GIIPS	-8.3727e-03**	-2.6184e-02***	-2.4249e-02***	-3.6615e-02***
	4.1367e-03	7.1352e-03	8.1317e-03	1.0597e-02
STR_REG	2.0858e-02***	1.1270e-02	1.5667e-02	1.4077e-02
	7.1089e-03	1.2640e-02	1.2063e-02	1.4472e-02
Constant	1.7556e-02	4.5126e-02	3.9155e-02	2.1774e-02
	1.9415e-02	2.9254e-02	3.3223e-02	3.1459e-02
Observations	285	285	285	285
Adjusted R-squared	0.227	0.327	0.256	0.411

This table reports the results from the regression analysis for the subsample of events exclusively related to liquidity (Event 1, 2, 3, 7, 8, 10, 2). The estimation is an OLS regression with clustered standard errors at the country level. CASs are estimated adopting a standard market model (MacKinlay, 1997). *TIER1* is the ratio between primary regulatory capital and risk weighted assets. LCR is the ratio of liquid assets to deposits and short-term funding; *NSFR* is the ratio of equity and long-term funding in total assets; *NPL_GL* is the ratio between impaired loans and gross loans; *LLR_NPL* is the ratio between loan loss reserves and non-performing loans; *GLOBAL* is a dummy variable for the global crisis period (15/09/2008-01/05/2010); *SOVEREIGN* is a dummy variable for the sovereign debt crisis period (02/05/2010-21/12/2011); *Post_LTRO* is a dummy variable for the period following the two LTROs by the ECB (after 22/12/2011); *ROAA* is the return on average assets; *GIIPS* is a dummy variable for banks located in Greece, Ireland, Italy, Portugal and Spain; *STR_REG* is a dummy variable indicating the events expected to increase the regulation on liquidity. Regressors are all winsorized at the 1st and 99th percentiles. Standard errors clustered at the country level are reported in parenthesis. ***, **, and * indicate statistical significance at 1%, 5%, and 10%.

Table 10. CDS market reaction to each event (Factor Model)

WHOLE SAMPLE	*CAAR*	*(Pseudo) Median*	*p-Value BMP test*	*p-Value Wilcoxon sign-rank test*	*p-Value G-rank test*	*No. of Obs*
Event1						
(0, +3)	-0.007955625	-0.00926395	0.751	0.469	0.873	43
(0, +2)	-0.01952345	-0.02622031	0.116	0.005***	0.410	43
(0, +1)	0.015668003	0.008026024	0.043**	0.079*	0.452	43
(0, 0)	0.013535611	0.014253196	0.000***	0.001***	0.166	43
(-1; 0)	-0.009417192	-0.010011764	0.077*	0.209	0.788	43
(-1, +1)	-0.007284801	-0.014704813	0.298	0.067*	0.637	43
(-2, +2)	-0.053039385	-0.060088521	0.000***	0.000***	0.098*	43
(-1, +3)	-0.030908429	-0.033074099	0.079*	0.003***	0.395	43
Event2						
(0, +3)	0.01393948	0.00850010	0.046**	0.183	0.735	44
(0, +2)	-0.001011062	-0.00349092	0.320	0.476	0.726	44
(0, +1)	-0.011732288	-0.01239489	0.001***	0.001***	0.298	44
(0, 0)	0.008593343	0.007726101	0.003***	0.001***	0.338	44
(-1, 0)	0.005311901	0.006884725	0.354	0.083**	0.605	44
(-1, +1)	-0.01501373	-0.013398718	0.003***	0.005***	0.447	44
(-2, +2)	-0.003952126	-0.005668836	0.170	0.316	0.647	44
(-1, +3)	0.010658039	0.006070828	0.193	0.369	0.835	44
Event3						
(0, +3)	0.1073198	0.121608	0.000***	0.000***	0.222	44
(0, +2)	0.161101	0.1580728	0.000***	0.000***	0.071*	44
(0, +1)	0.096021815	0.101024459	0.000***	0.000***	0.099*	44
(0, 0)	0.043932574	0.041755111	0.000***	0.000***	0.085*	44
(-1, 0)	0.040442819	0.037018055	0.000***	0.000***	0.282	44
(-1, +1)	0.092532059	0.096540133	0.000***	0.000***	0.165	45
(-2, +2)	0.166339596	0.157011286	0.000***	0.000***	0.090*	44
(-1, +3)	0.10426341	0.118427728	0.000***	0.000***	0.273	44
Event4						
(0, +3)	0.02662386	0.02474804	0.000***	0.000***	0.046**	47
(0, +2)	0.02121183	0.02053613	0.000***	0.000***	0.064*	47
(0, +1)	0.017416532	0.014901445	0.000***	0.000***	0.070*	47
(0, 0)	0.002073814	-0.002061945	0.620	0.086*	0.625	47
(-1, 0)	0.01021979	0.002914538	0.048**	0.043**	0.769	47
(-1, +1)	0.025562507	0.020083612	0.000***	0.000***	0.070*	47
(-2, +2)	0.020984947	0.017341781	0.000***	0.000***	0.152	47

(-1, +3)	0.034769839	0.030690401	0.000***	0.000***	0.040**	47
Event5						
(0, +3)	-0.06566583	-0.06894547	0.000***	0.000***	0.044**	47
(0, +2)	-0.06687071	-0.06968607	0.000***	0.000***	0.045**	47
(0, +1)	-0.065617434	-0.066978132	0.000***	0.000***	0.047**	47
(0, 0)	-0.009750127	-0.010459518	0.001***	0.001***	0.369	47
(-1, 0)	-0.011653053	-0.013817249	0.003***	0.001***	0.311	47
(-1, +1)	-0.06752036	-0.06851872	0.000***	0.000***	0.041**	47
(-2, +2)	-0.078730665	-0.082370396	0.000***	0.000***	0.038**	47
(-1, +3)	-0.067568756	-0.072023028	0.000***	0.000***	0.046**	47
Event6						
(0, +3)	0.0484992	0.0463966	0.000***	0.000***	0.070*	47
(0, +2)	0.03582404	0.03380778	0.000***	0.000***	0.113	47
(0, +1)	0.028079223	0.022992708	0.000***	0.000***	0.192	47
(0, 0)	0.01145703	0.00616314	0.019**	0.020**	0.639	47
(-1, 0)	-0.00148841	-0.007049649	0.321	0.094*	0.595	47
(-1, +1)	0.015133783	0.009614019	0.015**	0.015**	0.597	47
(-2, +2)	0.015878462	0.013889231	0.020**	0.015**	0.536	47
(-1, +3)	0.035553759	0.03423154	0.000***	0.000***	0.131	47
Event7						
(0, +3)	-0.02252314	-0.01477398	0.028**	0.052*	0.538	47
(0, +2)	-0.02193604	-0.01597063	0.006***	0.015**	0.413	47
(0, +1)	-0.021544339	-0.017827856	0.001***	0.002***	0.329	47
(0, 0)	-0.014560635	-0.011509028	0.001***	0.002***	0.316	47
(-1, 0)	-0.017115103	-0.014776173	0.000***	0.000***	0.200	47
(-1, +1)	-0.024098807	-0.021952723	0.000***	0.000***	0.207	47
(-2, +2)	-0.019466994	-0.012762144	0.087*	0.109	0.611	47
(-1, +3)	-0.025077604	-0.020178145	0.004***	0.009***	0.387	47
Event8						
(0, +3)	-0.01560179	-0.01616338	0.001***	0.000***	0.294	49
(0, +2)	-0.01278211	-0.01282794	0.001***	0.000***	0.271	49
(0, +1)	-0.006960535	-0.006494897	0.053*	0.022**	0.539	49
(0, 0)	-0.002749722	-0.003787357	0.097*	0.025**	0.478	49
(-1, 0)	-0.002541881	-0.001545624	0.424	0.541	0.938	49
(-1, +1)	-0.006752694	-0.004790032	0.172	0.178	0.753	49
(-2, +2)	-0.008726775	-0.007044902	0.069*	0.089*	0.649	49
(-1, +3)	-0.015393952	-0.014146483	0.011**	0.009***	0.465	49
Event9						
(0, +3)	0.005948914	0.006163691	0.044**	0.000***	0.441	48

(0, +2)	0.01004998	0.01154118	0.002***	0.000***	0.228	48
(0, +1)	0.012124131	0.013065315	0.000***	0.000***	0.114	48
(0, 0)	0.004455991	0.004489807	0.008***	0.001***	0.391	48
(-1, 0)	0.009847104	0.01342367	0.028**	0.000***	0.322	48
(-1, +1)	0.017515244	0.020965724	0.001***	0.000***	0.186	48
(-2, +2)	0.009515096	0.015509119	0.125	0.005***	0.510	48
(-1, +3)	0.011340026	0.014499099	0.034**	0.000***	0.381	48
Event10						
(0, +3)	0.004241473	0.000652322	0.476	0.858	0.909	45
(0, +2)	0.001542321	-0.001794173	0.238	0.687	0.956	45
(0, +1)	0.01035577	0.006299396	0.415	0.046*	0.643	45
(0, 0)	0.02031283	0.015047519	0.012**	0.000***	0.215	45
(-1, 0)	0.03620994	0.030347656	0.000***	0.000***	0.126	45
(-1, +1)	0.02625288	0.021111642	0.002***	0.000***	0.319	45
(-2, +2)	0.02277107	0.019363373	0.007***	0.003***	0.406	45
(-1, +3)	0.02013858	0.016240338	0.040**	0.010**	0.526	45
Event11						
(0, +3)	0.03007008	0.007656314	0.225	0.238	0.697	45
(0, +2)	0.0405375	0.02555965	0.002***	0.000***	0.253	45
(0, +1)	0.02620798	0.015840057	0.002***	0.001***	0.396	45
(0, 0)	0.01772403	0.009282026	0.010**	0.004***	0.497	45
(-1, 0)	0.00887868	-0.001734496	0.771	0.696	0.969	45
(-1, +1)	0.01736263	0.005297978	0.166	0.287	0.727	45
(-2, +2)	0.0436291	0.029663363	0.002***	0.000***	0.325	45
(-1, +3)	0.02122473	-0.003202693	0.828	0.679	0.932	45
Event12						
(0, +3)	-0.02115577	-0.0219584	0.000***	0.001***	0.373	45
(0, +2)	-0.02626573	-0.02634109	0.000***	0.000***	0.244	45
(0, +1)	-0.03108875	-0.033704378	0.000***	0.000***	0.066*	45
(0, 0)	0.009750231	0.001968318	0.376	0.576	0.791	45
(-1, 0)	0.004625008	-0.003185215	0.787	0.568	0.938	45
(-1, +1)	-0.03621397	-0.040143514	0.000***	0.000***	0.151	45
(-2, +2)	-0.01167597	-0.011559641	0.009***	0.071*	0.739	45
(-1, +3)	-0.02628099	-0.028814769	0.000***	0.000***	0.278	45

This table displays the results of the event study over various event windows for each of the 12 announcements by the BCBS concerning liquidity regulation. CASs are estimated adopting a factor model. The statistical significance of cumulated average abnormal spread changes (CAAS) is tested using the Boehmer et al. (1991) test, the Wilcoxon signed-rank (1945) test and the generalized rank test (Kolari and Phynnonen, 2011). Under the null hypothesis of the test, the CAAS change equals zero, whereas under the alternative hypothesis the average diverges from zero. ***,**,* denote that estimates are statistically significant at the 1, 5 and 10% levels.

Table 11. Aggregated CDS market reaction (Factor Model)

ALL EVENTS	*CAAS*	*t-test*	*Median*	*p-Value Wilcoxon sign-rank test*
(-2, +2)	0.02340762	0.172	0.01651678	0.151
(0, 0)	0.01204038	0.006***	0.0111289	0.005***
(-1, +1)	0.01547355	0.169	0.00961706	0.203
LIQUIDITY ONLY EVENTS				
(-2, +2)	0.01874049	0.503	0.00545882	0.812
(0, 0)	0.01541936	0.030**	0.01379187	0.031**
(-1, +1)	0.01108836	0.511	0.00701328	0.812

This table displays the results of the event study over various event windows for announcements by the BCBS concerning liquidity regulation. CASs are estimated adopting a factor model. *ALL EVENTS* denotes all 12 announcements concerning liquidity regulation. *LIQUIDITY ONLY EVENTS* denotes Event 1, 2, 3, 7, 8, 10, 12. The statistical significance of cumulated average abnormal spread changes (CAAS) is tested using the standard t-test and the Wilcoxon signed-rank (1945) test. Under the null hypothesis of the test, the CAAS change equals zero, whereas under the alternative hypothesis the average diverges from zero. ***,**,* denote that estimates are statistically significant at the 1, 5 and 10% levels.

Table 12. Bank CDS market reaction to liquidity regulation announcements (Factor Model)– All events

ALL EVENTS	(1) *CAS(0; 0)*	(2) *CAS(0; +1)*	(3) *CAS(-1; +1)*	(4) *CAS(-2; +2)*
TIER1	-1.6617e-03***	-3.8478e-03***	-2.7992e-03**	-3.2360e-03***
	5.3942e-04	9.7569e-04	1.2464e-03	1.0845e-03
LCR	-5.2531e-05	-8.2824e-05	-3.0696e-04***	-1.6803e-04
	4.7886e-05	1.0633e-04	1.0328e-04	1.1058e-04
NSFR	-2.7495e-04***	-6.0762e-04***	-3.3636e-04**	-2.4559e-04
	7.5077e-05	1.8258e-04	1.4198e-04	2.8182e-04
NPL_GL	4.2006e-03**	5.9133e-03*	4.8576e-03	5.3445e-03
	1.6604e-03	3.1400e-03	3.3080e-03	3.8551e-03
LLR_NPL	8.9107e-05	1.0289e-04	-4.2541e-05	4.8396e-05
	1.5650e-04	2.2830e-04	2.9429e-04	4.6458e-04
*NPL_GL*LLR_NPL*	-5.6597e-05**	-9.3225e-05*	-8.0228e-05	-7.3830e-05
	2.7766e-05	5.2859e-05	5.6216e-05	7.3855e-05
GLOBAL	1.1689e-02*	5.7070e-02	6.9034e-02***	1.2324e-01***
	6.9436e-03	1.2996e-02	1.1937e-02	1.6801e-02
SOVEREIGN	5.6891e-04	5.3546e-03	3.4524e-03	3.1054e-02**
	4.8831e-03	6.8673e-03	6.8821e-03	1.2732e-02
Post_LTRO	9.3330e-04	2.3864e-02***	2.7434e-02***	6.8773e-02***
	5.6358e-03	8.4245e-03	1.0078e-02	1.4028e-02
ROAA	5.3360e-01	1.7783e+00***	1.4408e+00**	3.1460e+00***
	3.5944e-01	5.1570e-01	7.2059e-01	1.2108e+00
GIIPS	-4.4505e-03	-9.1901e-03*	-9.2110e-03*	-1.9064e-02*
	2.8390e-03	5.1016e-03	5.0707e-03	9.9291e-03
STR_REG	1.6905e-02***	2.9751e-02***	2.6632e-02***	3.7621e-02***
	4.9135e-03	7.8600e-03	8.7529e-03	1.0438e-02
Constant	8.2715e-03	8.6175e-03	5.6764e-03	-4.2950e-02
	1.6281e-02	2.0437e-02	2.3238e-02	3.4058e-02
Observations	501	501	501	501
Adjusted R-squared	0.122	0.197	0.185	0.243

This table reports the results from the regression analysis for 12 events concerning liquidity regulation. The estimation is an OLS regression with clustered standard errors at the country level. CASs are estimated adopting a factor model. *TIER1* is the ratio between primary regulatory capital and risk weighted assets. LCR is the ratio of liquid assets to deposits and short-term funding; *NSFR* is the ratio of equity and long-term funding in total assets; *NPL_GL* is the ratio between impaired loans and gross loans; *LLR_NPL* is the ratio between loan loss reserves and non-performing loans; GLOBAL is a dummy variable for the global crisis period (15/09/2008-01/05/2010); *SOVEREIGN* is a dummy variable for the sovereign debt crisis period (02/05/2010-21/12/2011); *Post_LTRO* is a dummy variable for the period following the two LTROs by the ECB (after 22/12/2011); *ROAA* is the return on average assets; *GIIPS* is a dummy variable for banks located in Greece, Ireland, Italy, Portugal and Spain; *STR_REG* is a dummy variable indicating the events expected to increase the regulation on liquidity. Regressors are all winsorized at the 1st and 99th percentiles. Standard errors clustered at the country level are reported in parenthesis. ***, **, and * indicate statistical significance at 1%, 5%, and 10%.

Table 13. Table 10. Bank CDS market reaction to liquidity regulation announcements (Factor Model)– Liquidity only events

LIQUIDITY ONLY EVENTS	(1) *CAS(0; 0)*	(2) *CAS(0; +1)*	(3) *CAS(-1; +1)*	(4) *CAS(-2; +2)*
TIER1	-2.2003e-03***	-5.2555e-03**	-3.8792e-03	-1.5669e-03
	7.4532e-04	2.0593e-03	2.7792e-03	2.1927e-03
LCR	-7.5402e-05	-1.6685e-04	-4.5442e-04***	-5.1185e-04**
	6.9087e-05	1.6140e-04	1.7119e-04	2.1244e-04
NSFR	-2.7367e-04**	-5.5443e-04	-9.5467e-05	-2.2776e-04
	1.1787e-04	3.4747e-04	2.8819e-04	2.1049e-04
NPL_GL	4.1083e-03**	6.2177e-03	4.9977e-03	1.4008e-03
	1.8480e-03	4.0260e-03	5.2884e-03	4.3197e-03
LLR_NPL	5.6852e-05	-4.0488e-05	-3.0424e-04	-4.0828e-04
	1.8304e-04	2.8800e-04	4.2265e-04	4.7407e-04
*NPL_GL*LLR_NPL*	-6.1209e-05**	-1.1109e-04	-9.5739e-05	-1.0163e-05
	3.0501e-05	6.8744e-05	9.3088e-05	8.1087e-05
GLOBAL	3.3103e-02***	9.6262e-02***	1.0228e-01***	1.9298e-01***
	1.1644e-02	2.5473e-02	2.7989e-02	3.2618e-02
SOVEREIGN	-	-	-	-
	-	-	-	-
Post_LTRO	3.5567e-04	1.0479e-02	1.2635e-02	2.8712e-02
	7.4837e-03	1.5353e-02	2.0296e-02	2.0619e-02
ROAA	3.8393e-01	1.1834e+00	2.3576e-01	1.8674e+00
	6.3190e-01	8.7675e-01	1.1508e+00	1.5598e+00
GIIPS	-8.5116e-03**	-1.8718e-02***	1.9219e-02***	-3.6093e-02***
	3.8590e-03	6.2434e-03	7.3142e-03	1.0834e-02
STR_REG	2.1003e-02***	1.0311e-02	1.5471e-02	1.2482e-02
	7.7691e-03	1.3353e-02	1.2811e-02	1.4912e-02
Constant	1.4945e-02	6.0337e-02**	5.6381e-02	2.9618e-02
	1.8658e-02	2.4036e-02	2.9508e-02	3.1303e-02
Observations	285	285	285	285
Adjusted R-squared	0.256	0.306	0.242	0.391

This table reports the results from the regression analysis for 12 events concerning liquidity regulation. The estimation is an OLS regression with clustered standard errors at the country level. CASs are estimated adopting a factor model. *TIER1* is the ratio between primary regulatory capital and risk weighted assets. LCR is the ratio of liquid assets to deposits and short-term funding; *NSFR* is the ratio of equity and long-term funding in total assets; *NPL_GL* is the ratio between impaired loans and gross loans; *LLR_NPL* is the ratio between loan loss reserves and non-performing loans; GLOBAL is a dummy variable for the global crisis period (15/09/2008-01/05/2010); *SOVEREIGN* is a dummy variable for the sovereign debt crisis period (02/05/2010-21/12/2011); *Post_LTRO* is a dummy variable for the period following the two LTROs by the ECB (after 22/12/2011); *ROAA* is the return on average assets; *GIIPS* is a dummy variable for banks located in Greece, Ireland, Italy, Portugal and Spain; *STR_REG* is a dummy variable indicating the events expected to increase the regulation on liquidity. Regressors are all winsorized at the 1st and 99th percentiles. Standard errors clustered at the country level are reported in parenthesis. ***, **, and * indicate statistical significance at 1%, 5%, and 10%.