Market reaction to bank liquidity regulation

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Abstract

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JEL Classification: *G21, G28*

Keywords: *liquidity regulation; market reaction; event study, Basel III*

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1. Introduction

We examine banks' share price reactions to a series of events associated with the introduction of global liquidity regulation as part of Basel III, the comprehensive regulatory package that the Basel Committee for Banking Supervision[1] (BCBS) developed in response to the recent financial crisis which will be adopted between 2015 and 2018.

Unlike capital regulation which has been at the heart of banking regulation for decades, regulation of liquidity was not a major concern of policy makers prior to the crisis. With the exception of the Netherlands, Switzerland, and the UK, European countries did not have had legislation in place that focused specifically on liquidity. Basel III constitutes a fundamental change in that respect because it introduces global standards for bank liquidity to address the previously neglected role of liquidity risk (Brunnermeier (2009); Calomiris et al. (2012)). The new global liquidity standards aim to improve liquidity management and banks' ability to withstand liquidity shocks. To do so, they address different aspects of liquidity risk, and require banks to switch to higher quality and more liquid assets, and to longer term liabilities. Importantly, the focus on liquidity risk in Basel III reflects that a quickly evolving literature established the importance of bank funding models for risk (Le Leslè (2012)). Moreover, the Liikanen report[2] documented the influence of liquidity and funding structures on crisis propagation mechanisms. In the midst of the crisis, several banks, despite adequate capital levels, faced substantial liquidity outflows and shortages owing to their overreliance on volatile funding sources, improper asset-liability management, and off-balance-sheet positions which gave rise to liquidity risk (Strahan (2012); ECB (2013)). As a consequence of the turmoil, banks hoarded liquidity (Acharya and Merrouche (2013)), and curtailed liquidity provision to other intermediaries and to the real economy (Cornett et al. (2011)). In turn, this contributed to systemic risk, resulting in unprecedented provision of central bank liquidity support and government guarantees for bank debt (ECB (2010)).

[1] The Basel Committee on Banking Supervision is a committee of banking supervisory authorities established by the central bank Governors of the Group of Ten countries in 1975. It consists of senior representatives of bank supervisory authorities and central banks from almost thirty countries worldwide. It meets at the Bank for International Settlements (BIS) in Basel, Switzerland, where its permanent Secretariat is located.

[2] High-level Expert Group on reforming the structure of the EU banking sector, Final Report, 2 October 2012.

This fundamental overhaul of regulation generated vocal concerns in the banking community. Bankers expressed disquiet about the potential costs arising from complying with new regulations which would reduce profitability. Unsurprisingly, the process leading to the new framework involved intensive discussions and lobbying by banks. During a five year period prior to the announcement of the final version of Basel III, several successive amendments were made to the original proposal which resulted in a weakening of the guidelines that were initially put forward.

In this paper, we exploit the gradual nature of official announcements by the BCBS regarding the introduction of global liquidity standards to present a positive analysis of liquidity regulation. Specifically, we analyse if market participants view the introduction of liquidity regulation as being conducive to the public interest of safeguarding the banking system by conferring net benefits on consumers at the expense of the regulated banks, or, alternatively, if markets believe that banks capture regulators and ultimately reap the net benefits of changes in regulation relating to bank liquidity. Since these competing hypotheses entail predictions about the value of the banking firms, we use event study methodology, a simple and parsimonious, yet powerful way to establish immediate market reactions to policy announcements. Importantly, the regulation is yet to be implemented. An examination of the long-term impact of this regulation which contains two new measures of bank liquidity, the liquidity coverage ratio (LCR) and the Net stable funding ratio (NSFR), on the profitability of European banks is infeasible at present because the two ratios are neither historically available nor can they be computed with the current level of disclosure in bank balance sheets. Thus, only a combination of market data with accounting information can be used to shed light on how bank profits will be affected.

Our analysis proceeds in two steps. First, we examine abnormal returns (ARs) over one-day and cumulative abnormal returns (CARs) over three-day event windows for different groups of banks before the actual implementation to estimate market reactions to seven critical announcements related to proposals, amendments, and revisions of rules concerning bank liquidity regulation for the period February 2008 - January 2013. In addition, we also measure the cumulative market reaction by

calculating CARs for all events, and we calculate CARs over event dates which entail exclusively measures of bank liquidity, excluding those involving regulations on other issues (for instance capital adequacy) to avoid that the share price reactions refer to confounding events. For this research, we focus on European banks. Their funding metrics compare unfavourably with international peers, making them less prepared than US and Japanese banks to meet the requirements introduced by Basel III (EBA (2012)). Moreover, European banks are subject to different national liquidity regimes, making the convergence process a desirable, though challenging, objective to level the playing field.

In the second step, we analyze several plausible factors relating to bank location which correlate with the macroeconomic, regulatory, and institutional environment that may either amplify or mitigate share price reactions to liquidity. A final set of extensions focuses subsequently on bank-specific characteristics such as liquidity, capitalization, business orientation, and funding structure. The intuition is to establish whether these factors cause heterogeneous responses to the new regulation. To this end, we group bank stocks into portfolios based on characteristics that are likely to affect wealth transfers across different groups (Schwert (1981), Berkman et al. (2011)): Country specificities and bank-specific characteristics are likely to play a role because they introduce heterogeneity into the sample population. We expect banks to react differently to the new regulatory framework according to these characteristics.

Why should bank stock prices react to the new liquidity regulation? A widely held view in economics suggests that regulatory reforms provide opportunities to extract wealth from competitors (Stigler (1971)). Importantly, seminal work by Schwert (1981) emphasizes that investors seek regulation that increases security prices, and they avoid regulation which decreases security prices. In other words, changes in regulation can lead investors to sell shares of companies for which such changes are detrimental, and to buy shares of companies that will benefit from the change. From an investor's perspective, any decision to buy bank equity depends on an assessment that the bank is safe and sound, and yields the envisaged return. Expected returns therefore play a fundamental role in affecting investor decisions. This issue matters because changes in regulation may cause investors to revise beliefs about future expected returns of bank shares and affect their appetite for bank equity. In

the context of banking, the worst case suggests that investors' reluctance to provide funds to banks may have systemic repercussions.

Clearly, the concerns raised by the banking community indicate that it is plausible to assume that regulation of liquidity may affect bank profitability, a consequence that will cause discontent to bank shareholders. Furthermore, such regulation may also give rise to competitive distortions and transfers of equity capital to banks whose business models shield them from most of the negative consequences, suggesting not all banks will respond equally to these reforms. Finally, in the absence of any comprehensive prior set of rules governing bank liquidity, it is possible that the new regulation causes some unintended effects. Not only does the Basel Committee lack experience with regulating bank liquidity but, more importantly, it also lacks access to high-quality data in this regard (Caruana (2012)). Therefore, our study can shed new light on the policy debate with regard to the credibility and the effects, intended and unintended, which arise from regulating bank liquidity.

The use of event study methodology is not without challenges. First, the intensive public debate about changes in banking regulation during and after the recent crisis likely made investors anticipate tighter regulation, suggesting that the market may have expected the changes in regulation prior to the actual announcements of the BCBS. We deal with this problem by using several different screening windows for the time period we classify as the relevant one for the press releases relating to changes in liquidity regulation. Second, liquidity regulation is only one component of a massive overhaul of Basel III. In a number of occasions, announcements relating to liquidity regulation coincide with announcements relating to capital regulation or other components of Basel III. Establishing a causal effect of market participants' reactions from liquidity regulation requires identifying such confounding news. We therefore present tests that disentangle press releases which also contain information extending to other components of Basel III. Moreover, by conducting tests on CAR on different groups of banks conditional on certain bank-specific characteristics, we also address concerns related to possible confounding events (Binder (1985); Smith et al. (1986)). Third, we confront a series of econometric challenges. We adjust the tests following previous work by James (1983), Binder (1985), Smith et al. (1986), and Sefcik and Thompson (1986) and employ portfolio

time-series methodology to allow for cross-sectional heteroskedasticity and cross-security dependence resulting from using the same sets of event dates and event windows across sample banks. We adjust for first-order autocorrelation using the Prais-Winsten method (Allen and Wilhelm (1988)), and we also allow for day-of-the-week effects. Finally, in additional robustness tests, we also deal with possible changes in volatility during the estimation window using a GARCH (1,1) model, and we address possible data-mining concerns by comparing the bank returns around the events with those of a randomized sample of bank returns.

We obtain the following key results. Stock markets react, on average, negatively to the introduction of liquidity regulation. Shareholders revise their beliefs about future bank earnings, and achieving financial stability conflicts with the shareholder objective of profit maximization. The aggregate effect on shareholders of EU banks based on the event-day ARs for all seven events of 1.9% is equivalent to an average decrease in market capitalization of around 233 million Euros. However, there are several factors that amplify or mitigate these market reactions. First, we find that bank location matters. While banks in Germany experience negative CARs between -6.58 and 9.55%, the magnitudes are smaller for banks in the European periphery such as Greece, Italy, Ireland, Portugal, and Spain (henceforth referred to as GIIPS countries) display CARs between -8.23 and 4.54% (depending on the type of proxy we use for the market portfolio and the model used to estimate expected, i.e., normal, returns). While heterogeneous, these findings indicate that investors, overall, view liquidity regulation as a potential problem. However, our results challenge the view according to which banks located in distressed economies, should respond more negatively to the new liquidity framework than banks in countries with better fiscal positions. Second, we show that banks with higher liquidity ratios, defined as liquid assets to customer and short-term funds (our proxy of the Liquidity Coverage Ratio), display higher CARs than less liquid banks. Interestingly, we also find that banks with a higher Tier 1 capital ratio experience lower CARs, relative to less well-capitalized banks. Business models and funding structure also matter. We document lower CARs for banks with greater off-balance sheet exposure, pointing towards potentially unintended effects from the new regulation. This result casts doubts on the sustainability of such off-balance sheet activities, and

suggests that imposing requirements on lines of credit (a relevant component of off-balance sheet exposure for commercial banks) restrains firms from new investments. This phenomenon may amplify the real consequences of financial shocks in times of tight liquidity. Banks with more stable sources of funding experience negative price reactions.

These results are important. On one hand, markets expect that imposing liquidity requirements on banks reduces their profitability. To the extent to which banks that have large off-balance sheet activities experience difficulties refinancing, the new regulation has potential to adversely affect their ability to provide credit to the real sector. On the other hand, illiquidity spill-overs could result in full-blown banking crises with potentially even worse consequences for the real economy. While the case for an international and coordinated framework for liquidity regulation therefore appears essential to reduce the risk of cross-border illiquidity spill-overs, it remains an empirical question that is beyond the scope of our study to establish whether the cost imposed by liquidity regulation are higher than the potential benefits arising from the reduction of systemic risk. Moreover, it is hard to ascertain *a priori* the extent to which the convergence to common liquidity rules bears heterogeneous effects on national banking systems.

Our research is related to three strands of literature that focus on the role of government intervention and regulation in the banking sector. Primarily, our work builds on previous studies about the shareholder wealth effects arising from changes in bank regulation. Dann and James (1982) examine how shareholders react to the announcement of the removal of interest rate ceilings, and Allen and Wilhelm (1988) show that the Depository Institutions Deregulation and Monetary Control Act in 1980 triggered considerable changes in the competitive environment in the banking industry. Wagster (1996) uses an event study to examine how the 1988 Basel Capital Accord affected international banks. The adoption of international accounting standards are subject of the work by Armstrong et al. (2010). They demonstrate that banks and non-banks companies in Europe display heterogeneous responses. Recent research by Veronesi and Zingales (2010), Bayazitova and Shivadasani (2012), and Norden et al. (2013) uses event study methodology to examine shareholder wealth effects of bank bailouts during the recent crisis. The former two report that recapitalizing

banks under the Troubled Asset Relief Program produces positive excess returns for bank shareholders, and Norden et al. (2013) show that corporate borrowers experience positive abnormal stock returns if their distressed bank received capital support. Moreover, our analysis also complements the extant literature on the effects of Basel III. These works mainly address the effect of new regulation on economic growth,[3] on the cost of lending, and the interaction between the lender of last resort and liquidity regulation (Santos and Elliot (2012); Cao and Illing (2011)). Finally, this research also speaks to the broader literature on banking regulation. Barth et al. (2004) examine how a large number of design features in bank regulation and supervision affect banking sector development, performance, and stability in a large cross-country study. A more narrow focus is presented by Demirgüç-Kunt et al. (2008). They examine compliance with Basel II core principles, and show that better compliance increases bank soundness. In contrast to these studies, we present the first empirical analysis of share price reactions to liquidity regulation in the banking industry.

We proceed as follows. Section 2 discusses the institutional background, and Section 3 introduces testable predictions on the impact of the new regulation. Section 4 describes our data, and the empirical strategy and the results are presented in Section 5. Section 6 concludes.

2. Institutional background

The agreement of the BCBS on a harmonized regulatory framework for bank liquidity was an involved process with considerable discussion. On 21 February 2008, the BCBS published a first document entitled *Liquidity Risk Management and Supervisory Challenges* as an initial response to the 2007-2009 financial crisis. This document summarises the key findings of a review undertaken by the Committee on national supervisory regimes and banks' practices to manage liquidity in times of difficulty. In light of poor liquidity risk management by many banks and the diversity of national liquidity regimes, the document illustrates possible actions to strengthen liquidity risk management and coordinate supervisory practices. On 17 June 2008, the BCBS proposed 17 *Principles for Sound*

[3] See the BCBS impact assessments (BIS (2010)). To the same purpose, impact studies have been conducted by the Financial Stability Board and the International Monetary Fund.

Liquidity Risk Management and Supervision, a fundamental review of a previous document on liquidity management[4] introducing criteria for funding structure and liquidity ratio standards. The Committee then issued the final version of *Principles* on 25 September 2008 after receiving comments from the banking industry. Most of these comments emphasised the need for a concerted approach to supervision as well as concerns about the cost of an inappropriate micro-regulation.[5] Next, the BCBS released the *International framework for liquidity risk measurement, standards and monitoring* on 17 December 2009. This framework aims to elevate the resilience of internationally active banks to adverse liquidity shocks and promote international harmonisation of liquidity risk supervision, and introduces global regulatory standards for liquidity risk supervision to achieve two objectives:

- To strengthen banks' ability to withstand adverse liquidity shocks over a short-term period, the BCBS developed the *Liquidity Coverage Ratio* (LCR). The standard requires banks to hold sufficient High Quality Liquid Assets (HQLA), such as cash or government bonds, to meet a severe cash outflow for at least 30 days. The standard will be introduced in 2015.
- To promote longer-term resilience, the BCBS proposed the Net Stable Funding Ratio (NSFR). The NSFR incentivizes the use of stable sources of funding by restraining short-term wholesale borrowing. It also requires banks to hold equity and liability financing expected to be reliable sources of funds over a one-year time horizon. The amount of stable funds required is conditional on banks' liquidity characteristics of assets on and off balance-sheet. The standard will be introduced in 2018.

Appendix 1 presents a more detailed description of the two requirements.

The initial reaction in the banking industry was very negative. Banks viewed the new regime as punitive.[6] In turn, the BCBS decided to gradually introduce the standards to avoid detrimental effects on bank lending that could impair the economic recovery. Another benefit of introducing liquidity regulation sequentially is that the BCBS is able to review the proposal on the basis of impact

[4] The *Sound Practices for Managing Liquidity in Banking Organisations* document, February 2000.
[5] See for example comments released on July 29, 2008 by the Institute of International Finance and available at http://www.bis.org/publ/bcbs138/cacomments.htm
[6] See, for example, Financial Times, December 17, 2009 ("Basel was Faulty").

assessments and comments from the banking community over a longer period of time.[7]

A first group of amendments was set out in the Annex to the BCBS press release on 26 July 2010. The goal of the revisions was "to achieve a calibration and definition that penalises imprudent liquidity profiles, while minimising system level distortions" (p. 5 of the Annex). In particular, the LCR was relaxed by widening the range of qualifying liquid assets, and the NSFR was modified to favor retail over wholesale banking, mainly by loosening requirements for customer deposits and residential mortgages. The announcement was also intended to provide transparency about the design of the reforms and reduce market uncertainty.

The final version of the liquidity standards was published on 16 December 2010. This document brought together revised proposals set out in the 2008 Liquidity Principles, the December 2009 Consultation Document, and the July 2010 Annex. While the BCBS considered publication of the detailed rules as a remarkable achievement to protect financial stability and promote economic growth, the document received harsh criticism from the banking industry (Accenture (2011), McKinsey & Company (2012), IIF (2012)). In particular, European banks which were in the midst of the Euro area sovereign debt crisis expressed reservations about the new regulations (van Rixtel and Gasperini (2013); Allen and Moessner (2013)).

In response to these objections and to take into account the on-going problems in the Eurozone the BCBS modified the short-term liquidity standard. The Committee announced the introduction of *Basel III: The Liquidity Coverage Ratio and liquidity risk monitoring tools* on 7 January 2013. The main changes to LCR entailed a wider set of HQLA and more lenient assumptions for the calculation of net cash outflows. The document also clarified the possibility for banks to fall below the minimum LCR requirement during periods of stress. Moreover, the BCBS decided to delay implementing the standards. We summarize the seven key events we examine in this research in the following timeline.

[7] See the press release "Consultative proposals to strengthen the resilience of the banking sector announced by the Basel Committee", 17 December 2009. See http://www.bis.org/press/p091217.htm

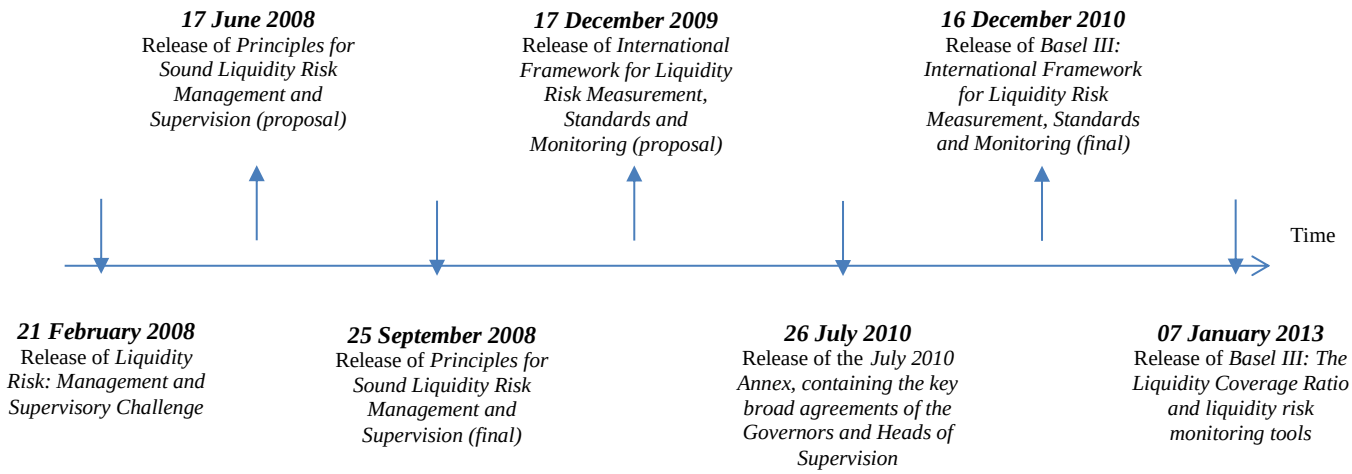

Table 1 presents an assessment of the impact of each event on the probability of stricter liquidity rules after each event, and Appendix 2 reports a detailed description of the BCBS events.

[TABLE 1: ASSESSMENT OF IMPACT OF EACH EVENT]

3. Testable predictions

This section develops empirical predictions for how bank share prices react to the new regulation. The fact that the regulatory process leading to the liquidity framework spanned over approximately five years, including revisions and relaxations of the original proposal, however complicates this task because the directions of the share price reactions to each one of the seven events is not clear *a priori*. To the extent that the regulation is believed to help stabilize banks without detrimental effects for profitability, bank shares should appreciate. Likewise, if markets assume that a common set of standards and coordinated supervision generate convergence benefits, bank shareholders should react positively to movement towards a global standard for liquidity regulation. In contrast, if investors perceive the new regulation as an unnecessary burden, and that the costs of convergence exceed the benefits, a negative price reaction is likely. The challenge then arises from the numerous revisions made over subsequent years. To the extent that investors believe the individual revisions relax the burden on the banks in terms of complying with the new regulation, share prices will produce positive abnormal returns. On the other hand, if market participants consider the revisions as further weighing

down on the banks' profits, share prices will display negative abnormal returns. The overall effect over the sample period on bank shareholder wealth is therefore difficult to establish. In addition to calculating the sum of the (cumulative) abnormal returns for all event dates, our empirical strategy therefore also presents (cumulative) abnormal returns for the individual event dates.

Moreover, there are reasons to believe that not all banks will be affected equally. The regulatory environment, determined by banks' location, is likely to affect share price reactions heterogeneously. Consequently, we develop first testable predictions with respect to the differential impact of the new liquidity regulation conditional on banks' location. Moreover, the fact that liquidity regulation targets primarily the liability side of banks' balance sheets, it is plausible to anticipate that manoeuvres to avoid reductions in profitability could vary across banks due to differences in the liquidity of banks' balance sheets, their business orientation, and due to the composition of the liability side in terms of the sources of funds. Such potential heterogeneities reinforce the need for empirical work to examine whether liquidity regulation triggers decreases or increases in bank shareholder wealth and which banks will benefit (or suffer) from these regulations.

3.1 Country characteristics

Country characteristics are also likely to mitigate or amplify share price reactions. Banks in countries located at the European periphery may respond differently to the new regulatory framework in comparison to those in countries located at the core.

Three phenomena play a role here. First, Le Leslé (2012) shows that interbank market conditions differ in that short-term funds are more expensive for banks from peripheral Europe relative to banks from countries at the core of Europe. As of 2012, the deposit rates in periphery countries were about 150 basis points higher for the former relative to the latter. Second, asset encumbrance is higher for banks from the periphery as these institutions are more reliant on ECB and national central bank funding.[8] High levels of asset encumbrance deter unsecured creditors and may lead to limited funding

[8] The term asset encumbrance refers to the usage of financial assets as collateral, for example on account of initial margin requirements of central and bilateral counterparties to cover derivatives exposures as well as to

options. Third, long-term funding markets became increasingly segmented at the national level during the Eurozone crisis (Allen and Moessner (2013)). For banks from peripheral countries, especially those more affected by the Euro crisis, raising deposits or long-term unsecured funds has become increasingly difficult during the crisis (van Rixtel and Gasperini (2013); BIS (2012)). The sharp downturns in these economies resulted in deteriorating macroeconomic conditions which makes it more difficult for banks to attract funding. Taken together, these arguments suggest that complying with the new liquidity requirements is likely to be more difficult and costly for banks located in the European periphery.

Another country-specific factor that may explain different reactions to the new regime is that some countries may already have had some form of liquidity regulation in place prior to the announcements by the BCBS. As mentioned above in Section 1, a key motivation behind the introduction of liquidity regulation by the BCBS was the promotion of a harmonized set of liquidity rules across countries, as liquidity regulation (unlike capital regulatory framework) was heterogeneous and fragmented across jurisdictions (G20 (2009)). The Netherlands, Switzerland, and the UK regulated liquidity prior to the introduction of Basel III.[9] Since banks in these countries were in a more comfortable position than banks located in other countries, we anticipate share price reactions to be less pronounced.

3.2 Bank characteristics: Liquidity and capitalization

The extent to which banks' liquid assets are financed by customer deposits and other sources of short-term funding is likely to influence the exposure to liquidity risk and funding shocks. More liquid assets may convey signals about bank solvency. Ratnovski (2013) predicts that these characteristics improve access to external funds, especially when liquidity conditions tighten. Similarly, Cornett et al.

raise funds in several manners (e.g. by issuing covered bonds). *Ceteris paribus*, elevated asset encumbrance limits funding options and deters unsecured creditors.

9 The Financial Services Authority issued in October 2009 new liquidity rules for UK banks and investment firms. This new regime introduced tougher qualitative and quantitative standards, as well as new systems and controls, reporting requirements and international management of liquidity. Similarly, in April 2010 the Swiss Financial Market Supervisory Authority and the Swiss National Bank revised the liquidity regime for national big banks. The new liquidity regime entered into force on 30 June 2010. Finally, a quantitative liquidity requirement, which resembles the Basel III's LCR, is in operation in the Netherlands since 2003.

(2011) show that exposure to liquidity shocks is limited if banks hold fewer illiquid assets in the form of loans and securitized assets. They also find that higher quality and more liquid assets improve the availability of collateral for the bank. In turn, such banks are better able to raise funds in money markets (e.g., via repos and central bank credit facilities) and capital markets (e.g., by issuing secured bonds).

Banks' capitalization should also plays a role for how bank share prices respond to liquidity regulation with better capitalized banks being better able to adjust to liquidity regulation. While we are not aware of theories that predict how capital interacts with bank liquidity holdings, it appears that a better capitalization is beneficial with regards to liquidity in several ways. First, higher capital buffers can limit the risk of the evaporation of liquidity because of the critical role counterparty and credit risk play in liquidity crises (Borio (2009); Diamond and Rajan (2000)). Similarly, higher capital can improve banks' ability to signal solvency to outsiders and attract external funds (Ratnovski (2013)). Second, *ceteris paribus*, higher capital ratios reduce banks' CDS spreads and the cost of capital (Di Cesare and Guazzarotti (2010)). Finally, equity capital, as the most stable funding source available, reduces maturity mismatches between asset and liabilities.

3.2 Bank characteristics: Business activities and funding sources

Bank business activities that focus on investment banking activities are likely to be more prone to suffer from liquidity risk. In investment banking, liquidity risk may stem from several sources. Funding is necessary to take positions in the provision of market-making services and it is a critical backstop for the issuance of securities (e.g., they are needed to back up issuing commercial paper). Similarly, trading activities entail traditional costs to address counterparty risk that can strain funding liquidity, such as collateral, margins, and haircuts. Further, investment banking is exposed to reputation risk (Tirole (2010)) because banks may be tempted to rescue vehicles toward which they have no legal obligations (as did Bear Stearns a few months prior to its collapse in 2008), leading to a weaker liquidity position.

In this context, it is important to discuss the nexus between banks' strategies in credit markets on

one hand, and their implications for liquidity and funding strategies on the other hand. While liquidity risk has traditionally been viewed to originate from deposit outflows, Strahan (2012) points out lending activities, in particular in the interbank market, play a key role for liquidity risk. He shows that the main sources of liquidity risk arise from undrawn loan commitments, obligations to repurchase securitized assets, margin calls in the derivatives markets, and withdrawal of funds from wholesale short-term financing arrangements. Cornett et al. (2011) also provide evidence that off-balance sheet activities in the form of undrawn loan commitments constitute liquidity risk. They document sudden shocks to bank liquidity if borrowers draw down commitments. Such evidence provides a rationale to impose liquidity requirements on unused commitments of lines of credit to non-financial firms. A potentially unintended consequence, however, is that imposing tight requirements on lines of credit may worsen the effect of credit crunches as firms typically draw down lines of credit in such conditions (Campello et al. (2011)). Berrospide and Meisenzahl (2013) argue that liquidity requirements have adverse effects for economic growth, in particular during times of liquidity shortages.

Recent evidence also suggests that banks relying to a greater extent on stable deposits are less affected by sudden liquidity shocks. Cornett et al. (2011) show that liquidity risk also originates from withdrawal of funds from wholesale deposits, and loss of other sources of short-term financing than from loss of demand deposits. Two reasons suggest more stable funding sources can mitigate liquidity risk. One, explicit and implicit government backing of deposits tend to insulate banks from liquidity risk.[10] Two, while retail deposits are not well suited to prevent liquidity crises, it is wholesale (unsecured) funding which evaporates first (Borio (2009)). In line with these arguments, Huang and Ratnovski (2011) state that short-term wholesale funds indeed enjoy effective seniority because of the sequential service constraint and the relative sluggishness of insured retail deposits. This was the main reason why in many recent bank failures such as Northern Rock in the UK, and IndyMac in the US, short-term wholesale financiers were able to exit ahead of retail depositors without incurring

[10] Gatev and Strahan (2006) find inflows of deposits during periods of low market liquidity, while Pennacchi (2009) does not find such flows during the pre-Federal Deposit Insurance Corporation (FDIC) period.

significant losses.[11] Unsurprisingly, the BCBS therefore motivated regulating liquidity with the aim to encourage banks to shift towards more stable funding sources and sustainable maturity structures of assets and liabilities.

4. Data and choice of event dates

We retrieve daily closing prices from Datastream for the period 21st February 2008 to 7th January 2013 for our event study. For the tests that focus on heterogeneous responses to the announcements by the BCBS, we combine this information with financial statement data, obtained from BankScope, a commercial data source provided by Bureau van Dijk. Our starting point for the sample selection is the population of 142 commercial banks and Bank Holding Companies (BHCs) from the European Union (EU) and Switzerland. We include Switzerland because of the vast size of its banking system and the linkages of Swiss banks with banks in the EU. Banks without deposits are excluded to ensure that these institutions engage in financial intermediation. This adjustment results in the exclusion of 14 institutions that are listed as commercial banks or BHC by BankScope but for which customer deposits are zero (see Appendix 3 for details). In addition, we drop seven observations for five banks because of negative common equity. The final sample consists of 128 banks.

Panel A of Table 2 reports the number of sample banks by country and shows the following sub-groups: EU banks, Eurozone banks, and banks located in GIIPS. The last column refers to the sub-group of British, Dutch, and Swiss banks which were subject to stricter liquidity rules prior to implementation of Basel III. Panel B of Table 2 reports mean values for several key financial variables for each geographical area's bank portfolio. Mean values refer to the period 2007-2012.

[TABLE 2: SAMPLE COMPOSITION AND DESCRIPTIVE STATISTICS BY COUNTRY]

[11] On the other hand, deposits cannot be seen as a *panacea* for a number of reasons (ECB (2009)). A combination of different funding sources, investors, and geographic diversification are considered as useful avenues to reduce the impact of funding shocks (Le Leslè (2012)). Consistently, the new liquidity framework introduced a monitoring metric encouraging the diversification of funding sources, in accordance with the Committee's 2008 Sound Principles.

Our event dates refer exclusively to official announcements and initiatives by the BCBS that result in proposed or actual changes of liquidity regulation since the 2007-09 crisis. This choice is a restrictive, yet plausible, criterion. Any other news and debates in the media regarding the introduction of liquidity regulation are based on and influenced by the debates within the BCBS and its representatives. unofficial .

The selection of event dates proceeds as follows. First, we use public information from the BIS website to determine all events and dates leading up to the Basel III framework. We consider all events detailed in the sections of the BIS website referred to as: (a) the "Global regulatory framework for capital and liquidity", comprising the entire spectrum of measures introduced by the BCBS through Basel II, Basel 2.5, and Basel III accords; and (b) the "Basel Committee's response to the financial crisis", which focuses on a wide range of initiatives undertaken by the BCBS since the 2007-09 crisis.[12]

Second, we refine the list of events by considering only those related to the Basel III framework, and drop initiatives referred to Basel II, and Basel 2.5 accords. Provided that the Basel III framework encompasses also other types of regulation, we only select events involving proposed or actual changes in liquidity regulation, and consequently drop events focusing on capital requirements only. Importantly, some actions that address liquidity regulation may have been released at the same time as measures on bank capital requirements. We consider these dates only when the event involves a major change in liquidity regulation. However, to understand the extent to which share price reactions are driven by announcements other than those related to liquidity, we also calculate abnormal returns over the event dates which entail exclusively initiatives on liquidity (i.e., events 1, 2, 3, and 7).

Third, we embark upon a media search to ascertain that the events we focus on indeed convey significant information to the market, and to rule out anticipation effects, a key concern when using event study analysis. To this end, we carefully search major international media outlets (Financial Times, Wall Street Journal, Wall Street Journal Europe, International Herald Tribune) via the

[12] See http://www.bis.org/bcbs/basel3/compilation.htm and http://www.bis.org/bcbs/fincriscomp.htm, respectively.

LEXIS/NEXIS database for a period up to one week after each of the seven event dates. This exercise suggests substantial international media coverage in the correspondence to all events included in our empirical tests.[13] To rule out anticipation effects, we extend this news search to a week, i.e., 5 trading days, prior to the event date. We find no evidence in the news sources that the events were anticipated by the press.

Finally, we record the day of the week on which the BCBS released its statement to the public. For our calculation of abnormal returns across event dates, we also verify that each announcement has been released prior to the closing times of European stock exchanges.[14] This condition ensures that the new information about changes in regulation is available to all relevant stock exchanges so that they can appreciate the effects equally.

5. Stock market reactions to bank liquidity regulation

This section contains our results, preceded by two discussions of different types of event study methodology we use to establish share price reactions. We first discuss in Section 5.1 how share prices across different jurisdictions respond to the announcements about liquidity regulation. Section 5.2 conditions on key bank characteristics that are likely to either amplify or mitigate the magnitudes of the share price reactions.

5.1 Event study by country

For our analysis of heterogeneous share price reactions in terms of bank location, we focus on different equally-weighted banks portfolios constructed on the basis of the banks' country of origin. Our portfolio time-series methodology allows for cross-sectional heteroskedasticity and cross-security dependence when the event dates and event windows are the same across sample units (Sefcik and

[13] We employ a variety of key-word searches to assess the international press coverage of the Basel Committee's initiatives included in our analysis. In particular, we use the following keywords: bank liquidity - liquidity proposals - Basel Committee - BIS- Bank for International Settlements - liquidity risk - Basel 3 - Basel III - bank supervisors - bank supervision - liquidity management.

[14] When the hour of the press release is unavailable we screen the international press to check whether any European bank stock reaction is reported, on the date of the event, in response to the Basel Committee's announcement.

Thompson (1986)). We also consider day-of-the-week effects because systematic differences in the mean return for different weekdays may contaminate our results (Kaplanski and Levy (2010)). To allow for AR(1) autocorrelation, we apply the Prais-Winsten adjustment prior to estimation (Allen and Wilhelm (1988)), and standard errors are adjusted for heteroskedasticity. We run the time-series regressions:

$$RET_t = \alpha_0 + \Sigma\beta_j I_{jt} + \delta Mkt_t + \Sigma\lambda_k D_k + \varepsilon_t \quad (1)$$

where *RET* is the return on the country-based equally-weighted portfolio of banks, *Mkt* is the return on the proxy for the market portfolio (MSCI Europe for the regressions on EU banks, and portfolios of national market indices in the other cases);[15] *I* is a dummy variable that equals 1 for the event-day ARs if at date *t* event $j = \{1,2,\ldots,7\}$ occurs and 0 otherwise; D_k, with $k = 1,\ldots,4$ are day-of-the-week dummies; and ε is a stochastic error term. For the three-day CARs, the dummy *I* equals 1/3 for $t - 1$, *t*, and $t + 1$, if at date *t* event $j = \{1,2,\ldots,7\}$ occurs and 0 otherwise.

Our regressions are performed over a total period of 1,353 trading days. The tests examine both event-day ARs and three-day CARs. The focus on event-day ARs is particularly useful for the purpose of this study because this restrictive criterion reduces the impact of potentially confounding events. Their influence typically increases as the event window widens.

Clearly, an analysis of how market participants perceive the introduction of liquidity regulation for the banking industry must consider the cumulative effect of all the announcements by the BCBS. Beyond documenting ARs and CARs for each individual event day, we therefore also assess the overall impact of the different announcements, i.e., we compute cumulative shareholder wealth effects by aggregating the CARs for all seven events (Wagster (1996)). We then employ *F*-Tests to assess the significance of these CARs. In other words, we test the following hypotheses:

H_0: $\beta_j = 0 \ \forall \ j=\{1,2,3,4,5,6,7\}$

H_0: $\Sigma\beta_j = 0 \ \forall \ j=\{1,2,3,4,5,6,7\}$.

where β_j is the coefficient on the dummy corresponding to the AR or CAR for event j. Finally, for

[15] In Appendix 4 we report the national market indices use for the country-based market portfolios.

all regressions, we also present the results for the events 1, 2, 3, and 7 separately to further isolate the potentially different effects on market participants' expectations regarding liquidity regulation:

H_0: $\Sigma\beta_j = 0 \ \forall \ j=\{1,2,3,7\}$.

For the sake of simplicity, we define two event buckets as follows: *All-events* bucket (for events one to seven) and *Liquidity-only* bucket (for events one, two, three, and seven). The CARs over the two buckets are computed as the sum of the individual event returns (AR(0) or CAR(-1, 1)), after multiplying by minus one returns from events with a negative effect on the probability to impose stricter liquidity rules (namely, the fifth and seventh event, as reported in Table 1).

We run equation (1) on groups of country-based portfolios. Specifically, we construct portfolios based on the following categories: EU, Eurozone, non-Eurozone (but EU), GIIPS (i.e., Greece, Italy, Ireland, Portugal, and Spain), non-GIIPS (but EU), Germany, and finally UK, Switzerland, and the Netherlands (which had strict liquidity rules prior to the BCBS proposals). This classification allows investigating the impact of the Euro sovereign debt crisis which hit banks differently according to the fiscal position of their home-governments (Allen and Moessner (2013)).[16] The portfolio consisting of UK and Swiss banks allows for the impact of belonging to jurisdictions with more stringent liquidity rules.

5.1.1 Event study by country: Main results

Table 3, Panels A and B present the results for the one-day ARs (AR(0)) and three-day-CARs (CAR(-1,1)) for seven portfolios of banks of each of the seven events described in Section 2 above.

[TABLE 3: STOCK MARKET REACTION: RESULTS FOR COUNTRY-BASED PORTFOLIOS]

[16] Allen and Moessner (2013) document divergent experiences of national banking systems, in terms of trends of bank deposit and inter-commercial bank and inter-central bank lending, during the euro area sovereign debt crisis. In particular they show that domestically-owned bank deposits in Greece and Ireland fell heavily and, more in general, that flows of funds into the liabilities of governments, commercial banks and other companies in countries perceived to be financially insecure were inhibited.

Our main finding is that shareholders in European banks respond to the introduction of liquidity regulation in a negative manner. Shareholders experience highly significant cumulative wealth losses for both the *All-events* (CAR(1-7)) and the *Liquidity-only* (CAR(1,2,3,7)) buckets. These empirical patterns suggest that bank shareholders consider this major change in regulation as detrimental to banks' future earnings. For banks in the EU, the aggregate effect on shareholders based on the event-day ARs for all seven events is -1.9%, which corresponds to an average decrease in market capitalization of around 233 million Euros.

However, the price reaction to the final BCBS announcement in January 2013 which relaxed the LCR in several respects resulted in strong positive CARs. In other words, the lobbying by banks to dilute the initially announced rules paid off, at least to some extent. Since this event decreased the probability of stricter rules, it carries a negative sign in the calculation of the CARs for the *All-events* and *Liquidity-only* buckets. Given the weak liquidity position of European banks, these results confirm that loosening the initially tough standards regarding liquidity requirements (in particular, of the LCR) has eased the burden on European banks and is consequently welcomed by shareholders.

The results for different sub-groups of European countries reveal several interesting patters. First, these findings highlight that shareholders of German banks are by far the most affected ones. Panel B of Table 3 shows that the cumulative reaction for the three-day CARs was -9.55% for the *All-event bucket* and -6.58% for the *Liquidity-only* bucket. Second, British, Dutch, and Swiss banks, on the other hand, are less affected. In particular, for the *Liquidity-only* bucket the sum of three-day CARs is insignificant and very close to zero (-0.0068). Third, and most surprisingly, share price reactions from banks located in GIIPS countries are less pronounced than those experienced by German banks. This result is likely to be driven by a negative reaction of the country-based market portfolios because we are considering country-factors for the analysis. The results using the MSCI Europe as a proxy for the market portfolio supports this explanation. In this case, the three-day CARs for German banks decline

to -7.13% for the *All-events* bucket, and -7.46% for the *Liquidity-only* bucket but the three-day CARs for GIIPS banks correspond to -8.23% and -4.54%, respectively. [17]

Thus, while these checks indicate that the choice of the market portfolio plays a role for the magnitude of the results, the *relative* responsiveness of the share price reactions across different countries remains unaffected. Shares of German banks do react more negatively in anticipation of liquidity regulation than other banks in Europe. For these other institutions, the overall market reaction using a three-day event window is -5.47%, and -3.43%, for the *All-events* and the *Liquidity-only* bucket, respectively (Column 1, Panel B, Table 3). On the other hand, the results for the GIIPS countries suggest that liquidity regulation has an impact not only on the banks in these countries, but also on the overall stock market performance in these countries. For instance, in the three days surrounding the last announcement (related to a relaxation of the liquidity rules), the market portfolio of the GIIPS increased by 0.86%, while the MSCI Europe decreased by 0.45%, and the CDAX (German market portfolio) decreased by 0.68%.

5.1.2 Event study by country: Robustness

A potential concern using event study methodology is that the news released by the BCBS coincides with some other bank-specific event such as earnings announcements which will also affect share prices. To rule out such concerns, we screen the international press via LEXIS/NEXIS and use the following keywords: dividends, earnings, CEO, losses, write-downs, restatement, downgrade, rating, fraud, annual report, manipulate, inspection, restructuring, M&A, merger, acquisition, stock split, dilution, fired, restructuring, issue, takeover. We then replicate the regressions in Table 3 but exclude banks for which our news search suggests the occurrence of confounding events over a three-day window, centred on the event day. Our findings remain virtually unchanged. These tests are relegated to the Supplementary Appendix to preserve space.

Two other possible problems may affect our results. One problem may arise from changes in volatility, and another threat to the validity of our results is that our key coefficients are significant

[17] These results are available in the supplementary online appendix.

simply because of sampling error or data mining. We deal with both of these concerns by using GARCH modelling (to allow for volatility clustering) and by constructing a random sample of returns.

While our main tests already correct for heteroskedasticity, Equation (1) may not be sufficient to capture the impact of changes in volatility on the standard errors for the CARs. The phenomenon that volatility tends to cluster potentially undermines the assumption of constant variance in this model because we rely on a long estimation period of 1,353 trading days. If volatility increases around the announcement days we study and we ignore such volatility clustering, we may unintentionally over-reject the null hypothesis (Boehmer (1991)).

To ameliorate the first concern, we estimate a GARCH(1,1) model comprising the following two equations:

Conditional mean equation: $$RET_t = \alpha_0 + \rho RET_{t-1} + \delta Mkt_t + \Sigma\lambda_k D_k + \varepsilon_t \quad (2a)$$

Conditional variance equation: $$h_t = \gamma_0 + \gamma_1(\varepsilon_{t-1})^2 + \gamma_2 h_{t-1} \quad (2b)$$

where *RET*, *Mkt*, and D_k are defined as in Equation (1). After estimating simultaneously Equations (2a) and (2b) using maximum likelihood, we obtain the residuals, ε_t, for the seven (21) days relating to the event-day ARs (three-day ARs)[18] for each of the events. We refer to this sub-sample as the *Treatment group*. As before, we multiply by minus one the returns for the window (-1, 1) for the fifth and seventh event (for which the announcements *decreased* the probability of stricter liquidity rules).

We construct the random sample by randomly selecting 50 trading days in our estimation window (1,353 trading days) to obtain a counterfactual group. We term this group the *Control group*. Next, we compare the average ε_t for the seven event-day ARs with the average ε_t for such random sample consisting of the 50 trading days we selected at random from the 1,353 available days in the estimation window. For the three-day ARs, we proceed analogously. Subsequently, we perform *t*-tests

[18] Note that we do *not* sum the abnormal returns in the (-1, 1) event window in this case, because this would be inconsistent with the way we construct the control group for the (-1, 1) window, since we pick *each* of the 50 trading days at random.

with unequal variances between the mean ε_t for the *Treatment group* and the mean return for the *Control group*.

The results reported in Table 4 confirm a negative reaction to the announcement of liquidity regulation for both the event-day ARs and the three-day ARs for Eurozone, non-Eurozone, non-GIIPS banks, and German banks. For the EU portfolio, GIIPS countries, and the portfolio comprising British, Swiss, and Dutch banks, however, the results are either insignificant or significant at the 10% level.

[TABLE 4: EFFECT OF ANNOUNCEMENTS FOR EUROPEAN BANKS]

Taken together, our results in Tables 3 and 4 illustrate that markets view liquidity regulation as undesirable. The key findings confirm the view that regulation aiming to improve financial stability is perceived as value-destroying by bank shareholders, although this does not necessarily mean that the international liquidity framework will in fact lead to erosion of bank profits. In particular, the findings for the event-day ARs suggest that bank shareholders across Europe reacted negatively upon announcement of liquidity regulation. At the same time, we uncover considerable heterogeneity in terms of the intensity of those share price reactions. Once country-factors are allowed for, it does not seem that shareholders of banks in peripheral countries are more worried than shareholders of banks in countries with a stronger fiscal position. In fact, even shareholders of non-GIIPS banks and, in particular, shareholders of German banks appear to react strongly to an increase in the probability of stricter rules, regardless of the proxy chosen for the market portfolio, and even after allowing for volatility clustering and possible sampling error in our estimates.

So far, we paid attention to bank location as a possible source of heterogeneous share price reactions. The next section takes this exploration one step further and investigates whether bank-specific characteristics also play a role for the magnitude of the market reactions.

5.2 Event study by key financial variables: Difference in CARs

From a regulatory perspective, it is desirable to identify key characteristics of banks that may amplify or mitigate banks' ability to adjust to the regulation of liquidity.

Ideally, these analyses exploit information about the NSFR and the LCR, and these two ratios' components. However, Basel III does at present not yet include a precise definition of the NSFR. Moreover, the data needed to compute both ratios are not disclosed in the banks' financial statement data. To overcome this challenge, we rely on several plausible approximations related to bank characteristics that may affect the impact of liquidity regulation on shareholder wealth.

Our first set of tests in this section exploits variables that condition the regressions on measures of bank liquidity and capitalization. To this end, we use the two ratios *Liquid assets to customer and short-term funding* and *Deposits and short-term funding to total assets* as proxies for short-term liquidity coverage to approximate the potential behavior of the LCR. We also use the ratio *Deposits from banks to total assets* to specifically establish the importance of liquidity from the interbank market. Previous work by Acharya and Merrouche (2013) has shown that interbank funding can become costly in periods of liquidity hoarding. Excessive leverage also plays a role for liquidity shocks. Adrian and Shin (2010) demonstrated that highly levered banks are more likely to experience liquidity shocks. We therefore also examine the role of *Tier 1 capital ratio* as a possible moderating variable for the share price reactions.

The second set of tests focuses on the role of business activities and funding sources. We gauge the role of business models that are geared toward off-balance sheet activities by conditioning our test on *Off-balance sheet items to total assets* which comprises committed and undrawn loan commitments. The role of funding models is reflected in two ratios. Our first proxy is the ratio of *Customer deposits to customer loans* to estimate the potential shortfall of customer deposits to support customer loans. This measure evaluates the self-sustainability of the traditional intermediation function of the bank (ECB (2013), Cornett et al. (2011)). To complement the analysis of funding structure, we aggregate all stable funding sources and express them in percent of total assets in a *Core*

funding ratio, our proxy for the NSFR. Since there is very poor coverage of information about banks' maturity structure for assets and liabilities, we rely on this indicator as a proxy for maturity mismatch.

For the empirical tests, we orthogonalize each variable so that each of them has zero correlation with the others (Berkman et al. (2011)). The benefit of doing so is that we are able to assess the impact of each independent variable after purging the potentially confounding effects of the other independent variables. This procedure replaces each ratio with the residuals derived from an OLS regression (one for each year) of that variable on an intercept and the other financial variables. In the next step, we sort the bank stocks on the basis of each financial variable, and we form two portfolios for each variable, *Y*: *High-Y* denotes the portfolio of stocks in the upper quartile of the distribution of *Y*, and *Low-Y* denotes the portfolio of stocks in the lower quartile of the distribution of *Y*. Since we obtain financial data at an annual frequency, we use the values of the financial variables as of the latest year before each of the announcement dates to construct the portfolios.[19]

We then analyse the difference in the abnormal returns (ARs) around the event using time-series regressions as follows:

$$RET(High\text{-}Y)_t - RET(Low\text{-}Y)_t = \alpha_0 + \Sigma\beta_j I_{jt} + \delta Mkt_{t+} \Sigma\lambda_k D_k + \varepsilon_{t.} \quad (3)$$

This technique produces the ARs of a trading strategy whereby we are long on banks with a value of *Y* in the highest quartile of the distribution of *Y* in a given year and short on banks with a value of *Y* in the lowest quartile of the distribution of *Y* in a given year. The coefficients β_1-β_7 are the estimated differences between the ARs of the *High-Y* and the *Low-Y* portfolios for different event dates (Berkman et al. (2011)). As before, we employ the Prais-Winsten correction for autocorrelation, adjust standard errors for heteroskedasticity, and perform the regressions over a total period of 1,353 trading days. We employ event windows of one and three days, and assess the significance of the sum of the difference-in-CARs over both of the event buckets.

[19] For instance, if the announcement occurs in February 2008, we employ the value of the financial variable from the bank annual report of 2007.

5.2.1 Event study by key financial variables: Liquidity and capitalization

Table 5 presents the results for our difference-in-CARs regressions for portfolios of banks, classified according to key liquidity and capitalization ratios. Panel A presents the event-day ARs, and we show in Panel B the three-day CARs.

Shareholders of banks with a high ratio of *Liquid assets to customer and short-term funding*, our proxy for the LCR, experience positive differential CARs relative to shareholders of banks with a low ratio. This positive difference-in-CARs, however, is only observed for the all-events bucket for the three-day CARs. The discrepancy between the two liquidity buckets for the three-day CARs is that the sixth event (which is omitted in the *Liquidity-only* bucket) has strong positive difference-in-CARs (3.3%). It is therefore not surprising that omitting this event renders the difference-in-CARs insignificant.

Next, we turn to the tests that focus on the ratio of *Deposits and short-term funding to total assets*. For the *Liquidity-only* bucket, the results are negative and significant. This result suggests that market participants view reliance on large amounts of deposits and short-term funding as problematic in anticipation of liquidity regulation. This finding is also reflected in the tests for the ratio of *Liquid assets to customer and short-term funding* above, for which short-term funding appears in the denominator rather than in the numerator of the ratio. The difference-in-CARs for the third variable that provides information on the composition of banks' funding, the ratio of *Deposits from banks to total assets*, is also negative and significant, however only for the event-day ARs.

On the other hand, well-capitalized banks react negatively to the announcements about liquidity regulation. Banks with a higher *Tier 1 capital ratio* have negative differential CARs in comparison with banks that have lower capital ratios. The difference-in-CARs are significant across all four specifications: For the event-day ARs, the difference-in-CARs are -5.75% and -3.28%, for the *All-events* and *Liquidity-only bucket*, respectively. For the three-day CARs, the difference-in-CARs are -7.13% and -4.92%, for the *All-events* and *Liquidity-only bucket*, respectively.

[TABLE 5: DIFFERENCE-IN-CARS: LIQUIDITY AND CAPITALIZATION]

5.2.2 Difference-in-CARs regressions: Results for business activities and funding sources

Table 6 illustrates results of the difference-in-CARs for portfolios of banks classified according to indicators that provide insights into business activities, and funding sources.

We first discuss the effects on the event-day ARs. Higher ratios of *Off-balance sheet items to total assets* are associated with negative difference-in-CARs. This finding holds for both event buckets. However, for the ratio of *Customer loans to customer deposits* the results are insignificant. These findings indicate that banks more reliant on off-balance sheet activities are penalized by the market. The results for the *Core funding ratio*, instead, are negative and significant for both event buckets. The results for the *Core funding ratio* support the finding reported in Section 5.2.1 for the *Tier 1 capital ratio*: more stable sources of funding tend to produce a negative price reaction.

The results for the three-day CARs are insignificant at the five percent level for all specifications, except for the specification with the *Core funding ratio*, for which the negative and significant difference-in-CARs for the *Liquidity-only* bucket is confirmed.

In sum, our findings are consistent in showing a positive difference-in-CARs for banks with high liquidity asset ratios (our proxy for the LCR) and negative difference-in-CARs for ratios related to stable funding (*Tier 1 capital ratio* and *Core funding ratio*). A potential explanation for this latter result is that shareholders of banks which need stricter rules to become more stable (in terms of long-term solvency) welcome the new international bank liquidity regulation, because it puts more emphasis on liquidity rather than capital ratios only.

[TABLE 6: DIFFERENCE-IN-CARS: BUSINESS ACTIVITIES, AND FUNDING SOURCES]

6. Concluding remarks

In this paper, we use event study methodology to present the first positive analysis of bank liquidity regulation, a major innovation of the new Basel III framework which introduces two new ratios that focus on banks' liquidity, the NSFR and the LCR.

The regulatory process leading to the introduction of liquidity regulation consists of seven separate but related announcements by the BCBS spanning approximately five years. Over this time horizon, the BCBS made several amendments and revisions to the initial proposal in response to comments received by the banking community. Our research exploits this gradual release of new information about the details of the new regulation to market participants to establish the effects on shareholder wealth in terms of ARs and CARs for listed banks in the EU and in Switzerland. Scrutinizing the BCBS announcements in detail suggests that five of the seven events are predicted to increase the probability of stricter liquidity rules, and two of these events are likely to decrease the probability of tighter liquidity regulation.

While policy makers argue that a safer financial system can benefit everyone, including bank shareholders, our key results suggests otherwise: First, shareholders of European banks react negatively to the announcements about bank liquidity regulation. Based on event-day abnormal returns, we find that EU bank shareholders experience a decline in wealth by 233 million Euros, equivalent to a negative AR of -1.9% for all seven events. Second, we document important heterogeneous share price reactions. Beyond documenting heterogeneous share price reactions for banks located in different countries in Europe, we show that banks' liquidity, capitalization, business orientation, and the funding sources matter.

We are the first to show that banks located at the European periphery display less strong reactions than banks located in Germany, despite better macroeconomic and fiscal conditions and tighter regulation. These results suggest that liquidity risk is high even in banking systems of countries with good fiscal positions (not only GIIPS), and thus an international framework would improve the stability of the whole European financial system. In terms of bank-specific heterogeneities, we find

that more liquid banks experience higher CARs. This result supports the concern raised by the banking community that the LCR imposes a heavy burden on less liquid banks. We also document that institutions with higher Tier 1 capital ratios experience lower CARs. Moreover, banks with more off-balance sheet activities also experience negative abnormal share price reactions. This result is suggestive of potentially undesirable consequence for the real economy, because off-balance sheet activities include undrawn loan commitments. If nonfinancial firms, in particular during episodes of tight liquidity conditions, intend to draw down their lines of credit, the findings point towards spill-over effects of the new rules to the real economy because tight liquidity requirements are likely to amplify the transmission of liquidity shocks from banks to the real sector. Taken together, our results indicate that the effects of liquidity regulation are at present not well understood and warrant further investigation which we leave for future research.

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Table 1. Events and predicted effects on probability of stricter rules after each event.

Event date	Short description	Probability to introduce stricter rules
21 February 2008	Release of *Liquidity Risk: Management and Supervisory Challenge*	Increased
17 June 2008	Release of *Principles for Sound Liquidity Risk Management and Supervision (proposal)*	Increased
25 September 2008	Release of *Principles for Sound Liquidity Risk Management and Supervision (final)*	Increased
17 December 2009	Release of *International Framework for Liquidity Risk Measurement, Standards and Monitoring (proposal)*	Increased
26 July 2010	Release of the *July 2010 Annex, containing the key broad agreements of the Governors and Heads of Supervision*	Decreased
16 December 2010	Release of *Basel III: International Framework for Liquidity Risk Measurement, Standards and Monitoring (final)*	Increased
07 January 2013	Release of *Basel III: The Liquidity Coverage Ratio and liquidity risk monitoring tools*	Decreased

This table shows the event dates, and we also provide a brief description for each event. The final column gives an overview about how whether the event increased or decreased the probability to introduce stricter rules for liquidity regulation.

Table 2. Sample composition and descriptive statistics by country.

Panel A. Sample composition for country-based portfolios

	Banks	EU	Eurozone	GIIPS	Liquidity regulation
Austria	6	YES	YES	NO	NO
Belgium	2	YES	YES	NO	NO
Cyprus	2	YES	YES	NO	NO
Denmark	29	YES	NO	NO	NO
Finland	3	YES	YES	NO	NO
France	7	YES	YES	NO	NO
Germany	10	YES	YES	NO	NO
Greece	7	YES	YES	YES	NO
Ireland	2	YES	YES	YES	NO
Italy	14	YES	YES	YES	NO
Luxembourg	3	YES	YES	NO	NO
Malta	2	YES	YES	NO	NO
Netherlands	5	YES	YES	NO	YES
Portugal	4	YES	YES	YES	NO
Spain	7	YES	YES	YES	NO
Sweden	4	YES	NO	NO	NO
Switzerland	13	NO	NO	NO	YES
UK	8	YES	NO	NO	YES
Total Banks	128	115	74	34	21

This table reports the number of banks in the sample by country. YES/NO denotes whether a country is in one of the categories listed on the top row for columns 2 to 5: EU, Eurozone, GIIPS, or Liquidity Regulation. The latter category includes only banks in the UK, Switzerland, and the Netherlands, for which stricter requirements for bank liquidity were introduced prior to Basel III.

Table 2 continued

Panel B. Mean value for key financial variables based on liquidity, capitalization, funding structure and business models

Sample period: 2007-2012	EU	Eurozone	Non Eurozone	GIIPS	Non GIIPS	Germany	UK, Switzerland, and Netherlands
Liquid assets to customer and short-term funding	33.05	32.65	33.76	23.54***	37.06	43.87	63.79
Deposits and short-term funding to total assets	0.65	0.63***	0.68	0.65	0.65	0.63	0.57
Deposits from banks to total assets	0.13	0.14***	0.11	0.15***	0.12	0.12	0.07
Tier 1 capital ratio	11.72	10.53***	13.52	10.32***	12.43	12.00	16.20
Off-balance sheet items to total assets	0.17	0.16***	0.19	0.19**	0.16	0.07	0.11
Customer loans to customer deposits	0.54	0.46***	0.67	0.53	0.54	0.47	0.57
Core funding ratio	0.47	0.46**	0.51	0.47	0.47	0.42	0.46

We present robust t-statistics in parentheses. Observations for which common equity is negative are excluded. ***, **, and * denotes that the mean value for Eurozone (GIIPS) countries is significantly different (at the 1%, 5%, and 10% level, respectively) from the mean for non-Eurozone (non-GIIPS) countries according to a two-sample t-test with unequal variances.

Table 3. Stock market reaction: Results for country-based portfolios.

Panel A: Effect of announcements for European banks - Event-day abnormal returns

Results for AR(0)	(1) EU	(2) Eurozone	(3) non Eurozone	(4) GIIPS	(5) non GIIPS	(6) Germany	(7) UK, Switzerland, and Netherlands
Market portfolio	0.586***	0.966***	0.615***	1.057***	0.747***	0.750***	1.072***
	(36.122)	(61.889)	(32.479)	(57.819)	(46.229)	(17.636)	(47.641)
AR(0) - Event 1	-0.003***	-0.002**	0.002***	0.006***	-0.002***	-0.010***	-0.000
	(-3.565)	(-1.999)	(5.383)	(4.814)	(-5.662)	(-14.761)	(-0.555)
AR(0) - Event 2	0.005***	0.003***	-0.004***	0.006***	-0.000	-0.006***	0.002***
	(4.014)	(6.299)	(-5.722)	(5.030)	(-0.747)	(-6.253)	(4.696)
AR(0) - Event 3	-0.008***	-0.005***	-0.009***	-0.003***	-0.008***	-0.002**	-0.010***
	(-7.386)	(-4.401)	(-15.742)	(-3.633)	(-15.612)	(-2.483)	(-16.205)
AR(0) - Event 4	0.004***	-0.005***	-0.009***	-0.001	-0.009***	-0.011***	-0.013***
	(4.089)	(-3.549)	(-20.884)	(-0.740)	(-13.685)	(-14.608)	(-25.941)
AR(0) - Event 5	0.004	0.006	0.006***	0.006	0.005**	0.003***	0.010***
	(0.801)	(1.202)	(3.997)	(1.152)	(1.980)	(3.448)	(14.417)
AR(0) - Event 6	0.002***	0.000	-0.003***	-0.001	-0.002***	-0.005***	0.002***
	(3.068)	(0.267)	(-5.918)	(-0.425)	(-4.213)	(-7.106)	(3.148)
AR(0) - Event 7	0.015***	0.021***	0.008***	0.025***	0.013***	0.033***	0.019***
	(12.206)	(46.155)	(10.571)	(19.577)	(22.727)	(37.159)	(33.342)
Day of the week dummies	YES	YES	YES	YES	YES	YES	YES
Observations	1,353	1,353	1,353	1,353	1,353	1,353	1,353
R-squared	0.703	0.855	0.570	0.833	0.759	0.544	0.764
Sum of ARs(1-7)	-0.0190***	-0.0352***	-0.0374***	-0.0241***	-0.0390***	-0.0701***	-0.0484***
Sum of ARs(1,2,3,7)	-0.0202***	-0.0248***	-0.0189***	-0.0165***	-0.0232***	-0.0514***	-0.0274***
F-Test(1-7)	9.903	43.03	209.0	15.36	159.5	419.8	401.1
Prob > F1	0.002	0.000	0.000	0.000	0.000	0.000	0.000
F-Test(1,2,3,7)	73.61	235.2	167.5	44.80	351.5	439.7	363.2
Prob > F2	0.000	0.000	0.000	0.000	0.000	0.000	0.000

This table shows Prais-Winsten regressions with robust standard errors. Events: 1. 21/02/2008; 2. 17/06/2008; 3. 25/09/2008; 4. 17/12/2009; 5. 26/07/2010; 6. 16/12/2010; 7. 07/01/2013. Robust t-statistics in parentheses. Observations for which common equity is negative are excluded. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively. The market portfolio is the MSCI Europe for the EU banks portfolio. For the other bank portfolios, the market portfolio return comprises the national market indices of each country. The national indices for each country are reported in appendix 4. Sum of ARs(1-7) and Sum of ARs (1,2,3,7) are computed as the sum of the individual event returns, after multiplying by minus one returns from events with a negative effect on the probability to impose stricter liquidity rules (namely, the fifth and seventh event, as reported in Table 1).

Table 3 continued

Panel B: Effect of announcements for European banks - Three-day CARs

Results for CAR(-1, 1)	(1) EU	(2) Eurozone	(3) non Eurozone	(4) GIIPS	(5) non GIIPS	(6) Germany	(7) UK, Switzerland, and Netherlands
Market portfolio	0.586***	0.966***	0.614***	1.057***	0.746***	0.750***	1.072***
	(36.249)	(61.916)	(32.482)	(57.871)	(46.201)	(17.636)	(47.660)
CAR(-1, 1) - Event 1	-0.002	0.002	0.003	0.015***	-0.004*	-0.012	0.010*
	(-0.239)	(0.593)	(1.011)	(4.942)	(-1.843)	(-1.334)	(1.938)
CAR(-1, 1) - Event 2	-0.008	0.004	-0.012***	0.010	-0.005**	0.002	0.005
	(-0.883)	(1.251)	(-10.263)	(1.252)	(-2.231)	(0.200)	(0.726)
CAR(-1, 1) - Event 3	-0.000	0.005	-0.010	0.001	-0.004	-0.010	0.001
	(-0.031)	(0.718)	(-0.889)	(0.196)	(-0.371)	(-0.938)	(0.086)
CAR(-1, 1) - Event 4	0.006	-0.007	-0.004	-0.006	-0.006	-0.006	-0.021**
	(0.886)	(-0.795)	(-0.385)	(-0.908)	(-0.539)	(-0.438)	(-2.467)
CAR(-1, 1) - Event 5	0.028	0.024	0.026	0.027	0.021	0.019	0.029
	(1.406)	(1.469)	(1.288)	(1.569)	(1.336)	(1.520)	(1.117)
CAR(-1, 1) - Event 6	0.002	-0.012***	-0.006	-0.005	-0.009***	-0.005	-0.021
	(0.586)	(-3.229)	(-0.838)	(-0.483)	(-8.918)	(-0.779)	(-1.507)
CAR(-1, 1) - Event 7	0.025***	0.025	0.016**	0.049***	0.013	0.046**	0.022
	(2.653)	(1.478)	(2.257)	(2.950)	(1.043)	(2.035)	(1.445)
Day of the week dummies	YES	YES	YES	YES	YES	YES	YES
Observations	1,353	1,353	1,353	1,353	1,353	1,353	1,353
R-squared	0.703	0.854	0.570	0.834	0.759	0.543	0.764
Sum of CARs(1-7)	-0.0537*	-0.0573	-0.0719***	-0.0605**	-0.0615**	-0.0955***	-0.0782**
Sum of CARs(1,2,3,7)	-0.0343*	-0.0141	-0.0357***	-0.0232	-0.0248	-0.0658**	-0.0068
F-Test(1-7)	3.378	4.453	6.698	4.468	5.837	7.568	4.252
Prob > F1	0.066	0.035	0.010	0.035	0.016	0.006	0.039
F-Test(1,2,3,7)	2.951	0.539	6.729	1.413	2.448	5.325	0.098
Prob > F2	0.086	0.463	0.010	0.235	0.118	0.021	0.754

This table shows Prais-Winsten regressions with robust standard errors. Events: 1. 21/02/2008; 2. 17/06/2008; 3. 25/09/2008; 4. 17/12/2009; 5. 26/07/2010; 6. 16/12/2010; 7. 07/01/2013. Robust t-statistics in parentheses. Observations for which common equity is negative are excluded. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively. The market portfolio is the MSCI Europe for the EU banks portfolio. For the other bank portfolios, the market portfolio return comprises the national market indices of each country. The national indices for each country are reported in appendix 4. Sum of CARs(1-7) and Sum of CARs (1,2,3,7) are computed as the sum of the individual event returns, after multiplying by minus one returns from events with a negative effect on the probability to impose stricter liquidity rules (namely, the fifth and seventh event, as reported in Table 1).

Table 4: Effect of announcements for European banks - T-tests with unequal variances

Results for AR(0)

Bank portfolio	Observations treatment	Observations control	Mean Treatment	Mean Control	T-test	P-value
EU	7	50	-0.0035	0.0000	1.2530	0.2460
Eurozone	7	50	-0.0054	0.0009	2.0382**	0.0818
non Eurozone	7	50	-0.0060	0.0008	3.2760***	0.0047
GIIPS	7	50	-0.0041	0.0010	1.1693	0.2818
non GIIPS	7	50	-0.0055	0.0003	3.2108***	0.0092
Germany	7	50	-0.0094	0.0014	2.3896**	0.0410
UK, Swit, Net	7	50	-0.0064	0.0001	1.9467*	0.0899

Results for AR(-1, 1)

Bank portfolio	Observations treatment	Observations control	Mean Treatment	Mean Control	T-test	P-value
EU	21	50	-0.0027	0.0000	1.4259	0.1622
Eurozone	21	50	-0.0027	0.0009	2.1457**	0.0396
non Eurozone	21	50	-0.0033	0.0008	2.0493**	0.0456
GIIPS	21	50	-0.0029	0.0010	1.7399*	0.0916
non GIIPS	21	50	-0.0029	0.0003	2.1621**	0.0364
Germany	21	50	-0.0045	0.0014	2.1636**	0.0348
UK, Swit, Net	21	50	-0.0034	0.0001	1.4471	0.1580

The estimates of the AR(0) and AR(-1, 1) are based on the GARCH(1,1) model:

Conditional mean equation: $$RET_t = \alpha_0 + \rho RET_{t-1} + \delta Mkt_t + \Sigma\lambda_k D_k + \varepsilon_t \quad (2a)$$

Conditional variance equation: $$h_t = \gamma_0 + \gamma_1 \varepsilon_{t-1}^2 + \gamma_2 h_{t-1} \quad (2b)$$

After estimating simultaneously equations (2a) and (2b) using maximum likelihood, we obtain the residuals, ε_t, namely, the abnormal returns for day *t*. We then group the seven (21) ε_t relating to the event-day ARs (three-day ARs) to construct the treatment group. We multiply by minus one the returns for the window (-1, 1) for the fifth and seventh event (for which the announcements *decreased* the probability of stricter liquidity rules). To construct the control group for the seven (21) ε_t, we randomly pick 50 trading days in our estimation window. We compare the average ε_t for the seven (21) event-day ARs (three-day ARs) with the average ε_t for such random sample using t-tests with unequal variances. The columns 'Observations treatment' and 'Observations control' report the number of observations in the treatment and control group, respectively. The columns 'Mean treatment' and 'Mean control' report the mean ε_t for the treatment and control group, respectively. The column named 'T-test' and 'P-value' reports the t-statistic and p-value for the two-sample t-tests, respectively. UK, Swit, Net, stand for United Kingdom, Switzerland, and the Netherlands, respectively.

Table 5. Results for difference-in-CARs regressions: liquidity and capitalization

	Panel A: Event-day ARs					Panel B: Three-day CARs			
	(1) Liquid assets to customer and short-term funding	(2) Deposits and short-term funding to total assets	(3) Deposits from banks to total assets	(4) Tier 1 capital ratio		(1) Liquid assets to customer and short-term funding	(2) Deposits and short-term funding to total assets	(3) Deposits from banks to total assets	(4) Tier 1 capital ratio
EU Banks Returns	0.191***	-0.495***	0.263***	-0.574***	*EU Banks Returns*	0.191***	-0.496***	0.264***	-0.574***
	(4.711)	(-8.723)	(9.149)	(-10.619)		(4.717)	(-8.744)	(9.182)	(-10.612)
AR(0) - Event 1	0.004***	0.013***	-0.002***	0.004***	*CAR(-1,1) - Event 1*	0.010***	0.020***	-0.001	-0.001
	(5.715)	(13.427)	(-2.746)	(4.469)		(7.785)	(2.829)	(-0.405)	(-0.084)
AR(0) - Event 2	0.007***	0.007***	-0.002***	-0.003***	*CAR(-1,1) - Event 2*	0.017***	0.020***	-0.002	-0.006
	(9.817)	(7.127)	(-4.030)	(-4.067)		(5.725)	(3.616)	(-0.746)	(-1.030)
AR(0) - Event 3	-0.005***	-0.019***	-0.009***	-0.025***	*CAR(-1,1) - Event 3*	0.005	-0.037**	-0.014	-0.047***
	(-7.098)	(-16.045)	(-4.773)	(-14.217)		(0.564)	(-2.237)	(-0.588)	(-3.831)
AR(0) - Event 4	0.008***	0.007***	0.000	-0.010***	*CAR(-1,1) - Event 4*	0.019***	0.027***	-0.008*	-0.013
	(7.963)	(5.392)	(0.113)	(-10.012)		(4.728)	(3.340)	(-1.837)	(-1.600)
AR(0) - Event 5	-0.007***	0.004**	0.009***	0.004***	*CAR(-1,1) - Event 5*	-0.009*	0.021	0.001	-0.007
	(-8.279)	(2.473)	(9.673)	(3.575)		(-1.918)	(1.048)	(0.095)	(-0.856)
AR(0) - Event 6	0.009***	0.016***	0.004***	-0.010***	*CAR(-1,1) - Event 6*	0.033***	0.052***	0.011***	-0.017
	(5.071)	(13.236)	(6.483)	(-9.214)		(3.025)	(6.393)	(5.761)	(-1.621)
AR(0) - Event 7	0.001	0.023***	0.016***	0.008***	*CAR(-1,1) - Event 7*	0.017	0.052***	0.000	-0.004
	(0.512)	(15.498)	(9.511)	(5.082)		(0.819)	(4.356)	(0.001)	(-0.277)
Day of the week dummies	YES	YES	YES	YES	Day of the week dummies	YES	YES	YES	YES
Observations	1,353	1,353	1,353	1,353	Observations	1,353	1,353	1,353	1,353
R-squared	0.061	0.173	0.129	0.318	R-squared	0.065	0.178	0.127	0.318
Sum of ARs(1-7)	0.0291***	-0.0034	-0.0343***	-0.0575***	Sum of CARs(1-7)	0.0758***	0.0100	-0.0157	-0.0713***
Sum of ARs(1,2,3,7)	0.0051**	-0.0230***	-0.0288***	-0.0328***	Sum of CARs(1,2,3,7)	0.0147	-0.0487**	-0.0175	-0.0492**
F-Test(1-7)	57.23	0.543	88.82	196.2	F-Test(1-7)	8.095	0.0923	0.197	6.652
Prob > F1	0.000	0.461	0.000	0.000	Prob > F1	0.005	0.761	0.657	0.010
F-Test(1,2,3,7)	4.092	83.34	109.0	145.1	F-Test(1,2,3,7)	0.405	4.726	0.286	4.907
Prob > F2	0.043	0.000	0.000	0.000	Prob > F2	0.524	0.030	0.593	0.027

This table shows Prais-Winsten regressions with robust standard errors. Panel A present event-day ARs, and Panel B shows three-day CARs. Events: 1. 21/02/2008; 2. 17/06/2008; 3. 25/09/2008; 4. 17/12/2009; 5. 26/07/2010; 6. 16/12/2010; 7. 07/01/2013. Robust t-statistics in parentheses. Observations for which common equity is negative are excluded. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively. Sum of CARs(1-7) and Sum of CARs (1,2,3,7) are computed as the sum of the individual event returns, after multiplying by minus one returns from events with a negative effect on the probability to impose stricter liquidity rules (namely, the fifth and seventh event, as reported in Table 1). Columns (1) to (4) correspond to estimation of difference-in-CARs based on the 25^{th} and 75^{th} percentile of the following variables: (1) Liquid assets to customer and short-term funding; (2) Deposits and short-term funding to total assets; (3) Deposits from banks to total assets; (4) Tier 1 capital ratio.

Table 6. Results for difference-in-CARs regressions: funding structure and business models

	Panel A: Event-day ARs				Panel B: Three-day CARs		
	(1) Off-balance sheet items to total assets	(2) Customer loans to customer deposits	(3) Core funding ratio		(1) Off-balance sheet items to total assets	(2) Customer loans to customer deposits	(3) Core funding ratio
EU Banks Returns	-0.232***	-0.005	-0.646***	*EU Banks Returns*	-0.233***	-0.005	-0.648***
	(-4.040)	(-0.090)	(-6.227)		(-4.067)	(-0.090)	(-6.253)
AR(0) - Event 1	0.005***	-0.014***	0.004***	*CAR(-1,1) - Event 1*	0.010**	-0.011	0.009*
	(5.437)	(-13.227)	(3.271)		(2.074)	(-0.783)	(1.786)
AR(0) - Event 2	-0.014***	0.003***	-0.002	*CAR(-1,1) - Event 2*	0.001	-0.003	0.004
	(-9.860)	(2.971)	(-1.045)		(0.080)	(-0.593)	(0.329)
AR(0) - Event 3	-0.001	0.010***	-0.049***	*CAR(-1,1) - Event 3*	0.016	0.014	-0.094***
	(-0.557)	(9.257)	(-8.355)		(1.479)	(1.416)	(-3.879)
AR(0) - Event 4	-0.003***	-0.005***	0.012***	*CAR(-1,1) - Event 4*	-0.008*	-0.025***	0.000
	(-2.783)	(-3.871)	(7.419)		(-1.948)	(-5.484)	(0.003)
AR(0) - Event 5	0.002	-0.002	0.003	*CAR(-1,1) - Event 5*	0.014*	0.002	-0.002
	(1.235)	(-1.300)	(1.092)		(1.807)	(0.163)	(-0.113)
AR(0) - Event 6	0.013***	-0.001	0.017***	*CAR(-1,1) - Event 6*	-0.006	0.017	0.031***
	(6.378)	(-0.712)	(14.167)		(-0.321)	(0.996)	(4.439)
AR(0) - Event 7	0.020***	-0.001	0.010***	*CAR(-1,1) - Event 7*	0.047**	0.003	0.021***
	(17.025)	(-0.953)	(4.188)		(2.009)	(0.347)	(3.187)
Day of the week dummies	YES	YES	YES	Day of the week dummies	YES	YES	YES
Observations	1,353	1,353	1,353	Observations	1,353	1,353	1,353
R-squared	0.044	0.005	0.190	R-squared	0.044	0.005	0.192
Sum of ARs(1-7)	-0.0691***	-0.0037	-0.0121***	Sum of CARs(1-7)	-0.0480	-0.0121	-0.0691
Sum of ARs(1,2,3,7)	-0.0296***	0.0000	-0.0575***	Sum of CARs(1,2,3,7)	-0.0201	-0.0023	-0.1020
F-Test(1-7)	19.85	0.703	12.83	F-Test(1-7)	1.527	0.174	3.249*
Prob > F1	0.000	0.402	0.000	Prob > F1	0.217	0.677	0.072
F-Test(1,2,3,7)	90.21	0.000	74.44	F-Test(1,2,3,7)	0.402	0.014	12.78***
Prob > F2	0.000	0.997	0.000	Prob > F2	0.526	0.906	0.000

This table shows Prais-Winsten regressions with robust standard errors. Panel A present event-day ARs, and Panel B shows three-day CARs. Events: 1. 21/02/2008; 2. 17/06/2008; 3. 25/09/2008; 4. 17/12/2009; 5. 26/07/2010; 6. 16/12/2010; 7. 07/01/2013. Robust t-statistics in parentheses. Observations for which common equity is negative are excluded. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively. Sum of CARs(1-7) and Sum of CARs (1,2,3,7) are computed as the sum of the individual event returns, after multiplying by minus one returns from events with a negative effect on the probability to impose stricter liquidity rules (namely, the fifth and seventh event, as reported in Table 1). Columns (1) to (4) correspond to estimation of difference-in-CARs based on the 25th and 75th percentile of the following variables: (1) Off-balance sheet items to total assets; (2) Customer loans to customer deposits; and (3) Core funding ratio.

Appendix 1: The Liquidity standards

The *Liquidity Coverage Ratio* aims to ensure that a bank has an adequate stock of unencumbered high quality liquid assets (HQLA) which consists of cash or assets that can be converted into cash at little or no loss of value in private markets to meet its liquidity needs for a 30 calendar day liquidity stress scenario:

$$LCR = \frac{\text{Stock of HQLA}}{\text{total net cash outflows over the next 30 calendar days}} \geq 100\%$$

As in its final version (7 January 2013), in order to qualify as HQLA (the numerator of the ratio), assets should be liquid in markets during a time of stress and, in most cases, be eligible for use in central bank operations. HQLA are comprised of Level 1 and Level 2 assets. Level 2 are subject to limits and a range of haircuts conditional to their market liquidity.

The denominator of the LCR is the total net cash outflows, i.e. total expected cash outflows, minus total expected cash inflows. Expected cash *outflows (inflows)* are calculated by multiplying the outstanding balances of various categories or types of liabilities and off-balance sheet commitments (contractual receivable) by the rates at which they are expected to run off or be drawn down (to flow in)[20]. Banks are expected to meet this requirement on an on-going basis. However, during a period of financial stress, banks are allowed to use their stock of HQLA, thereby falling below 100%[21]. The standard will be introduced on 1 January 2015, but a graduated approach will be followed as the minimum requirement will be initially set at 60% in order to rise in equal annual steps to reach 100% on 1 January 2019, as reported below:

1 January 2015	1 January 2016	1 January 2017	1 January 2018	1 January 2019
Minimum LCR = 60%	Minimum LCR = 70%	Minimum LCR = 80%	Minimum LCR = 90%	Minimum LCR = 100%

The *Net Stable Funding Ratio (NSFR)* establishes a minimum acceptable amount of stable funding based on the liquidity characteristics of an institution's assets and activities over a one year horizon. The NSFR aims to limit over-reliance on wholesale funding during times of buoyant market liquidity

[20] Total cash inflows are subject to an aggregate cap of 75% of total expected cash outflows, thereby ensuring a minimum level of HQLA holdings at all times

[21] Nonetheless, the LCR standard has to be intended as a minimum level of liquidity for international active banks; consistently national authorities may require higher minimum level of liquidity, especially is they deem that the LCR does not adequately reflect the liquidity risks that supervised banks face

and encourage better assessment of liquidity risk across all on and off-balance sheet items. In addition, the NSF approach would help to counterbalance incentives for institutions to fund their stock of liquid assets with short-term funds that mature just outside the supervisory defined horizon for that metric. The standard is expressed as the ratio:

$$NSFR = \frac{\text{Available amount of stable funding}}{\text{Required amount of stable funding}} \geq 100\%$$

As for the numerator, "*Stable funding*" are those types and amounts of equity and liability financing expected to be reliable sources of funds over a one-year time horizon under conditions of extended stress. The amount of such funding *required* of a specific institution (the denominator of the ratio) is a function of the liquidity characteristics of various types of assets held, off-balance sheet contingent exposures incurred, and/or the activities pursued by the institution. Liabilities and assets are then weighted according to their stability and liquidity characteristics, respectively. The standard will be introduced by 1 January 2018.

Appendix 2: Event Descriptions

Event	Description
1 (21-02-08)	The BCBS releases a document entitled *Liquidity Risk: Management and Supervisory Challenges*. It summarizes the key findings of a study carried on by the Working Group on Liquidity and aimed to review banks' liquidity risk management strategies as well as liquidity supervision practices in member countries.
2 (17/06/08)	The BCBS issues for public comment enhanced global *Principles for Sound Liquidity Risk Management and Supervision*. This guidance discusses they key elements of a robust framework for liquidity risk management. Such elements include: board and senior management oversight; the establishment of policies and risk tolerance; the use of liquidity risk management tools such as comprehensive cash flow forecasting, limits and liquidity scenario stress testing; the development of robust and multifaceted contingency funding plans; and the maintenance of a sufficient cushion of high quality liquid assets to meet contingent liquidity needs.
3 (25/09/08)	Global bank supervisors endorse strengthened sound practice standards for liquidity risk management and supervision. The final document on *Principles for Sound Liquidity Risk management* is released.
4 (17/12/09)	The BCBS issues for consultation a package of proposals to strengthen global capital and liquidity regulations with the goal of promoting a more resilient banking sector. As far as bank liquidity is concerned, the *International framework for liquidity risk measurement, standards and monitoring* (consultative document) is released. The document introduces two internationally consistent liquidity standards (the LCR and NSFR). It also comprises a set of common metrics that should be considered as the minimum types of information which supervisors should use in monitoring the liquidity risk profiles of supervised entities. The proposed set of monitoring tools refers in particular to: contractual maturity mismatch; concentration of funding; available unencumbered assets; market-related monitoring tools.
5 (26/07/10)	The Group of Governors and Heads of Supervision (GHOS), the oversight body of the BCBS, meet to review the BCBS capital and liquidity reform package. Main revisions on the liquidity rules deal with: (1) About the LCR: relaxing the definition of qualifying liquid assets (e.g. by including high quality corporate bonds and covered bonds) and introducing a more favourable treatment of certain liabilities (e.g. a lower run-off rate floors for retail and SME deposits); (2) About the NSFR: a more favourable treatment of the retail business (e.g. by increasing the available stable funding factor for retail and SME deposits and lowering the required stable funding ratio for residential mortgages). However, at this stage the BCBS states that both standards require further observation and number of adjustments. As for the LCR examples of measures to be refined include the development of standards for jurisdictions which do not have sufficient Level 1 assets to meet the standard; the introduction of percentage factor to measure cash inflows; a clearer definition of operational activities with financial institution counterparties (e.g. custody, clearing and settlement, cash management activities. The BCBS declares that the NSFR requires an "observation phase" to address any unintended consequences across business models or funding structures before finalising and introducing the revised NSFR as a minimum standard by 1 January 2018.
6 (16/12/10)	The BCBS issues the Basel III rules text, which presents the details of global regulatory standards on bank capital adequacy and liquidity agreed by the Governors and Heads of Supervision, and endorsed by the G20 Leaders at their November Seoul summit. The BCBS also publishes the results of its comprehensive quantitative impact study (QIS). In particular, the final version of the document *Basel III: International framework for liquidity risk measurement, standards and monitoring is released*. The document embodies and refines amendments announced in broad terms in July 2010. No substantial changes have been made to the NSFR.
7 (7/01/13)	The BCBS issues the full text of the *Basel III: The Liquidity Coverage Ratio and liquidity risk monitoring tools* following endorsement on 6 January 2013 by the GHOS. The revisions to the LCR developed and agreed by the BCBS over the past two years include an expansion in the range of assets eligible as HQLA and some refinements to the assumed inflow and outflow rates to better reflect actual experience in times of stress. The main measures are summarized as follows: (1) the expansion of the list of HQLA by the introduction of Level 2B assets (subject to higher haircuts and a limit of 15% of total HQLA), including Corporate debt securities rated A+ to BBB–and certain unencumbered equities (both subject to a 50% haircut), Certain residential mortgage-backed securities rated AA or higher (with a 25% haircut); (2) a more favourable treatment of: insured deposits, by a lower outflow on certain types of fully insured retail deposits (from 5% to 3%); of fully insured non-operational deposits from non-financial corporates, sovereigns, central banks and public sector entities (from 40% to 20%), "non-operational" deposits provided by non-financial corporates, sovereigns, central banks and PSEs (from 75% to 40%); (3) a more favourable treatment of committed liquidity facilities to non-financial corporates with the reduction of the drawdown rate on the unused portion of committed liquidity facilities to non-financial corporates, sovereigns central banks and PSEs from 100% to 30%. Similarly, a better treatment has been applied to interbank credit and liquidity facilities (distinguished from inter-financial credit facilities), in order to reduce the outflow rate on the former from 100% to 40%; (4) a better treatment of central bank operations by reducing the outflow rate on maturing secured funding transactions with central banks from 25% to 0%; trade finance, including guidance to indicate that a low outflow rate (0–5%) is expected to apply; (5) a new and standardized treatment for derivatives position, comprising additional derivatives risks included in the LCR with a 100% outflow (relates to collateral substitution, and excess collateral that the bank is contractually obligated to return/provide if required by a counterparty); a standardised approach for liquidity risk related to market value changes in derivatives positions; net outflow of 0% for derivatives (and commitments) that are contractually secured/collateralised by HQLA . In addition, the BCBS has agreed a revised timetable to phase in the standard and to give effect to the BCBS intention for the stock of liquid assets to be used in times of stress.

Appendix 3: Banks without deposits or with negative equity for one or more years.

Ageas SA/NV, Alpha Bank AE, Azimut Holding SpA, Bankia SA, Brewin Dolphin Holdings Plc, Eurobank Ergasias SA, Exor Spa, Groupe Bruxelles Lambert, Institut Régional de Développement de la Région Nord Pas-de-Calais-I.R.D. Nord Pas-de-Calais, Marfin Investment Group, National Bank of Greece SA, Paragon Group of Companies Plc, Pargesa Holding SA, Piraeus Bank SA, Robeco NV, Sampo Plc, SOFIBUS Patrimoine, Swiss Life Holding, Tekfen Holding AS, Cofitem – Cofimur.

Appendix 4: National market indices.

Italy	FTSE MIB INDEX - PRICE INDEX
Germany	CDAX GENERAL 'KURS' - PRICE INDEX
Greece	DJGL GREECE DJTM GREECE - PRICE INDEX
Portugal	PORTUGAL-DS Market - PRICE INDEX
Spain	IBEX 35 - PRICE INDEX
Ireland	IRELAND SE OVERALL (ISEQ) - PRICE INDEX
Uk	FTSE 250 - PRICE INDEX
Switzerland	FTSE SWITZERLAND - PRICE INDEX
France	FRANCE CAC 40 - PRICE INDEX
Sweden	OMX STOCKHOLM 30 (OMXS30) - PRICE INDEX
Belgium	BEL ALL SHARE - PRICE INDEX
Austria	DJGL AUSTRIA DJTM AUSTRIA - PRICE INDEX
Cyprus	CYPRUS GENERAL - PRICE INDEX
Denmark	OMX COPENHAGEN (OMXC20) - PRICE INDEX
Finland	OMX HELSINKI (OMXH) - PRICE INDEX
Luxembourg	LUXEMBOURG SE GENERAL - PRICE INDEX
Malta	MALTA SE MSE - PRICE INDEX
Netherlands	AEX ALL SHARE - PRICE INDEX

Supplementary Appendix

Market reaction to international bank liquidity regulation

- not for publication –

Supplementary appendix:

Effect of announcements for European banks. Event-day abnormal returns using MSCI Europe as the market portfolio for all countries.

Results for AR(0)	(1) EU	(2) Eurozone	(3) non Eurozone	(4) GIIPS	(5) non GIIPS	(6) Germany	(7) UK, Switzerland, and Netherlands
Market portfolio	0.586***	0.677***	0.434***	0.762***	0.517***	0.650***	0.747***
	(36.122)	(36.282)	(26.402)	(30.218)	(33.210)	(20.348)	(39.475)
AR(0) - Event 1	-0.003***	-0.005***	0.000	-0.001	-0.004***	-0.018***	-0.001*
	(-3.565)	(-7.357)	(0.077)	(-1.518)	(-4.927)	(-21.831)	(-1.762)
AR(0) - Event 2	0.005***	0.005***	0.003***	0.007***	0.004***	-0.003***	0.003***
	(4.014)	(6.163)	(2.819)	(8.509)	(2.729)	(-4.375)	(3.083)
AR(0) - Event 3	-0.008***	-0.006***	-0.011***	-0.003*	-0.009***	-0.003***	-0.009***
	(-7.386)	(-8.062)	(-10.158)	(-1.846)	(-5.274)	(-2.929)	(-11.563)
AR(0) - Event 4	0.004***	0.008***	-0.003***	0.009***	0.002**	0.001	0.001
	(4.089)	(7.274)	(-3.972)	(8.267)	(2.045)	(1.124)	(1.020)
AR(0) - Event 5	0.004	0.007	0.002	0.010	0.003	-0.001	0.001
	(0.801)	(1.265)	(0.829)	(1.478)	(0.817)	(-1.329)	(0.508)
AR(0) - Event 6	0.002***	0.005***	-0.003***	0.005***	0.000	0.000	0.007***
	(3.068)	(5.759)	(-6.418)	(2.645)	(0.621)	(0.660)	(8.662)
AR(0) - Event 7	0.015***	0.020***	0.007***	0.025***	0.011***	0.030***	0.019***
	(12.206)	(27.830)	(6.207)	(10.582)	(17.699)	(35.401)	(27.792)
Day of the week dummies	YES	YES	YES	YES	YES	YES	YES
Observations	1,353	1,353	1,353	1,353	1,353	1,353	1,353
R-squared	0.703	0.700	0.484	0.588	0.668	0.543	0.703
Sum of ARs(1-7)	-0.0190***	-0.0196***	-0.0225***	-0.0189***	-0.0210***	-0.0508***	-0.0189***
Sum of ARs(1,2,3,7)	-0.0202***	-0.0251***	-0.0150***	-0.0236***	-0.0200***	-0.0538***	-0.0260***
F-Test(1-7)	9.903	10.77	41.17	5.733	19.75	249.4	36.33
Prob > F1	0.002	0.001	0.000	0.017	0.000	0.000	0.000
F-Test(1,2,3,7)	73.61	201.8	41.70	45.75	58.69	579.2	199.9
Prob > F2	0.000	0.000	0.000	0.000	0.000	0.000	0.000

This table shows Prais-Winsten regressions with robust standard errors. Events: 1. 21/02/2008; 2. 17/06/2008; 3. 25/09/2008; 4. 17/12/2009; 5. 26/07/2010; 6. 16/12/2010; 7. 07/01/2013. Robust t-statistics in parentheses. Observations for which common equity is negative are excluded. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively. The market portfolio is the MSCI. Sum of ARs(1-7) and Sum of ARs (1,2,3,7) are computed as the sum of the individual event returns, after multiplying by minus one returns from events with a negative effect on the probability to impose stricter liquidity rules (namely, the fifth and seventh event, as reported in Table 1).

Supplementary appendix:

Effect of announcements for European banks. Three-day CARs using MSCI Europe as the market portfolio for all countries.

Results for CAR(-1, 1)	(1) EU	(2) Eurozone	(3) non Eurozone	(4) GIIPS	(5) non GIIPS	(6) Germany	(7) UK, Switzerland, and Netherlands
Market portfolio	0.586***	0.676***	0.433***	0.762***	0.517***	0.649***	0.747***
	(36.249)	(36.363)	(26.507)	(30.314)	(33.312)	(20.365)	(39.578)
CAR(-1, 1) - Event 1	-0.002	0.001	-0.005	0.004	-0.004	-0.025**	0.012
	(-0.239)	(0.081)	(-1.006)	(0.444)	(-0.693)	(-2.080)	(1.165)
CAR(-1, 1) - Event 2	-0.008	-0.005	-0.013	-0.006	-0.009	-0.001	-0.009
	(-0.883)	(-0.571)	(-1.452)	(-0.472)	(-1.069)	(-0.204)	(-0.885)
CAR(-1, 1) - Event 3	-0.000	0.005	-0.012	0.020*	-0.010	-0.005	-0.009
	(-0.031)	(0.438)	(-0.785)	(1.921)	(-0.610)	(-0.395)	(-0.953)
CAR(-1, 1) - Event 4	0.006	0.007	0.004	0.010	0.005	0.012*	-0.005
	(0.886)	(0.801)	(0.443)	(1.048)	(0.688)	(1.680)	(-0.885)
CAR(-1, 1) - Event 5	0.028	0.032	0.020	0.040	0.023	0.014	0.026
	(1.406)	(1.550)	(1.120)	(1.274)	(1.542)	(1.465)	(1.193)
CAR(-1, 1) - Event 6	0.002	-0.000	0.006	-0.007	0.006***	0.005	-0.004
	(0.586)	(-0.034)	(0.797)	(-0.685)	(3.292)	(1.536)	(-0.365)
CAR(-1, 1) - Event 7	0.025***	0.028**	0.020***	0.063***	0.012	0.043**	0.024*
	(2.653)	(1.964)	(3.815)	(4.983)	(1.217)	(2.349)	(1.761)
Day of the week dummies	YES	YES	YES	YES	YES	YES	YES
Observations	1,353	1,353	1,353	1,353	1,353	1,353	1,353
R-squared	0.703	0.700	0.485	0.590	0.668	0.542	0.704
Sum of CARs(1-7)	-0.0537*	-0.0522	-0.0613**	-0.0823**	-0.0463*	-0.0713**	-0.0654
Sum of CARs(1,2,3,7)	-0.0343*	-0.0274	-0.0506***	-0.0454**	-0.0338	-0.0746***	-0.0302
F-Test(1-7)	3.378	2.611	4.539	4.008	2.978	6.085	3.705
Prob > F1	0.066	0.106	0.033	0.046	0.085	0.014	0.055
F-Test(1,2,3,7)	2.951	1.533	6.655	4.181	2.603	8.221	1.815
Prob > F2	0.086	0.216	0.010	0.041	0.107	0.004	0.178

This table shows Prais-Winsten regressions with robust standard errors. Events: 1. 21/02/2008; 2. 17/06/2008; 3. 25/09/2008; 4. 17/12/2009; 5. 26/07/2010; 6. 16/12/2010; 7. 07/01/2013. Robust t-statistics in parentheses. Observations for which common equity is negative are excluded. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively. The market portfolio is the MSCI. Sum of ARs(1-7) and Sum of ARs (1,2,3,7) are computed as the sum of the individual event returns, after multiplying by minus one returns from events with a negative effect on the probability to impose stricter liquidity rules (namely, the fifth and seventh event, as reported in Table 1).

Supplementary appendix:

Effect of announcements for European banks. Event-day abnormal returns after exclusion of banks with potentially confounding events.

Results for AR(0)	(1) EU	(2) Eurozone	(3) non Eurozone	(4) GIIPS	(5) non GIIPS	(6) Germany	(7) UK, Switzerland, and Netherlands
Market portfolio	0.586***	0.965***	0.615***	1.057***	0.747***	0.750***	1.071***
	(36.117)	(61.894)	(32.480)	(57.855)	(46.219)	(17.634)	(47.621)
AR(0) - Event 1	-0.003***	-0.002**	0.003***	0.006***	-0.003***	-0.010***	0.001
	(-3.373)	(-2.211)	(5.781)	(5.002)	(-6.652)	(-14.764)	(1.382)
AR(0) - Event 2	0.004***	0.002***	-0.005***	0.006***	-0.001***	-0.006***	0.001*
	(4.133)	(4.406)	(-7.408)	(4.535)	(-2.640)	(-6.884)	(1.920)
AR(0) - Event 3	-0.008***	-0.004***	-0.010***	-0.003***	-0.008***	-0.001	-0.013***
	(-7.770)	(-3.599)	(-16.184)	(-3.909)	(-17.290)	(-1.306)	(-20.450)
AR(0) - Event 4	0.004***	-0.005***	-0.008***	-0.001	-0.009***	-0.011***	-0.013***
	(4.714)	(-3.902)	(-20.018)	(-0.743)	(-15.591)	(-14.114)	(-26.147)
AR(0) - Event 5	0.003	0.005	0.006***	0.004	0.004*	0.003***	0.008***
	(0.730)	(1.258)	(4.010)	(1.181)	(1.885)	(3.232)	(12.877)
AR(0) - Event 6	0.002***	0.000	-0.003***	-0.001	-0.002***	-0.005***	0.002***
	(3.038)	(0.143)	(-5.928)	(-0.655)	(-4.215)	(-7.107)	(3.205)
AR(0) - Event 7	0.015***	0.021***	0.008***	0.025***	0.013***	0.033***	0.020***
	(12.468)	(50.558)	(10.583)	(21.539)	(22.546)	(37.167)	(34.677)
Day of the week dummies	YES	YES	YES	YES	YES	YES	YES
Observations	1,353	1,353	1,353	1,353	1,353	1,353	1,353
R-squared	0.703	0.855	0.569	0.833	0.759	0.545	0.764
Sum of ARs(1-7)	-0.0190***	-0.0347***	-0.0383***	-0.0225***	-0.0399***	-0.0689***	-0.0508***
Sum of ARs(1,2,3,7)	-0.0211***	-0.0252***	-0.0203***	-0.0158***	-0.0250***	-0.0508***	-0.0312***
F-Test(1-7)	12.36	59.54	218.5	18.69	192.9	405.9	446.1
Prob > F1	0.000	0.000	0.000	0.000	0.000	0.000	0.000
F-Test(1,2,3,7)	87.28	204.4	190.0	40.23	438.6	429.6	470.5
Prob > F2	0.000	0.000	0.000	0.000	0.000	0.000	0.000

This table shows Prais-Winsten regressions with robust standard errors. Events: 1. 21/02/2008; 2. 17/06/2008; 3. 25/09/2008; 4. 17/12/2009; 5. 26/07/2010; 6. 16/12/2010; 7. 07/01/2013. Robust t-statistics in parentheses. Observations for which common equity is negative are excluded. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively. The market portfolio is the MSCI Europe for the EU banks portfolio. For the other bank portfolios, the market portfolio return comprises the national market indices of each country. The national indices for each country are reported in appendix 4. Sum of ARs(1-7) and Sum of ARs (1,2,3,7) are computed as the sum of the individual event returns, after multiplying by minus one returns from events with a negative effect on the probability to impose stricter liquidity rules (namely, the fifth and seventh event, as reported in Table 1).

Supplementary appendix:

Effect of announcements for European banks. Three-day CARs after exclusion of banks with potentially confounding events.

Results for CAR(-1, 1)	(1) EU	(2) Eurozone	(3) non Eurozone	(4) GIIPS	(5) non GIIPS	(6) Germany	(7) UK, Switzerland, and Netherlands
Market portfolio	0.585***	0.965***	0.614***	1.057***	0.746***	0.750***	1.071***
	(36.240)	(61.910)	(32.473)	(57.885)	(46.179)	(17.636)	(47.629)
CAR(-1, 1) - Event 1	-0.001	0.004	0.001	0.018***	-0.005**	-0.012	0.008***
	(-0.199)	(0.964)	(0.133)	(5.846)	(-2.446)	(-1.336)	(3.099)
CAR(-1, 1) - Event 2	-0.008	0.004	-0.012***	0.010	-0.005***	0.002	0.003
	(-0.936)	(1.133)	(-4.555)	(1.165)	(-4.388)	(0.229)	(0.602)
CAR(-1, 1) - Event 3	-0.001	0.005	-0.011	-0.000	-0.004	-0.014	0.001
	(-0.047)	(0.790)	(-0.889)	(-0.017)	(-0.363)	(-1.621)	(0.083)
CAR(-1, 1) - Event 4	0.006	-0.008	-0.003	-0.006	-0.006	-0.008	-0.022***
	(1.004)	(-1.032)	(-0.268)	(-0.909)	(-0.593)	(-0.712)	(-3.072)
CAR(-1, 1) - Event 5	0.023	0.018	0.026	0.019	0.019	0.015	0.024
	(1.342)	(1.368)	(1.289)	(1.477)	(1.278)	(1.547)	(1.017)
CAR(-1, 1) - Event 6	0.002	-0.011***	-0.006	-0.004	-0.009***	-0.005	-0.021
	(0.762)	(-3.372)	(-0.840)	(-0.357)	(-8.925)	(-0.782)	(-1.506)
CAR(-1, 1) - Event 7	0.025***	0.025	0.017**	0.049***	0.013	0.046**	0.024
	(2.616)	(1.442)	(2.262)	(2.843)	(1.055)	(2.035)	(1.475)
Day of the week dummies	YES	YES	YES	YES	YES	YES	YES
Observations	1,353	1,353	1,353	1,353	1,353	1,353	1,353
R-squared	0.703	0.854	0.570	0.834	0.759	0.543	0.764
Sum of CARs(1-7)	-0.0492*	-0.0492**	-0.0741***	-0.0501*	-0.0603**	-0.0980***	-0.0776**
Sum of CARs(1,2,3,7)	-0.0344*	-0.0119	-0.0392***	-0.0212	-0.0261*	-0.0697**	-0.0111
F-Test(1-7)	3.185	3.882	6.867	3.436	6.203	9.113	4.475
Prob > F1	0.075	0.049	0.009	0.064	0.013	0.003	0.035
F-Test(1,2,3,7)	2.976	0.381	6.893	1.110	2.707	6.224	0.225
Prob > F2	0.085	0.537	0.009	0.292	0.100	0.013	0.635

This table shows Prais-Winsten regressions with robust standard errors. Events: 1. 21/02/2008; 2. 17/06/2008; 3. 25/09/2008; 4. 17/12/2009; 5. 26/07/2010; 6. 16/12/2010; 7. 07/01/2013. Robust t-statistics in parentheses. Observations for which common equity is negative are excluded. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively. The market portfolio is the MSCI Europe for the EU banks portfolio. For the other bank portfolios, the market portfolio return comprises the national market indices of each country. The national indices for each country are reported in appendix 4. Sum of ARs(1-7) and Sum of ARs (1,2,3,7) are computed as the sum of the individual event returns, after multiplying by minus one returns from events with a negative effect on the probability to impose stricter liquidity rules (namely, the fifth and seventh event, as reported in Table 1).

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