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Accounting for Financial Stability: Lessons from the Financial Crisis and Future Challenges*

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Abstract

This paper investigates what we can learn from the financial crisis about the link between accounting and financial stability. The picture that emerges ten years after the crisis is substantially different from the picture that dominated the accounting debate during and shortly after the crisis. Widespread claims about the role of fair-value (or mark-to-market) accounting in the crisis have been debunked. However, we identify several other core issues for the link between accounting and financial stability. Our analysis suggests that, going into the financial crisis, banks' disclosures about relevant risk exposures were relatively sparse. Such disclosures came later after major concerns about banks' exposures had arisen in markets. Similarly, banks delayed the recognition of loan losses. Banks' incentives seem to drive this evidence, suggesting that reporting discretion and enforcement deserve careful consideration. In addition, bank regulation through its interlinkage with financial accounting may have dampened banks' incentives for corrective actions. Our analysis illustrates that a number of serious challenges remain if accounting and financial reporting are to contribute to financial stability.

JEL classification: G21, G22, G28, G32, G38, K22, M41, M42, M48

Key words: Banks, Financial crisis, Mark-to-market; Fair value accounting; Financial stability; Disclosure, Loan loss accounting

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1. Introduction

The 2008 financial crisis set off a major debate about the role of accounting for financial stability. Early in the crisis, policymakers and commentators made strong claims about fair-value or mark-to-market accounting (FVA), arguing it exacerbated the crisis by facilitating excessive leverage in booms and leading to contagion and downward spirals in busts. Later, the G20 raised concerns about banks' accounting for loan losses and the incurred loss model, arguing it delays loss recognition and corrective actions by banks. There is also an ongoing debate on the role of prudential filters that shield regulatory capital from fair value (FV) changes of certain assets.¹

For these debates, empirical evidence on the links between accounting and financial stability is important. We have since learned that FVA was largely a scapegoat; there is no evidence that it significantly contributed to the financial crisis or its severity. The claims were largely based on hypothetical links or models, rather than empirical facts. However, the evidence on FVA does not imply that there were no problems with banks' financial reporting more broadly. To the contrary, we highlight several problems that are central to the link between accounting and financial stability. Our analysis of banks' financial reporting leading up to and during the financial crisis suggests issues related to disclosure and loss recognition that we should take seriously. In our view, the crisis provides a number of important lessons and points to several regulatory challenges going forward, including opportunities for future research. Our goal is to re-direct the debate on accounting issues that have received less attention, yet are central when it comes to the link between accounting, reporting and financial stability, i.e., disclosure, loan loss recognition, prudential filters, and the interaction of bank regulation and accounting choices.

¹ Illustrating this debate, Basel III abolishes filters shielding regulatory capital from FV changes of available for sale (AFS) debt securities, but after opposition from banks, the U.S. gave all but the largest ("advanced approach") banks a one-time irrevocable choice.

For financial reform, it is important to start from the right diagnosis. We therefore begin with a brief synopsis of the evidence on the role of FVA that has emerged since the financial crisis. First, FVA, let alone pure mark-to-market accounting, played a limited role for most banks. It is a misconception that FVA dominates banks' balance sheets (e.g., Laux and Leuz, 2010). For banks, loans constitute by far the largest category, and a large fraction of banks' losses occurred in the loan books. However, banks apply amortized cost accounting for almost their entire loan portfolio (even when they have the choice to use FVA). Second, many, if not most, assets recorded at FV were valued using models (or matrix pricing) rather than marked to actual market prices even before the crisis (Laux and Leuz, 2010). Third, there are a number of safe guards built into the accounting rules, which act as circuit breakers for downward spirals and contagion. For example, banks can move from using market prices to models when the liquidity in asset markets dries up, and many banks did so for their troubled assets in the crisis (Laux and Leuz, 2010). Moreover, the accounting rules explicitly state that securities must not be valued using fire-sale prices. They also use the construct of "other-than-temporary impairments" to shield banks' net income from the effects of short-lived declines in the FV of their assets. In addition, many countries had prudential filters in place that shield banks' regulatory capital from FV losses on available-for-sale (AFS) debt securities. These safeguards weaken the links that are central to the potential problems with FVA. Fourth, there is little evidence that banks systematically engaged in fire sales. In fact, the evidence suggests that commercial banks bought rather than sold mortgage-backed and other asset-backed securities during the crisis (e.g., Badertscher et al., 2012; He et al., 2012; Abbassi et al., 2016).² Fifth, it is not clear that banks' write-downs of FV assets were excessive. If anything,

² One of the few examples of an alleged asset fire sale is Lone Star's purchase of the Merrill Lynch CDO portfolio for \$6.5 billion or 22 cents on the dollar in July 2008. However, there is no indication that Merrill's financial accounting triggered the sale or that the transaction (fire-sale) price became a relevant mark for other banks.

write-downs came late and were initially small, necessitating further write-downs (Laux and Leuz, 2010; Vyas, 2011; Huizinga and Laeven, 2012). Sixth, in the aggregate, banks' FV gains are not procyclical; expansionary periods are characterized by unrealized losses on AFS securities, not gains (Xie, 2016). Moreover, there is no evidence that unrealized gains and losses on AFS securities under FVA are associated with procyclical lending (Xie, 2016) or procyclical leverage (Laux and Rauter, 2017) by U.S. banks. Complementary research on insurers also concludes that FVA did not magnify their problems, but instead induced (some) insurers to take actions earlier. Instead, historical cost accounting (HCA) is associated with gains trading (Ellul et al., 2014, 2015).

Thus, the research that has emerged since the crisis debunks widespread misconceptions and claims about FVA. The evidence neither supports that FVA played a significant role in the crisis nor that it contributed to its severity by facilitating excessive leverage in the boom before the crisis. Moreover, we do not see how HCA could have made a meaningful difference in or before the crisis. Consistent with this claim, several early failures were banks with few FV assets and most assets reported at amortized costs (e.g., IKB and Northern Rock). Despite all this evidence, it would be premature to conclude that there were no problems with bank accounting and reporting. In fact, the focus on FVA might have diverted the attention from other accounting and reporting issues that matter for financial stability.

In this paper, we take the primary reasons for several prominent bank failures in Europe and the U.S. as our starting point and ask what role accounting and financial reporting could have played in these failures (for better or worse). The leading (immediate) cause for bank failures during the crisis was high leverage coupled with short-term funding by sophisticated (institutional) investors. Such funding structures when used to finance risky assets can be very instable and expose banks to runs. Therefore, information about banks' funding structures and their exposures

(e.g., to troubled loans and assets) is a critical issue that deserves attention. To what extent were bank disclosures sufficient, did they contribute to the panic in markets? What role do disclosures and accounting charges play in influencing bank behavior?

Reviewing prominent failures also suggests that banks were reluctant to take corrective actions early enough, such as raising equity, discontinuing dividend payments or selling troubled assets. Thus, timely disclosures and impairments could provide incentives for banks to take corrective actions. However, given the short-term nature of many banks' funding structure and the reliance on institutional investors, there is also the concern about bank runs. Investors could view corrective actions such as, for example, a dividend cut as signs of weakness, triggering a bank run. This concern is particularly severe if write-downs of impaired assets further reduce the equity of thinly capitalized banks. The latter point highlights the link between accounting and regulatory capital. But again, there are tradeoffs. It is possible that prudential filters that shield regulatory capital from FV losses distort banks' incentives to take early corrective actions. Thus, prudential filters are not just buffers that mitigate downward spirals, but they could also have side effects by weakening swift crisis management. Finally, the central role of short-term (in particular unsecured wholesale) funding in bank failures raises the question of whether accounting measurement can be independent of banks' funding structures.

The aforementioned issues are the focus of this paper. First, we analyze the link between bank disclosures and financial stability. Disclosures are important for investors and prudential regulation, with regulators stressing its importance for market discipline (e.g., in Basel II and Basel III; see also Flannery, 2001). At the same time, investors might have low incentives to exert market discipline in booms (Hellwig, 2005, and Freixas and Laux, 2012) and overreact to negative news in a crisis, triggering bank runs (e.g., Morris and Shin, 2002; Goldstein and Sapra, 2014). Thus,

the role of bank disclosures with respect to financial stability is not obvious. In light of this debate, we ask when banks first disclosed their exposures to troubled assets, how the market reacted to these disclosures and what the evidence tells us about when investors learned about bank problems. We find that banks' disclosures about their exposures came late and banks had to substantially revise these numbers (upwards) as the crisis continued. We find little evidence (e.g., in CDS prices) that the disclosures set off problems or destabilized banks. Instead, it seems that poor and unreliable disclosures led to an erosion of trust, which likely was a bigger problem than the overreaction to bad news. In retrospect, an important lesson from the crisis is that we need a mechanism to assure the market that it receives truthful information about banks' exposures (or lack thereof), in particular, when a crisis starts to unfold. Stress tests provided such a mechanism, conveying detailed disclosures about banks' exposures by asset class (i.e., a roster of assets). Once investors had a detailed roster of bank assets and exposures, they were able to value these assets independent of bank managers' assessments. Of course, disclosures and stress tests alone cannot solve debt overhang problems or the leverage ratchet effect (Admati et al., 2017). But detailed disclosures about exposures could protect solvent banks from adverse market reactions, including runs at the onset of a crisis, and make it easier for them to raise additional capital at that point. Strict disclosure requirements should also make it harder for banks to hide losses and gamble for resurrection. We need more research on these issues.

Second, we analyze the timing and magnitude of loan impairments in the crisis. In contrast to disclosures, impairments have direct consequences for regulatory capital and contracts (e.g., debt covenants). A similar picture emerges as for disclosures. Impairments came late and were initially much too small. In the aftermath of the crisis, the so-called incurred loss model was viewed as one culprit for the delay in loss recognition, motivating a recent shift in the accounting standards to an

expected loss model. We analyze banks' disclosures of potential loan losses to see whether the rules "constrained" banks' loss recognition. We find little evidence to support such a claim. Instead, a reluctance to recognize (or disclose) losses and weak enforcement are more likely explanations. Consistent with this view, banks and their auditors faced substantial litigation and regulatory enforcement actions due to their disclosure and impairment practices during the crisis.

Third, we examine the role of prudential filters for banks' corrective actions. Filters mitigate the impact of FV changes on regulatory capital and hence reduce the potential for downward spirals. However, filtering FV losses could also delay banks' corrective actions and provide incentives to hold on to AFS securities that deteriorated in value. Thus, our filter analysis speaks to the more general tradeoff in bank regulation between inducing corrective actions versus triggering downward spirals with loss recognition. We exploit cross-country variation in prudential filters as well as a few country-level changes to analyze the association between AFS results and corrective actions, such as dividend cuts and reduction in risk-weighted assets and leverage, in different AFS filter regimes. While our analysis cannot establish causality, we document that the association between AFS results (or AFS losses) and banks' corrective actions is weaker in countries where filters shield banks' regulatory capital from FV losses. At a minimum, our results indicate that the interaction between accounting and bank regulation deserves careful attention when it comes to financial stability.

To illustrate another area in which incentives provided by bank regulation played a role in the crisis, we discuss how banks' choices to classify assets as belonging to the trading book or the banking book had differential regulatory capital but also accounting consequences. Our discussion suggests that incentives to classify securities into the trading book to obtain more favorable risk

weights played into the perceived problems with FVA.³ This interaction of accounting and bank regulation shows that understanding the “plumbing” matters.

Finally, we identify several issues that deserve more attention going forward. One of these issues is the connection between accounting measurement and bank funding structure. Short-term funding implies that current asset values matter. With short-term funding, banks essentially have to roll over their funding and the ensuing refinancing is akin to selling a pool of assets (at current market prices).⁴ The intent to hold these assets to maturity does not alter this insight. In fact, the ability to hold assets to maturity or for the collection of cash flows depends on the bank’s ability to roll over its funding. Thus, banks’ funding structures are potentially more important in determining relevant accounting measurement than either management’s intent or the bank business model, which is what the accounting standards reference.

Overall, the picture that emerges ten years after the crisis is substantially different from the picture that dominated the debate during and shortly after the crisis. Based on our analysis and review of the literature, lack of disclosures and delayed loss recognition seem to have been a bigger problem than the converse. Moreover, bank regulation intended to improve financial stability appears to have had unintended consequences through its interactions with bank accounting. Thus, a number of thorny problems on the interaction of accounting and financial stability remain. We concede that in some cases we can provide only conjectures based on current evidence. We encourage future research to tackle these important issues.

The paper is organized as follows. In Section 2, we discuss and analyze problems related to

³ Relatedly, regulatory risk weights play an important role in banks’ decision to transfer assets off balance sheet through securitization. For example, as Acharya and Schnabl (2010) point out, in Spain, where the regulator required an 8-percent capital charge against assets in conduits, banks did not sponsor conduits.

⁴ Consistent with our view, mark-to-market accounting arises naturally from market forces in repo transactions.

banks' financial disclosures. Section 3 discusses the timing of banks' loss recognition during the crisis and reasons for the apparent delay. In Section 4, we analyze the link between FV losses and regulatory capital with respect to banks' corrective actions. Section 5 concludes and points to several issues for future research.

2. Bank disclosures, market reactions and financial stability

Financial reporting plays an important role in providing information to investors, boards, and supervisors. For instance, it can provide information about a built-up or concentration of exposures and risks on banks' balance sheets, but also about their funding structure and ability to absorb shocks. As such, it provides the foundations for market discipline, corporate governance, and prudential supervision. Regulators and the literature emphasize the potential role of market discipline for financial stability (e.g., Flannery, 2001; but see also Hellwig, 2005 for critical perspective). Consistent with this view, market discipline is also an important pillar of prudential regulation (e.g., in Basel II and Basel III), requiring additional disclosures that go beyond the disclosure requirements for financial reports.

At the start of a crisis, disclosures are particularly important, providing relevant information about the exposures to troubled assets. Such information can reduce uncertainty (e.g., help separate solvent and insolvent banks). But disclosing negative information can also trigger bank runs and set off a panic among investors (e.g., Morris and Shin, 2002; Goldstein and Sapra, 2014). Thus, the role of bank disclosures with respect to financial stability is not obvious.⁵

In this section, we focus on two issues that have received less attention in the debate. The first issue is the timing of banks' disclosures (e.g., about exposures to subprime assets and losses). We

⁵ See, for example, Acharya and Ryan (2016) for an extensive discussion of different views on transparency (opacity) for financial stability.

investigate the evolution of these disclosures during the crisis and ask the following questions: When did banks' financial reports provide relevant information to market participants? Were banks' disclosures more proactive or reactive? The idea is to delineate disclosures relative to the timeline of the crisis. The second issue is how markets respond to these disclosures. Did they reduce uncertainty? We investigate market reactions to banks' disclosures to see whether there is any evidence that the disclosures made matters worse and contributed to the uncertainty in markets. Our analysis highlights that the credibility of disclosures and concerns about misstatements are key issues that deserve attention by regulators and future research.

2.1 Evolution of crisis-related disclosures

To investigate the evolution of disclosures over the crisis, we examine the financial reporting of 20 large banks (10 from the U.S. and from Europe each) in detail. We choose this sample based on bank size and financial difficulties during the crisis. They are the largest banks in each region or banks that had significant financial difficulties during the crisis. In total, 12 of the 20 sample banks faced bailouts, takeovers, bank runs, or bankruptcies. In Table 1, we present an overview of the timing and content of their disclosures about subprime exposures, funding structures, and interest rate sensitivities between 2006-Q4 and 2008-Q4. The table also includes information about the use of discretionary accounting choices related to FVA, the timing of corrective actions, and subsequent litigation for misleading statements or disclosures.

Prior to the crisis, all sample banks disclosed at least some basic information about leverage, funding gaps, or interest rate risk. This information was not disclosed in a standardized way, but investors should have been able to understand that banks were highly levered and often funded short-term. That said, we find few detailed disclosure about factors that turned out to be critical in the crisis. For instance, extant rules at the time did not require specific disclosures on banks'

subprime or RMBS exposures. Only three of our sample banks, BNP, JP Morgan, and Northern Rock voluntarily provided very basic information about their risk exposures to the subprime mortgage market already in their 2006 annual reports. None of the other sample banks disclosed specific information related to their exposure to the subprime mortgage market until September 2007. This lack of disclosure is particularly noteworthy considering that there were several signs in the first half of 2007 suggesting a deteriorating subprime mortgage market (Ryan, 2008). Several financial institutions failed and subprime originators, e.g., New Century Financial, announced refinancing problems. Rating agencies downgraded several hundred subprime-related MBS. On August 9, 2007, BNP Paribas announced the closure of three investment funds because it could no longer value its assets due to problems in the U.S. mortgage market, triggering further uncertainty about the exposure of financial institutions to the U.S. mortgage market (Greenlaw et al., 2008) and presumably creating demand for more detailed disclosures.

The apparent lack of disclosures prompted the SEC to raise questions about exposures to the subprime market in its comment letters to major banks in regards to their 10-K or 10-Q filings. On August 1, 2007, Lehman was the first bank to receive such a comment letter asking about its exposure to subprime residential mortgages. Lehman responded and the SEC closed the matter on September 19, 2007, writing: “We note that you believe the likelihood is remote that the amount, or range, of reasonably possible losses in connection with your involvement with subprime residential mortgage loans will be material to your consolidated financial condition ... We have no further comments at this time.”⁶

In Europe, the Committee of European Banking Supervisors (CEBS), an independent advisory group on EU banking supervision, conducted a systematic review of EU banks’ risk disclosures in

⁶ SEC, Letter to Lehman Brothers Holdings Inc., September 19, 2007, File No. 1-09466.

their 2007 financial reports (CEBS, 2008). The ensuing CEBS Transparency Report (2008) documents incomplete disclosures, especially about banks' activities related to securitized mortgage loans and about liquidity risk management, and in parts non-compliance with existing requirements under IFRS 7 and the Basel Pillar 3 regulation. Similar to Lehman's response to the SEC, the press releases by large EU banks in August 2007 were vague and intended to reassure investors that exposures to the subprime market were either small or under control (e.g., "no negative impact from subprime", "not exposed", "well protected", "limited exposure").⁷ None of the European sample banks provided an amount for its subprime exposure at this time.

An illustrative example is Germany's IKB. It was one of the earliest banks to fail and bailed out on August 1, 2007. The bailout came just about one month after IKB published its annual report on June 28, 2007. This report did not provide any explicit indication of the bank's subprime exposures (which stemmed primarily from liquidity guarantees to a special-purpose conduit, Rhineland Funding, which was heavily invested in the subprime market). IKB mentioned these subprime exposures for the first time in its first-quarter report on July 20, 2007, describing these exposures as being "insignificant." Ten days later, on July 30, 2007, the bank issued a profit warning, revealing more details about its dealings with Rhineland Funding and the corresponding exposures. Deutsche Bank and other banks had cut IKB's credit lines before the July 30 disclosure based on their own assessments of IKB's risks (e.g., Financial Times, August 3, 2007, p. 22).

In the U.S., large banks started to provide explicit and more systematic disclosures on their subprime exposures in September 2007. After Goldman Sachs had reported net gains from its subprime investments in its 8-K filing on September 20, Merrill Lynch was the first major bank,

⁷ See press releases by Hypo Real Estate on August 3, Deutsche Bank on August 4, Dexia on August 6, and BNP on August 13, 2007.

along with Washington Mutual, to provide some (negative) details in its 8-K filing on October 5. Merrill's 8-K filing revealed total impairments on CDOs, other subprime mortgages, and non-investment grade lending commitments of \$4.5 billion. The disclosure was limited to the impairment amount and highlighted Merrill's effort to reduce investments in similar asset classes; it did not yet disclose any details about its remaining exposures. The subsequent third-quarter earnings announcement published on October 24, 2007 included write-downs of \$7.9 billion on CDOs and provided more detailed information about Merrill's exposure to subprime mortgage-related securities in the footnotes to the 10-Q report. However, these disclosures raised more questions than answers.⁸ Merrill's competitors followed with detailed disclosures about their subprime exposures in November 2007 (Citigroup on November 5, Bank of America on November 9, Bear Stearns and Lehman on November 14).

Among the large European banks that, to this point, had not yet (publicly) experienced any financial difficulties, only the Swiss UBS (on October 30) and the Belgian Fortis (on November 8) disclosed further details about their investments in subprime-related securities. Other banks remained silent and disclosed either in December (such as the British RBS on December 6; HBOS on December 13) or when they published their annual reports in early 2008. UBS is another important example. As mentioned, UBS first provided information about its exposures to the U.S. subprime market in its third-quarter management report (October 30, 2007). The report describes its positions and accounting policies largely in a qualitative way, mentioning the aggregate net exposure to the U.S. mortgage markets as well as current impairment charges. Then, UBS provided more quantitative information about the different types of exposures to the U.S. mortgage market in its 2007 Annual Report, published on March 18, 2008. Later, and only upon request by the

⁸ For instance, the Economist asked on October 28, 2007, "Is Merrill the tip of the iceberg? If so, who is the Titanic?"

Swiss Federal Banking Commission, UBS issued a 50-page shareholder report on April 18, 2008, explaining the bank's activities in the U.S. subprime market in great detail.

2.2 Market responses to bank disclosures and fundamental events

One potential explanation for banks' reluctance to provide more information earlier is that they feared that investors and, in particular, creditors providing short-term funding would react negatively. Disclosures about exposures could trigger market overreactions, including bank runs (e.g., Bouvard et al., 2015, Goldstein and Leitner, 2018, Goldstein and Sapra, 2014). Bank regulators may have feared contagion and spillover effects from bank disclosures, which in turn may have made them more lenient in their enforcement of existing disclosure requirements.

To shed light on market responses, we examine 5-year CDS spreads and stock returns for the ten U.S. banks in our sample around key disclosure and other economic events in 2007. CDS pricing data comes from IHS Markit and stock price data comes from CRSP. We begin by simply plotting 5-year CDS spreads for the nine U.S. banks that started disclosing in fall 2007 in event time (Figure 1, Panel A). The spread reactions on the day of the disclosure event (or the next day) are not consistent with the notion that investors overreact to banks' disclosures of risk exposures and losses. For a few banks (especially Bear Stearns and Lehman), CDS spreads decrease when the market learns about the exposures and corresponding losses. For the other banks, we do not find any meaningful reaction. This pattern is more consistent with the notion that much of the negative information was already known or expected by investors.

One factor may have been that the disclosures were not very forthcoming and often aimed at reassuring investors (relative to negative market expectations that pre-existed in the market). For instance, a Goldman equity analyst predicted Merrill's write-downs fairly accurately late in

September 2007, well before Merrill confirmed these write-downs on October 5 (Wall Street Journal, September 27, 2007). Shortly thereafter, other analysts changed their earnings forecasts for Merrill correspondingly (e.g., Credit Suisse).

Figure 1, Panel B is centered on October 5, which is when Merrill Lynch and Washington Mutual were the first major U.S. banks to report negative information (i.e., losses) about their subprime investments. The parallel movement shows that the CDS spreads of all ten sample banks behave similarly.

While investor reactions to banks' disclosures are fairly moderate, we observe larger spread reactions on other days when there are no specific disclosures. For example, there is a substantial spike in the level of all banks' CDS spreads in the middle of October 2007 (October 16, 17, and 19). This spike falls between October 5, when Merrill first reported its write-downs, and October 24, when it provided detailed information on its exposures to subprime mortgage-related securities. There is another large spike on October 30, 2007, when Merrill Lynch reported the ousting of its CEO and the spreads for all banks increased. Another example is the market response to the publication of the SEC's letter to Lehman on August 1, 2007, expressing concerns about the lack of adequate risk disclosures. In the following days, the CDS spreads for many sample banks increase considerably (Figure 2).

In a more formal analysis, we benchmark market responses to banks' disclosures against market reactions to other major events in the early phase of the financial crisis. We regress daily changes in CDS spreads and stock returns on indicator variables for the 3-day window [-1,+1] around (1) any disclosure event that reveals information about a bank's exposure to subprime risks (*Firm Disclosure*), (2) the first disclosure event for each bank (*First Firm Disclosure*), (3) the 10-

Q or 10-K filing of each bank, and (4) a series of 19 economic events that we select based on a crisis time line and news search. We estimate the models using firm-fixed effects.

Table 2 presents the results of the OLS regressions. Interestingly, we find no significant market-wide reactions in the CDS prices to crisis-related events until July 2007, consistent with the notion that the market did not foresee the systemic relevance of these events. The first significant reaction of the CDS spreads occurs when Federal Reserve chairman Ben Bernanke warned that the crisis in the US sub-prime lending market could cost up to \$100 billion on July 20, 2007, and again when Countrywide Financial Corporation warned of “difficult conditions” on July 24, 2007. More such reactions follow later in the year (e.g., around the AHMI bankruptcy or when Freddie Mac announces major losses). The picture for the stock market is similar, except that there are a few significant reactions earlier in the year (i.e., when Freddie Mac first reported problems on February 27). In contrast to these market responses to major crisis-related events, the average reaction to firm disclosures is negligible and statistically insignificant, except for the reactions to banks’ 10-Q and 10-K disclosures. However, as discussed in the previous section, these filings often adjusted previously disclosed losses upwards and hence the market reactions could also reflect that the market was losing confidence in banks’ reporting.

While our analysis is very descriptive, we do not see market reactions suggesting that investors overreacted in a major way or that specific disclosures about subprime exposures or losses destabilized the banks. Instead, CDS spreads were often already substantially elevated before banks released their disclosures to investors. The observed patterns suggest that investors and analysts formed expectations about banks’ problems and losses ahead of the disclosure events, using many sources. If anything, banks’ early disclosures seem to have (falsely) assuaged investors’ concerns.

2.3 Misstatements and investor confidence

Although banks substantially increased their disclosures of relevant information during the crisis, their early disclosures often substantially underreported total exposures and underestimated eventual losses. For example, Merrill Lynch initially disclosed \$5.7 billion of net “subprime mortgage-related exposures” in its 8-K report on October 24, 2007, only to revise this number to \$46 billion in gross exposures three months later. Merrill Lynch also predicted a \$4.5 billion CDO and subprime charge for the third quarter, but increased this figure to \$7.9 billion only three weeks later. Similarly, Bear Stearns provided a relatively optimistic outlook in its 10-Q report in November 2007 and then reported its first-ever quarterly loss in December 2007. It is easy to find similar examples in Europe. For instance, the Belgian-Dutch Fortis described the impact of its subprime exposures on the 2007 results as “non-material.” Yet, its 2007 financial report included a \$3 billion write-down on a portfolio consisting mostly of mortgage-backed securities.

These statements were clearly misleading and, hence, can be characterized as misstatements. However, they do not necessarily reflect managerial intent. Some misstatements can be explained by exposures that were formerly off-balance sheet but later brought back on banks’ balance sheets. In other cases (such as Merrill Lynch), banks reported net exposures, but then switched to gross exposures when the hedges became ineffective (e.g., due to increased counterparty risk) and hence the positions could no longer be netted.⁹

Our point is that, irrespective of managerial intent or the reasons for the misstatements, the series of misstatements likely contributed to investor uncertainty, especially as the reasons for the later revisions of the initial disclosures were often opaque. Thus, considering the evolution of bank

⁹ Netting of assets and liabilities is an issue that has received greater attention only recently (see, e.g., Acharya and Ryan, 2016).

disclosures during the crisis, it seems reasonable that the erosion of trust was a larger problem for financial stability than a potential overreaction to bad news by investors. The documented market reactions to banks' initial and later disclosures in Table 2 are also consistent with this interpretation. The run on Bear Stearns is a case in point. There are several indications that the unwillingness of institutional debt holders and counterparties to further provide the bank with sufficient liquidity stemmed from a loss of confidence in Bear Stearns. This loss built up over a longer time period and most likely was a combination of worries about the bank's bad investments, which started with the collapse of two of its hedge funds in June 2007, management's struggles to present a convincing strategy how to deal with these problems, and a disclosure policy that downplayed problems. For example, the initial write-down of Bear Stearns' mortgage securities came later than the write-downs for its competitors. The initial lack of disclosures might have (falsely) signaled that Bear Stearns was less exposed to the mortgage market than its competitors. But investors later learned that this was not true. And even when it finally disclosed its mortgage market exposure, Bear Stearns provided fewer details than its peers (e.g., Merrill Lynch).

The importance of a company's reputation for truthful reporting is also evident in the public interaction between Lehman and Greenlight Capital's hedge fund manager David Einhorn. In several speeches at analyst and research conferences, Einhorn analyzed Lehman's impairment policies for its subprime portfolios and largely justified his decision to short Lehman stock with his assessment that its impairments were inadequate, when compared to expectations Einhorn formed based on publicly available data.¹⁰

¹⁰ For example, Einhorn stated: "Lehman has additional large exposures to Alt-A mortgages, CMBS and below investment grade corporate debt. Our analysis of market transactions and how debt indices performed in the February quarter would suggest Lehman could have taken many billions more in write-down than it did" (April 8, 2008, Grant's Spring Investment Conference).

Inadequate disclosures and accounting misstatements also manifested in the large number of lawsuits. For the 20 sample banks in Table 1, we find litigation cases related to banks' financial reporting and disclosure filed by investors against the banks or their executives in all but two cases. The exceptions are BNP Paribas and Goldman Sachs. In the case of Bank of America, Bear Stearns, Lehman Brothers, Merrill Lynch, Deutsche Bank, and Wachovia lawsuits were also filed against the banks' auditors. Of course, shareholder litigation may have ulterior motives.¹¹ However, after the crisis, the SEC, FDIC, and the New York Attorney General filed lawsuits with allegations that were in line with those of investors in their earlier lawsuits. We find lawsuits initiated by a public regulator or prosecutor for 12 of the 20 banks in Table 1. These public lawsuits and enforcement actions are consistent with our characterization of banks' (early) disclosures as misstatements.

In our mind, the misstatements also point to issues with the gatekeepers. For example, the New York Attorney General sued Lehman's auditor Ernst & Young (EY) in December 2010, after former shareholders had already filed class action lawsuits, accusing EY of helping Lehman to "engage in a massive accounting fraud" and misleading investors about the investment bank's financial health. EY agreed to pay \$99 million to settle the class action suits with investors and \$10 million to settle with the New York Attorney General. Among other things, Lehman's auditors accepted that the accounting for the Repo 105 transactions was largely designed to conceal the bank's leverage right around the balance sheet dates. Even if these transactions did not specifically violate GAAP, they were likely misleading investors (see also DeFond et al., 2018). The fact that auditors were willing to sign off on such accounting treatments points to insufficient audit scrutiny

¹¹ Litigations against plaintiffs are generally not brought to court, but settled without plaintiffs admitting or denying any allegations of wrongdoing. Thus, settlements cannot be taken as proof of wrongdoing.

during the crisis. This issue deserves more attention, especially considering the central role that robust auditing plays for the credibility of financial reporting and investor trust.

2.4 The importance of (structured) disclosures

Banks' financial reports are by far not the only source of information through which market participants learn about banks' risk exposures. Trends in CDS spreads and analyst forecasts for banks' risk positions are examples that illustrate that concerns about banks and their risk exposures arose well ahead of banks' own disclosures.

Our analysis suggests that late (or incomplete) disclosures as well as repeated upward revisions in banks' exposures, asset impairments and losses made matters worse and led to an erosion of investor trust. Without trust, investors are more skeptical and even more likely to run on highly levered banks that rely heavily on short-term funding. Moreover, if the market cannot trust that negative information is disclosed, there will be negative externalities for healthy banks. Consistent with our interpretation that the problem during the crisis was not too much information, but instead a lack of reliable disclosures, investors welcomed regulatory initiatives (e.g., stress tests) in the post-crisis period to enhance the transparency of the banking sector.¹²

In our mind, the crisis has two important lessons when it comes to disclosure. First, investors need timely and more complete disclosures about exposures and potential losses.¹³ There also need to be mechanisms that allow banks to convey when they do not have material exposures in a way

¹² Here are two examples that illustrate the point: "With the stress test and the extra information coming from it, we believe the market is beginning to be at a position to differentiate good and bad banks even if they are all in the same country with economic difficulties" (Société Générale, Report on Santander, 7/29/2009). "On the more positive side, the disclosure plans do look impressive this year, with the EBA disclosure template providing much more information than the 2010 equivalent. This should lead to better identification of which banks are actually at risk on the sovereign issue" (Deutsche Bank, Report on BNP Paribas, 7/8/2011).

¹³ One could counter our call for more disclosure with the argument that the recent crisis illustrated that market discipline via transparency does not work. We do not share this view and come back to this point in Section 5.

that investors can trust. Second, the experience with mandatory supervisory disclosures that regulators in both Europe and the U.S. demanded as part of their stress tests illustrates the importance of structured disclosures about nominal exposures. In response to the stress tests, banks (or the supervisors) published templates with standardized information about risk exposures. These rosters of assets were very useful to investors and analysts, enabling them to build their own estimates for the values of banks' assets and hence allowing them to assess the solvency of banks. Analysts often used the disclosed nominal exposures in combination with default probabilities and loss given default estimates, which they developed on their own for certain asset classes. That is, once they had a roster of assets, analysts essentially derived their own FV estimates. This example illustrates that the regulatory debate since the crisis has perhaps focused on the wrong piece of information. In our mind, a granular roster of bank assets and nominal exposures as well as changes therein deserves more attention. Such a template of "quantity" disclosures would ideally be dynamic, i.e., updated regularly, so that it continuously reflects banks' most important risk factors. Instead, the debate tends to be focused on asset values and the valuation methods (e.g., FVA versus HCA). Of course, current bank balance sheets also provide quantity information, but under current accounting rules, these assets are often highly aggregated. Moreover, it is difficult for investors to determine whether changes in asset values from one year (or quarter) to the next stem from purchases, sales, transfers across reporting categories or pure changes in asset values. That is, current disclosures do not clearly separate composition and valuation changes.

3. Loan Loss recognition during the crisis: Incentives versus standards

The rules for loan loss provisioning and recognition received considerable attention during and after the crisis.¹⁴ Banks' recognition of losses was frequently criticized as being too small and coming too late and hence as contributing to procyclicality. The incurred loss model embedded in the prevailing accounting rules were seen as a key reason for this "too-little-too-late" problem, essentially constraining banks' loss recognition (e.g., Dougan, 2009; Financial Stability Forum 2009; Basel Committee on Banking Supervision, 2011; Curry, 2013). In response to this criticism, the FASB and the IASB changed the accounting rules for loans from an incurred loss model to a more forward-looking "expected credit loss model" with the hope that the new approach increases financial stability and reduces procyclicality (e.g., Basel Committee on Banking Supervision, 2015b; FASB, 2016; European Commission, 2016). While the rules have already changed, we still lack evidence that the loss model or loan accounting rules were indeed the primary culprit for the delay in loss recognition. A reluctance to recognize losses on the part of bank managers is another potential explanation. Sorting out the relevance of these explanations is important considering that loans are by far the largest asset category on banks' balance sheets.

In this section, we provide evidence on the timeliness of loan loss recognition during the crisis as well as on banks' incentives to reveal loan losses. We proceed in two steps. First, we benchmark banks' loan loss provisioning and write-downs at the height of the crisis against concurrent market estimates of future loan losses and realized loan losses in future periods. This benchmarking exercise provides further evidence regarding the claim that banks' loss recognition was initially small and hence delayed. Next, we turn to the reasons for the delay and the potential role of the

¹⁴ For instance, the Financial Stability Forum (2009) identified the regulation of loan loss provisioning as an important policy priority to reestablish financial stability. See also Bernanke (2009) and G20 Summit Declaration (2009).

accounting rules. While we cannot directly observe whether the rules constrained banks in their loss recognition, we can analyze banks' disclosure decisions, which are not governed by the same rules or the incurred loss model. Thus, disclosure decisions should be informative with respect to banks' reporting incentives. We also study the results of the European stress tests, which among other things evaluated whether banks had sufficiently impaired their loan portfolios under the prevailing accounting rules. Thus, the stress-test results also shed some light on the question of whether banks were reluctant or constrained. Overall, our analysis points to banks' reporting incentives being an important influence on loss recognition, which has implications for the implementation of the new accounting rules.

3.1 Timeliness of banks' loan loss recognition

We examine the loan loss recognition for a sample of 20 large U.S. banks. We focus on their 2008 financial statements, which were prepared and released early in 2009. At that point in the crisis, it was apparent that banks would sustain substantial loan losses. Moreover, after the government bailout and guarantees for U.S. banks in 2008, banks are likely less concerned about setting off runs and hence more willing to recognize losses.

Table 3, Column C reports banks' allowance for loan losses, which represents the cumulative provisions for loan losses. We benchmark these reported reserves against (i) concurrent market estimates of future loan losses and (ii) realized losses in future periods. Our proxy for concurrent market expectations are estimated loan losses in analyst reports in early 2009 by Citigroup, Goldman Sachs, and Standard & Poor's as well as regulatory assessments from the SCAP stress test. For the analyst reports, the estimates provide a lower bound because the reports typically do not cover the entire loan portfolio (Table 3, Column I). We compute the median estimate, requiring at least two inputs (Table 3, Column J). We see that banks' reported loss expectations are

substantially below this market-based benchmark. Specifically, Column K shows that the ratio of expected loan losses based on market estimates to recognized loan losses varies between 1.47 (First Horizon) and 8.80 (Northern Trust). For the median bank, market-based estimates exceed reported loss estimates by a factor of 3.53, which is a substantial difference.¹⁵

We recognize that market estimates for loan losses at the height of the crisis could substantially overstate actual future loan defaults and losses. Therefore, we also benchmark banks' recognized loan losses against future realized losses. We measure realized loan losses using net charge-offs in subsequent periods. We accumulate net charge-offs from 2009 to 2011 only. Accumulating charge-offs over a three-year period likely captures the majority of realized loan losses from the loan portfolio that US banks held in 2008. It also provides a reasonable trade-off between (i) including charge-offs from loans originated after 2008 and (ii) not including loan defaults from the 2008 loan portfolio that were realized after 2011. Table 3, Column N reports the cumulative net charge-offs for the 20 sample banks. In Column O, we show that the reported loan loss allowance in 2008 is considerably smaller than the realized losses over the next three years. The ratio of future charge-offs to 2008 allowance varies between 1.43 (M&T) and 5.71 (Synovus) and the median is 2.8.

This evidence supports the criticism that banks were late in recognizing their loan losses during the crisis. It is also consistent with related evidence in the literature. Vyas (2011) benchmarks the write-downs of U.S. financial institutions in 2007-2008 against decreases in credit indices and concludes that banks delayed writing down their assets. Similarly, Huizinga and

¹⁵ These findings are consistent with similar analysis for four banks in Laux and Leuz (2010).

Laeven (2012) provide evidence suggesting that banks overvalued their real estate-related assets relative to market assessments of these assets reflected in banks' share prices.

3.2 Why was banks' loss recognition delayed in 2008?

From a regulatory perspective, the key question is why banks delayed their loss recognition early in the crisis. Banks could have been constrained by the incurred loss model embedded in the accounting rules (e.g., Dougan, 2009; Financial Stability Forum 2009; Basel Committee on Banking Supervision, 2011; Curry, 2013).¹⁶ For example, FAS 5 in U.S. GAAP requires losses to be probable, based on past or current events, and estimable, which could restrict banks' ability to record expected credit losses that do not meet the "probable" or "estimable" thresholds. Given the standard refers to past events, this restriction should be particularly relevant in booms and early in a downturn, leading to large increases in loss provisions in a crisis. Based on these arguments, the Financial Crisis Advisory Group to the FASB and the IASB identified the rules for credit loss recognition as a major weakness in U.S. GAAP and IFRS and as a source of procyclicality (FCAG, 2009). For this reason, both standard setters adopted the expected loss model, which requires more forward-looking provisioning for future loan losses.

At this point, it is too early to say whether the expected loss model makes a difference when it comes to procyclicality and financial stability.¹⁷ Instead, we highlight that managerial reporting incentives provide another potential explanation for the delay in banks' loan loss recognition during the crisis. Bank managers have various reasons to be reluctant to recognize loan losses (e.g.,

¹⁶ A similar constraint potentially comes from regulators' Interagency Policy Statement on the Allowance for Loan and Lease Losses (FDIC, 2006) introducing banks' one-year ahead charge-offs as the lower limit for the allowance. Our disclosure tests below apply equally to this constraint.

¹⁷ Two recent papers that simulate whether the expected loss model reduces procyclicality highlight that the results hinge on modeling assumptions and managers' ability to anticipate a crisis sufficiently in advance. See Chae et al. (2018) and Abad and Suarez (2018).

earnings-based bonuses, concerns about their jobs). Loan accounting, like any other accounting rule, provides substantial discretion to bank managers, which they can exploit to avoid the recognition of losses. Hence, managerial reporting incentives could play an important role for observed reporting behavior.¹⁸ Moreover, once we take reporting incentives into account, the loss model in the standards could be less relevant. Managers are likely reluctant to recognize losses, whether they are incurred or expected. Thus, analyzing banks' reporting incentives for loss recognition could provide important and relevant insights.

3.2.1 Evidence on U.S. banks' reporting incentives

It is not possible to directly observe the incentives that managers face when recognizing losses. But we can learn about these incentives by studying banks' disclosures that could convey information about expected loan losses. For U.S. banks, there are two relevant types of disclosures. First, U.S. GAAP requires banks to disclose the FV of the loan portfolio in the notes to the financial statements (FAS 107). Second, the SEC requires that public companies report material corporate events and information on a more current basis using Form 8-K. Importantly, these two disclosures are not constrained by a particular loss model. Thus, if banks managers intended to communicate potential future losses early in the crisis, say in 2007 or 2008, they could have disclosed them through the FV disclosures in notes or in their 8-K filings. Thus, studying these disclosures should be informative about managers' willingness to communicate expected loan losses.

¹⁸ There is substantial cross sectional-variation in the timeliness of loan loss provisions that provides evidence for the discretion (e.g., Beatty and Liao, 2011, Bushman and Williams, 2015, and Gallemore, 2018). There is an extensive literature on the role of reporting incentives and standards in international accounting, which provides a conceptual basis for our discussion here. See, e.g., Ball et al. (2003), Leuz (2003), Burgstahler et al. (2006).

Evidence from FV disclosures

In Table 3, we compute the difference between the book value of the loans (net of the allowance for loan losses) and the corresponding FV of the loans (disclosed in the notes) as a proxy for additional loan losses that bank managers expect beyond those recognized in the allowance. Adding this difference (between Column A and B) to the allowance for loan losses, we obtain the total implied losses that the bank managers report in their financials (Column D).¹⁹

Conceptually, the FV of a loan does not only capture expected credit losses, but also interest rate changes since loan origination. Thus, to the extent that banks adjust the discount rate when computing the FV, the decline in the risk-free rate during the crisis implies that our proxy of implied loan losses underestimates the true expected losses that banks implicitly disclosed with their FV disclosures. However, loans are very illiquid and, as the crisis has shown, involve a systemic risk component. It is therefore also relevant that return spreads between illiquid risky securities and liquid risk-free securities widened during the crisis. For many loan portfolios, it seems plausible that the latter effect dominated the decrease in the risk-free rate, suggesting that the discount rate for loans increased during the crisis. If banks use these increased rates in determining the disclosed FV, our proxy for implied loan losses reflects also illiquidity premia and hence overestimates the expected credit losses.

With these caveats in mind, we compare the total implied losses to the concurrent market estimates. Table 3, Column L, shows that, for seven of the 20 banks, the total implied losses exceed the market estimates. For instance, Capital One reports an implied loss of \$14.6 billion, which exceeds the median market estimate of \$12.4 billion. Thus, in this example, the bank

¹⁹ To illustrate, Capital One reports a FV for the loan portfolio of \$86.4 billion, which is \$10.1 billion below the reported book value. Adding this difference to the allowance of \$4.5 billion, we obtain the total implied loss of \$14.6 billion.

communicated expected loan losses beyond what it recognized in the balance sheet, consistent with the loan accounting rules being a constraint to loss recognition. However, for the median sample bank, the ratio of market estimates to total implied losses is well above one (i.e., 1.84), implying that the market expected substantially more loan losses than what the banks disclosed.

Using future net charge-offs as a benchmark, we find that, for seven banks, total implied losses shown in 2008 exceed actual future losses (and for two more banks the ratio in Column P is close to one). For instance, for Capital One, total implied losses in 2008 were within two percent of actual net charge-offs over the next three years. However, for ten banks, charge-offs over the next three years substantially exceeded the total implied loan losses shown in the 2008 reports, with the median factor being 2.1.

We acknowledge that neither benchmark is perfect, but the picture that emerges from concurrent market estimates and actual future losses is similar. The expected loan losses disclosed by U.S. banks in 2008 were relatively low, even though the FV disclosures in the notes are not constrained by a particular loss model. This interpretation comes with the caveat that FV disclosures for loans likely face less scrutiny than recognized balance sheet numbers and hence may be of lower quality (e.g., Cantrell et al., 2014).

Evidence from 8-K disclosure filings

Regulation S-K in the U.S. requires all SEC registrants to provide current reports using Form 8-K when new information (e.g., a corporate event) emerges. In addition, FAS 5 in U.S. GAAP required banks to disclose (additional) loan losses even when the conditions for recognition of these losses were not met, as long as “there is at least a reasonable possibility that a loss or an

additional loss may have been incurred.”²⁰ Put differently, the probability threshold in FAS 5 for disclosure was substantially lower than for recognition. Thus, if bank managers expected future loan losses but could not recognize them due to the criteria and the incurred loss model of FAS5, they still had a disclosure obligation under FAS 5 or Regulation S-K. In this case, we should see disclosures to precede banks’ loss recognition. Aside from banks’ annual and quarterly reports, 8-K filings are a natural place for banks to provide these disclosures.

We examine all 8-K filings by U.S. commercial banks between 2006 and 2009 that reported material write-downs (under Item 2.06 of the SEC’s 8-K Guidance). In total, we identify 139 8-K reports that include such a disclosure and, of these, 64 relate to loan losses. Other write-down disclosures were mostly related to impairments on AFS securities (not loans). We distinguish between loan loss disclosures that occur in the same quarter as the loss recognition and those that precede a loss recognition. The former are likely profit warnings. For the latter, one could argue that banks disclose losses that are expected but do not yet meet the criteria for recognition in the accounting rules. If banks were indeed constrained by the rules, we should see many of those.

Figure 3 summarizes our findings. The solid black line shows all 8-K reports that banks issued between 2006-Q1 and 2009-Q4 and included loss disclosures (irrespective of the underlying assets). The dotted dark line shows the 8-K reports for which the loss disclosures are related to loans. The dashed gray line shows the 8-K reports with only those loan loss disclosures, for which the bank did not recognize a loan loss in the same quarter. With a very few exceptions (i.e., five reports in 2007), loan loss disclosures accompany the recognition of loan losses in the same quarter. Thus, the vast majority of disclosures alert investors to loan losses or loan impairments to

²⁰ The FAS 5 criteria for recognition were “probable” and “estimable.” The probable threshold was defined as “likely to occur” and typically interpreted as being higher than 50%. See EITF D-80, Ryan and Keeley (2013), Wall (2013).

be recognized in the upcoming quarterly financial statements (like the Merrill Lynch report on October 5, 2007). Put differently, at the time of the 8-K filing, these losses were already incurred (i.e., met the conditions in the accounting rules). There is very little evidence that banks provided disclosures about (additional) expected credit losses before the losses were also recognized (and hence incurred as defined by the rules). This evidence is again consistent with the reporting incentives view that banks were reluctant to report expected losses.²¹

SEC enforcement actions and lawsuits

The disclosure evidence above puts a question mark behind the narrative that banks were constrained in their loss recognition by the accounting rules (e.g., due to the incurred loss model). In this regard, SEC enforcement actions and lawsuits could provide another piece of (anecdotal) evidence. If banks' loss recognition was the result of them following the rules, then there are fewer legitimate grounds to sue banks for the delay after the crisis. It is of course conceivable that shareholders bring lawsuits for ulterior reasons even when banks followed the accounting rules. Arguably, such actions are less likely when it comes to the SEC, the Department of Justice or an Attorney General (see also discussion in Section 2).

Thus, it is telling that 5 out of 10 U.S. sample banks in Table 1, Panel A, faced litigation or enforcement actions by a U.S. regulator or the U.S. government for misstatements (and 3 of the other 5 banks ceased to exist and hence could probably no longer be prosecuted). These legal actions were not always based on banks' loan loss recognition, but they nevertheless illustrate that regulators and the government considered banks' reporting to be misleading to investors. Such

²¹ We also note that the cross-sectional variation in banks' loss recognition illustrated in Table 3 is consistent with banks exercising substantial discretion in the application of the accounting rules. Similarly, Bierey and Schmidt (2017) document that impairments on Greek government bonds vary substantially across European banks even when the underlying instrument is the same, again consistent with banks using substantial discretion.

evidence is consistent with the reporting incentives argument. In addition, we provide a few more examples in which the legal actions pertain to banks' loan loss recognition:

In April 2009, the SEC charges American Home Mortgage with accounting fraud and misleading investors about the company's deteriorating financial condition as the subprime crisis emerged. The SEC claims that executives intentionally understated the company's reserves despite knowing that American Home Mortgage's own internal analysis showed that the company needed at least \$38 million in additional reserves. The analysis also showed that the company's losses on its delinquent second liens were mounting quickly and that American Home Mortgage would lose at least 72 percent of the value of these loans after the properties went through foreclosure. Executives knowingly failed to reserve adequately for the expected losses caused by the company's delinquent loans. Executives also misled American Home Mortgage's auditor about the adequacy of the reserves for the first quarter of 2007.

In 2012, the SEC charged three former bank executives of TierOne Bank for understating losses and misleading investors and federal regulators at the height of the financial crisis. TierOne's regulator, the Office of Thrift Supervision (OTS), required TierOne to maintain higher capital ratios to deal with high-risk problem loans. To comply with the higher capital requirements, TierOne executives disregarded information that the collateral values of certain TierOne loans were overvalued, and avoided the necessary write-down. TierOne's losses became public late 2009 after OTS required TierOne to obtain new appraisals for its impaired loans. TierOne, in turn, disclosed more than \$130 million in loan losses. Had these loss provisions been booked in the proper quarters, the bank would have missed its required capital ratios as far back as the fourth quarter of 2008.

In 2013, the SEC also charged two KPMG auditors for their roles in the failed audit of TierOne Bank. The SEC's investigation found that the auditors failed to appropriately scrutinize management's estimates of TierOne's allowance for loan and lease losses, arguing that the auditors "merely rubber-stamped TierOne's collateral value estimates and ignored the red flags surrounding the bank's troubled real estate loans," (Robert Khuzami, Director of the SEC's Division of Enforcement.)

3.2.2 Evidence from the ECB's Asset Quality Review of European banks

The discussion in the previous section provides evidence on U.S. banks' reporting incentives and their reluctance to reveal loan losses, but it is indirect when it comes to the question of whether the delay in loan loss recognition reflected a "neutral" or proper application of the accounting

rules. In this regard, the ECB's Asset Quality Review (AQR) for European banks offers additional insights because it essentially entailed an independent assessment of banks' loan loss recognition and provisioning. The AQR was an important part of the so-called Comprehensive Assessment that the ECB conducted when it took over the supervision of the most significant EU banks. The objective of the assessment was to enhance the transparency of bank exposures and assure that banks fulfill the ECB thresholds in Pillar 2 capital requirements. The AQR investigated shortfalls in the banks' 2013 financial statements relative to ECB thresholds, specifically for loan loss provisioning, adjustments for counterparty risk, and FV adjustments. National supervisors were responsible for ensuring that the guidelines of the review were followed at the bank level. The ECB published the results of both the stress test and the AQR on October 26, 2014.

Importantly for our purposes, the AQR was based on "the relevant accounting principles" at the time, which means IAS 39 for IFRS-reporting banks (ECB, AQR Guidelines, p. 8-9). Thus, any shortfalls that the AQR identified stem from the ECB's interpretation of the accounting rules; they do not reflect a stress scenario or additional regulatory buffers. As a result, we can interpret shortfalls as illustrating that banks used managerial judgment and less strict interpretations of the prevailing rules to overstate their loan portfolios. Thus, the AQR provides a way to gauge the role of reporting incentives in banks' loss recognition (relative to extant rules).

Table 4 presents the AQR results for 20 large European banks. The fourth column shows that the AQR adjusted the loan loss provisions uniformly upwards. Table 4 shows that the adjustments were material relative to a number of benchmarks. Thus, even when assessing banks' loan loss recognition under the constraints of the existing rules (which were based on the incurred loss model), banks' loan portfolios were overstated, relative to the ECB's interpretation of the

accounting rules. This evidence does not seem consistent with the view that banks were constrained by the rules.

3.3 The importance of reporting incentives and enforcement

The picture that emerges in this section is more consistent with the incentives explanation for banks' delayed loan loss recognition. This picture is also consistent with the evidence in Section 2. Overall, banks seem to have been reluctant to communicate and recognize their losses. This conclusion with respect to banks' reporting incentives, especially at the outset of a financial crisis, has important implications going forward. First, it suggests that enforcement by securities regulators, bank supervisors and auditors deserves much more attention in the regulatory debate (see also Costello et al., 2018). Second, it suggests that changing the accounting rules (or the loss model) will likely have limited impact on financial stability.

The regulatory response after the crisis largely focused on the accounting rules (e.g., the adoption of the expected loss model in IFRS and U.S. GAAP), rather than on mechanisms that change banks' reluctance to report losses and impairments. While the expected loss model shifts the recognition of loan losses to earlier periods, the forward-looking nature of the approach implies even more managerial judgment and flexibility in the measurement of expected loan losses. The evidence in this section suggests that banks used accounting discretion to understate recognized losses in the notes or in their 8-K filings (even when they do not have direct regulatory implications). Thus, we have to ask why this tendency would not also be a concern when banks operate under an expected loss model.²² For this reason, the new accounting rules need to be

²² That said, it is possible that the effects are stronger under the incurred loss model, if it interacts with banks' reluctance to recognize losses, essentially providing a convenient "explanation" for small and delayed impairments. We need more research to explore this question.

accompanied by changes in enforcement by auditors, regulators and supervisors, if they are to have the intended effects.

However, even if the introduction of an expected loss approach significantly changes banks' provisioning behavior, we do not know whether more timely impairments would have truly made a difference during the crisis or whether more timely loss recognition reduces the procyclicality of lending.²³ The literature provides evidence consistent with this notion. For example, Beatty and Liao (2011) and Bushman and Williams (2015) find that banks with timelier loss provisions are more willing to lend in a downturn and have lower systemic risk contributions. However, as Acharya and Ryan (2016) point out, these findings face a number of identification challenges and are far from settled. For one, these studies rely on cross-sectional and hence largely discretionary (or voluntary) variation in the timeliness of loan loss provisions, which raises selection concerns. It is not clear that forcing banks to recognize loan loss provisions on a timelier basis, as the new standards intend to do, will have the same effect. Future research needs to explore this important issue and establish more firmly that there is a link between loss provisioning and bank behavior, such as lending and risk taking, which in turn is central for the role of accounting measurement in financial stability.

4. Bank accounting and capital regulation

Bank accounting and capital regulation interact in a number of ways. For one, capital regulation is a key channel through which the accounting rules could affect bank behavior. Book equity as determined by the accounting rules generally serves as the starting point when computing banks' regulatory capital. Regulators can then apply prudential filters to adjust book equity (e.g.,

²³ The change in the rules and the expected loss model could matter in regulatory stress tests. As the simulations are based on the rules and conducted by the regulator, banks' reporting incentives play a smaller role.

exclude intangibles, deferred tax assets). A prominent filter is the “add-back” of FV losses from AFS debt securities in the computation of regulatory capital. While such filters shield regulatory capital from certain negative market shocks, they could also hurt incentives for corrective actions. Thus, understanding the effects of filters is important from a financial stability perspective. Moreover, an analysis of filter effects could speak to the more general tradeoff in bank regulation between inducing corrective actions versus triggering downward spirals.

In this section, we take a step in this direction and study whether filters alter the link between losses and banks’ corrective actions. At present, we have little evidence how prudential filters affect bank behavior or financial stability. We exploit cross-sectional and intertemporal variation in countries’ prudential filters for losses on AFS securities and analyze whether they mediate the association between AFS losses and banks’ corrective actions. While our analysis cannot establish causality, our evidence suggests there is a tradeoff for filters when it comes to corrective actions.

Another prominent area in which capital regulation and accounting interact is securitization. Prior work shows that the regulatory treatment influences how securitizations are structured and in turn accounted for (e.g., Landsman et al., 2008; Acharya and Schnabl, 2010). We point to a lesser known case where capital regulation and accounting interact. Bank regulation distinguishes between assets in the trading book and in the banking book. The two books differ with respect to the risk weights in capital regulation. We highlight that the tilt in risk weights prior to the crisis may have given banks an incentive to put illiquid assets in the trading book, which implied that they had to be fair valued. Overall, our discussion highlights that these interactions between capital regulation and accounting deserve attention in the regulatory debate.

Our analysis in this section is related to evidence for insurance companies pointing to important interactions between accounting and prudential regulation. Merrill et al. (2014) and Ellul

et al. (2015) show that property and casualty insurance companies, for which FV losses have more direct regulatory implications than for life insurance companies, are more likely to sell downgraded assets with price declines.²⁴ Moreover, U.S. life insurers, which are subject to more HCA, exhibit more risk taking in the pre-crisis period (Ellul et al., 2014) and disproportionately engage in gains trading in the financial crisis (Ellul et al., 2015).

4.1 Prudential filters for AFS securities and banks' corrective actions

IFRS and U.S. GAAP require banks to report FV gains and losses of AFS securities in *Other Comprehensive Income* (OCI) and to accumulate these gains and losses in separate equity reserves. So-called AOCI filters set by the prudential regulators determine the fraction of accumulated unrealized FV gains and losses that are excluded from regulatory capital.

AOCI filters are important because AFS securities typically are the largest group of securities for banks (e.g., Laux and Leuz, 2010). The underlying rationale for shielding regulatory capital from FV losses is to prevent fire sales and downward spirals when the FV of AFS securities declines. At the same time, filters could reduce managers' incentives to take corrective actions in response to FV declines, especially early in or ahead of a crisis.²⁵ That is, when FV losses of AFS (and HTM) debt securities do not reduce regulatory capital, bank managers could feel less pressure to raise capital or to reduce dividend payments and risk exposures. As a result, prudential filters could also distort incentives and, thus, be harmful for financial stability.

This tradeoff explains the continued regulatory debate about prudential filters. After the crisis,

²⁴ Interestingly, the evidence for life insurers is similar to the evidence for banks, for which AOCI filters generally shield capital from FV losses. Badertscher et al. (2012) and Abbassi et al. (2016) find little evidence of fire sales for European or U.S. banks and show that banks increase their securities holdings during the crisis.

²⁵ Moreover, if unrealized losses are excluded from regulatory capital, banks could also have incentives to avoid the sale of these securities and engage in opportunistic gains trading (e.g., Barth et al., 2017; Dong and Zhang, 2018).

U.S. bank regulators adopted Basel III regulation, which eliminates prudential filters. But due to fierce opposition from banks, U.S. bank regulators eventually granted a one-time option to retain the AOCI filter for banks using a non-advanced approach in the calculation of risk-weights.²⁶ Nearly all eligible U.S. banks chose this option (Kim et al. 2018). Thus, understanding the effects of AOCI filters continues to be of practical importance.

Institutional Setting

There are significant differences in AOCI filters for accumulated losses from AFS debt securities across countries (e.g., Argimon et al., 2018; Bischof et al., 2018). In addition, some countries adjusted these filters during the crisis. We exploit this cross-sectional and intertemporal variation in AOCI filters to examine whether prudential filters affect banks' corrective actions. Towards this end, we analyze reductions in dividends, risk-weighted assets (RWA), leverage, and equity raising. Reducing dividends is an important way for banks to preserve capital. In fact, U.S. banks were criticized for delaying dividend cuts during the financial crisis (e.g., Acharya et al., 2011). In addition, banks can raise new equity or sell assets and repay debt to reduce leverage. Moreover, banks can reduce the risk of the assets they hold. Hence, we use the ratio of RWA to total assets as a proxy for the banks' asset risk (e.g., Acharya and Steffen, 2015).

Sample and data

We start with data on prudential filters for AFS debt securities reported under IFRS from Bischof et al. (2018), which are available for 39 countries. BvD Bankscope covers 32,525 firm-years for 3,414 IFRS-reporting banks from these 39 countries for the period from 2001 to 2016.

²⁶ Chircop and Novotny-Farkas (2016) analyze market reactions around the announcement by U.S. regulators to adopt Basel III regulation and include unrealized FV gains and losses on AFS securities in regulatory capital. On average, market reactions are negative. However, this evidence is difficult to interpret in light of concurrent events. Moreover, the effects for shareholders and tax payers are not necessarily aligned.

To avoid double counting, we exclude 7,234 firm-years from 1,011 banks that are consolidated into the IFRS group accounts of another sample bank. We lose an additional 22,362 firm-years because of missing data for some variables. Our final sample comprises 2,929 firm-years and 740 distinct banks from 38 countries. We winsorize all variables at the 1% and 99% level.

For our analyses, we distinguish between countries with a 100% filter for losses from AFS debt securities (17 countries) and countries with less extensive filters (15 countries with a 0% filter and two countries with a 55% filter). We identify four countries with changes in their AOCI filters during our sample period: Germany and Portugal in 2009, Italy and Spain in 2010. In all four cases, countries introduced a 100% filter. We ignore other prudential filters (e.g., for AFS equity securities or accumulated gains from AFS debt securities) because (1) equities represent a much smaller fraction of banks' assets and (2) there is much less variation in other filters across countries (e.g., very few countries exclude unrealized gains and losses from AFS equities from capital).

We compare the characteristics of banks in countries with a 100% AOCI filter and those in countries with less extensive filters, using fiscal year 2006 as our benchmark. As Table 5 shows, there are systematic differences in the banks of these two groups. Banks in countries with AOCI filters are larger, rely on more short-term funding, and are more weakly capitalized. There are also differences in banks' asset compositions. The fraction of AFS securities and trading securities is on average larger in countries that apply a 100% AOCI filter.

Comparing the volatility of banks' capital ratios across countries with different filters is also interesting. Given filters mechanically shield regulatory capital against the volatility of FV assets, one might expect the volatility of the regulatory capital ratios to differ more between banks from the two country groups than the volatility of accounting equity (which includes AOCI for both groups). However, our descriptive statistics are not consistent with this expectation or the notion

that prudential filters reduce the volatility of regulatory capital ratios. Both bank groups exhibit comparable volatility in the accounting equity ratios (3.86 vs. 3.83) and in the regulatory capital ratios (4.90 vs. 4.56 for tier 1 capital). This evidence is descriptive and needs to be interpreted cautiously because other factors and characteristics can influence the volatility of capital ratios. However, it does raise the question of whether the effects of filters on bank risk taking outweigh their mechanical effects in reducing volatility.

Research Design

The idea of our analysis is to examine whether filters alter banks' corrective actions in response to AFS losses. Thus, we estimate the association between current corrective actions and lagged (or current) AFS losses and then test whether this association varies with the existence of a 100% AOCI filter. We estimate the following regression model:

$$\begin{aligned}
 \text{Corrective Action Score}_{i,t} = & \alpha + \beta_1 \cdot \text{AFS Loss}_{i,t-1} + \beta_2 \cdot \text{AFS Loss}_{i,t-1} \cdot \text{Prudential Filter}_{i,t-1} \\
 & + \beta_3 \cdot \text{AFS Loss}_{i,t} + \beta_4 \cdot \text{AFS Loss}_{i,t} \cdot \text{Prudential Filter}_{i,t-1} \\
 & + \beta_5 \cdot \text{Prudential Filter}_{i,t-1} + \beta_6 \text{ Controls}_{i,t} + \gamma_i + \delta_t + \varepsilon_{i,t}
 \end{aligned} \tag{1}$$

where i denotes the individual bank and t denotes the fiscal year. We define corrective actions as *Dividend Cuts* (if *Dividend Payouts* are lower than in the previous period), *RWA Cuts* (if *Risk-Weighted Assets* are lower than in the previous period), *Leverage Cuts* (if *Leverage* is lower than in the previous period), and *Capital Raising* (if *Share Capital* is larger than in the previous period).²⁷ The *Corrective Action Score* (# *Cuts*) is the sum of the values of *Dividend Cuts*, *RWA Cuts*, *Leverage Cuts*, and *Capital Raising* scaled by 4. *AFS Loss* takes a value of 1 if the sum of realized and unrealized gains and losses from AFS assets in the respective year is negative, zero

²⁷ See Table 6 for detailed definitions of the variables.

otherwise. *Prudential Filter* is an indicator variable that takes a value of 1 if capital regulation in a bank's domicile in a given year excludes 100% of the FV losses of AFS debt securities from regulatory capital (AOCI filter), zero otherwise.

If an AFS loss in the previous (current) period induces bank managers to take corrective actions, we should observe a positive coefficient estimate for β_1 (β_3). If prudential filters mute this relation, we expect a negative coefficient estimate for β_2 (β_4). In untabulated analyses, we find that AFS losses exhibit parallel trends or patterns over the sample period across the two filter groups, which is reassuring. As a robustness check, we also estimate a continuous version of our regression model in (1). We estimate the following regression model:

$$\begin{aligned}
 \text{Risk-Taking Score}_{i,t} = & \alpha + \beta_1 \cdot \text{AFS Result}_{i,t-1} + \beta_2 \cdot \text{AFS Result}_{i,t-1} \cdot \text{Prudential Filter}_{i,t-1} \\
 & + \beta_3 \cdot \text{AFS Result}_{i,t} + \beta_4 \cdot \text{AFS Result}_{i,t} \cdot \text{Prudential Filter}_{i,t-1} \\
 & + \beta_5 \cdot \text{Prudential Filter}_{i,t-1} + \beta_6 \text{ Controls}_{i,t} + \gamma_i + \delta_t + \varepsilon_{i,t}
 \end{aligned} \tag{2}$$

where i again denotes the individual bank and t denotes the fiscal year. We create a composite *Risk-Taking Score (PCA)* for each firm year, which combines the four components *Dividend Payouts*, *Risk-Weighted Assets*, *Leverage*, and *Share Capital* using principal components analysis. We sum the scores of the first two principal components, each weighted by the relative magnitude of their eigenvalues. The composite score increases in *Dividend Payouts* and *Risk-Weighted Assets* and decreases in *Leverage* and *Share Capital*. Higher values for the composite score indicate more risk taking and fewer corrective actions. *AFS Result* is the sum of realized and unrealized gains and losses from AFS assets during the current period, scaled by total assets. As specification (2) inverts the left- and right-hand side variables relative to the regression model in (1), we again expect positive coefficient estimates on lagged and current AFS results. If prudential filters mute this relation, we expect negative coefficient estimates for β_2 and β_4 .

In both models, we include control variables for the concurrent performance in the trading portfolio, return on assets, capital adequacy, and size. We interact the controls for capital adequacy and size with the *Prudential Filter* indicator to capture potential differences in bank characteristics across the two groups of countries. All specifications include year- and firm-fixed effects. We cluster standard errors by country. We define all control variables in the notes to Table 6 and provide summary statistics in the appendix for all variables used in the analysis.

Results and discussion

Table 6 presents the results from model (1) in Columns 1 to 3 and from model (2) in Column 4. Past losses from AFS securities are positively associated with the summary score for dividend cuts, RWA cuts, leverage cuts, and capital raising in all three specifications (significant at the 1% level). This finding is consistent with the notion that banks respond to AFS losses with corrective actions. However, this relation is muted or essentially undone for banks in countries with a 100% AOCI filter, for which the interaction is significantly negative and of a similar magnitude. The main effect is weaker for current AFS losses but the interaction is again significantly negative. Moreover, as the specification is based on a loss dummy, we check in Column 3 that the results are robust to controlling for the level of the AFS result and its interaction with the filter indicator.

The results are very similar when we estimate a continuous version of this analysis using the composite risk-taking score and the magnitude of the AFS result (model 2). The composite score for risk taking is positively associated with both the lagged and current AFS result (statistically significant at the 1% level). The interaction of $AFS\ Result_{i,t-1}$ with $Prudential\ Filter_{i,t-1}$ is statistically insignificant but negative and sizeable. The interaction of $AFS\ Result_{i,t}$ with $Prudential\ Filter_{i,t-1}$ is negative and statistically significant (at the 1% level). These results are again consistent with the idea that prudential filters mute incentives for early corrective actions.

In untabulated tests, we find that the results hold when we restrict the sample period to the years from 2006 to 2008, but naturally the statistical significance decreases due the decrease in sample size from 2,198 to 577. In addition, we estimate the coefficient for the main variable of interest (β_2), i.e., the interaction of the lagged AFS loss (or result) with prudential filters, over time. We plot these estimates in Figure 4 and find that the negative interaction stems primarily from the years 2006 and 2011 onwards. This pattern is reassuring as 2006 and to a lesser extent 2011 and 2013 were years for which AFS losses were more prevalent and AFS results declined. More importantly, this pattern suggests an interesting link between central bank policy and banks' corrective actions (when there is no AOCI filter). As central banks raise interest rates towards the peak of an economic boom, banks experience lower AFS results or even AFS losses, which in turn makes it more likely that banks in countries without filters take corrective actions. We leave it for future research to explore this mechanism in more detail.

In sum, with a 100% AOCI filter, banks appear to be less inclined to take corrective actions in response to AFS losses, such as cutting dividends, reducing leverage and RWAs, or raising new capital. While our analysis does not feature causal identification, our findings are consistent with the notion that bank managers have stronger incentives to take early corrective actions when FV losses are not completely filtered and reduce regulatory capital. As such, our evidence highlights that prudential filters can have side effects. We acknowledge that corrective actions, if they come too late, could also involve fire sales of AFS securities, which in turn could create problems. We do not have the data to examine this possibility.²⁸ However, at a minimum, the side (or incentive) effects of prudential filters need to be part of the regulatory debate as they question the notion that

²⁸ There is little evidence of fire sales by banks during the financial crisis (see Fn. 24). However, it is possible that banks held on to AFS securities in part due to the presence of AOCI filters. We need more research into this matter.

prudential filters necessarily foster financial stability.

4.2 Regulatory incentives to use FVA prior to the crisis

The regulatory debate often focuses on implications of the accounting rules for prudential regulation (e.g., the debate about the expected credit loss model).²⁹ But the interactions can go in both directions. Prudential regulation can also influence accounting measurement and banks' accounting choices. We point to differences in regulatory risk weights for assets in the trading book and in the banking book as a lesser known example. Differential risk weights can affect banks' classification decisions for securities, which in turn influences the measurement base and the accounting for these securities. Thus, if accounting measurement of bank assets (e.g., at FV) has implications for financial stability, then it is important to consider the incentive effects from prudential regulation with respect to banks' accounting treatments.

We highlight this issue with a specific example provided in the Turner Review (British Financial Services Authority [FSA], 2009). The British FSA solicited the Turner Review to investigate problems with prudential regulation in the period leading up to the crisis. The Turner Review among other things suggests that, prior to crisis, the Basel II framework provided in some instances favorable risk weights for assets classified in the trading book relative to the banking book. This tilt in the capital requirements was in place for European banks that chose to apply internal risk models (and the underlying VaR simulations), rather than the standard approach for the measurement of market risk. Importantly, European banks using internal models were often large and systemically relevant (Behn et al., 2016). For these banks, capital requirements for a

²⁹ Two exceptions are recent papers by Hamilton (2018) and Kim et al. (2018) showing that banks reclassify assets from AFS to HTM after the removal of prudential filters. The ensuing trading restrictions that comes with the HTM classification can have real effects, altering banks' asset portfolio and refinancing choices.

given instrument were generally lower in the trading book than in the banking book. This tilt likely incentivized managers to classify assets into the trading book. The Turner Review in Exhibit 1.12 provides descriptive evidence illustrating the tilt in capital requirements. It shows, for a small sample of four banks, that the market-risk capital requirements were only 0.4-1.1% of these banks' trading assets. As a result, trading assets that made up on average close to 37% of banks' balance sheet assets contributed on average only 7.3% of the total capital requirements. Viewed from this perspective, it is perhaps not surprising that most of the growth in assets and leverage came from banks' trading books (British Financial Services Authority, 2009).

The importance of this example for our paper is that favorable regulatory risk weights for assets in the trading book likely had accounting consequences. In principle, the regulatory classification of an asset is independent from its accounting classification for financial reporting purposes. However, bank regulation (such as Basel II and III) prescribes that assets in the trading book are measured at FV when determining the minimum regulatory capital requirements (e.g., Basel Committee on Banking Supervision, 2006, para. 693). Moreover, both classification systems refer to managers' trading intent as the key criterion, which likely provides incentives to choose a consistent classification for each asset for regulatory and financial reporting purposes. Doing so would certainly reduce complexities in the internal reporting systems. Anecdotally, auditors regard a regulatory classification in the trading book as evidence for managers' trading intent when reviewing the bank's financial accounting classification, setting further incentives for consistency.

Thus, it is conceivable that banks classified assets that were rarely traded (e.g., mortgage-backed securities) into the trading book to receive favorable regulatory treatment, but then struggled to determine the FV for these assets as market liquidity dried up completely during the financial crisis. Put differently, some of the assets in the trading category probably should have

been in the banking book where they would not have required FV measurement had it not been for the tilt in capital requirements. It is difficult to provide empirical evidence for this conjecture. Banks only recently started providing more details reconciling financial statement and regulatory classifications.³⁰ However, if the conjecture is correct, banks' valuation difficulties during the crisis stemmed in part from their own classification decisions, which in turn were driven by favorable risk weights in the trading book.

Our point is not that using FVA for relatively illiquid assets is necessarily a problem. As discussed in previous section, FV losses can provide incentives for early corrective actions. The broader point is rather that biases in assets' regulatory treatment can influence bank accounting and that this interaction deserves further attention by both prudential regulators and accounting standard setters.³¹ Moreover, the crisis brought to light that the intent-based distinction between the two books was a clear weakness in bank regulation. The Basel Committee on Banking Supervision (2013) notes in its review after the crisis that "trading intent has proven to be an inherently subjective criterion that is difficult to police and insufficiently restrictive from a prudential perspective in some jurisdictions. Coupled with large differences in capital requirements against similar types of risk on either side of the boundary, the overall capital framework proved susceptible to arbitrage before and during the crisis." Consistent with our point here, Basel IV discusses tighter rules for the initial allocation to the two books as well as the reallocation of instruments between the books (e.g., PwC, 2017).

³⁰ This trend probably reflects the recent revision of the Pillar 3 disclosure requirements under the Basel III framework (requiring more detail on the interlinkage between financial statements and regulatory exposures in Template LI1; Basel Committee on Banking Supervision, 2015b). Before, banks rarely provided information on the regulatory trading book voluntarily. See Deutsche Bank's annual report in 2013 as a rare example.

³¹ The Basel III framework eliminates the tilt in favor of the trading book and, if anything, provides a tilt in the opposite direction, favoring banking book assets. Thus, the point remains relevant though the tilt has changed.

5. Conclusion and suggestions for future research

This paper investigates what we can learn from the financial crisis about the link between accounting and financial stability. The picture that emerges ten years later is substantially different from the picture that dominated the accounting and regulatory debate during and shortly after the crisis. We have since learned that FVA was largely a scapegoat and that there is no evidence that it significantly contributed to the financial crisis or its severity. However, this conclusion does not imply that there were no problems related to banks' accounting and financial reporting.

Our analysis suggests that banks' disclosures about relevant risk exposures and their recognition of losses came relatively late. It appears that banks were reluctant to communicate and recognize their losses and that this delay in disclosure and loss recognition was likely a bigger problem than the converse. Our discussion points to the importance of recognizing banks' reporting incentives, especially at the beginning of a financial crisis. In this situation, enforcement by auditors, securities regulators and bank supervisors plays an important role and deserves more attention. In addition, we present novel evidence that prudential filters may have dampened banks' incentives for corrective actions early in the crisis.

An overarching theme of our paper is that measures that are intended to improve financial stability ex post when the crisis is in full swing often have unintended side effects when it comes to banks' actions ex ante or when the crisis may still be averted. Thus, a review of what happened during the crisis holds a number of important lessons and points to several regulatory challenges going forward. In addition, there are opportunities for future research. Below we discuss three themes and fruitful avenues that are closely related to our discussions in this paper.

5.1 Role of loss recognition in triggering corrective actions

Once debt overhang problems arise for one or several banks, disclosures or financial reports alone can do little to resolve them.³² Thus, the debate should focus on the role of accounting, be it through disclosure, measurement, or recognition, at an earlier stage. In particular, the question is whether accounting can contribute to financial stability by providing banks with incentives to reduce risk-taking, take corrective actions early or avoid debt overhang problems in the first place.

An example is our evidence in Section 4 suggesting that prudential filters may have dampened banks' incentives to take prompt corrective actions precisely because they shielded banks' regulatory capital. Our evidence is only a start and we need to understand much better how the recognition of losses affects bank behavior, especially early in the crisis. There is some evidence on the role of financial reporting on bank decisions in normal times, examining the introduction of SFAS 115 and the removal of AOCI filters for advanced approaches banks in the US.³³ We need more work of this kind and, in particular, evidence on how disclosure or accounting measurement can influence bank behavior as a crisis unfolds.

There are several challenges when attempting to provide banks with incentives to act early. First, while corrective actions may address the problems, it is well known that they could also serve as a signal that the bank experiences difficulties, which in turn could destabilize the bank and counteract the corrective measures. Especially banks with a heavy reliance on short-term funding will try to avoid actions that suggest they could be in trouble (such as cutting dividends or raising capital). Thus, early actions have to come early enough so that the bank does not run into

³² Of course, reliable information about banks' assets and liabilities can help the resolution of overhang problems through restructuring, selling or liquidation (e.g., Granja, 2013). But for such actions, supervisors and creditors typically have access to internal information and do not solely rely on public disclosures and reports.

³³ See, for example, Beatty (1995), Hodder et al. (2002), Chircop and Novotny-Farkas (2016), and Kim et al. (2018).

problems even if investors interpret the actions as a negative signal. In this regard, it is important to think about banks' incentives to report information that would trigger corrective actions. Our evidence suggests that banks often have a tendency to delay the disclosure and recognition of losses. This point applies also to the new expected loss model for loan accounting, which will work only if banks have an incentive to properly anticipate future losses, both in booms and when the economy begins to cool down. Therefore, enforcement and bank governance are important instruments for future research to study. Another area is the interaction between risk management and accounting. Along these lines, Khan et al. (2018) argue that more extensive use of FV measurements induced property and casualty insurance companies to invest in better information and control systems, which improved risk management. Indeed, there are similar hopes that the expected loan loss model could improve banks' risk management (e.g., ESRB Report, 2017).

5.2 Disclosure and market discipline

Incentives for early corrective actions can come not only from accounting measurement and loss recognition, but also from disclosures. Regulators have recently expanded the disclosure requirements for banks (e.g., Pillar 3 of the Basel III Framework), asking them to disclose risk positions in more detail and in a more standardized format. The underlying idea is to strengthen market discipline. The continued reliance on market discipline in bank regulation may be surprising as one could argue that market discipline did not work ahead of the previous crisis. What are potential reasons for this failure?

First, sufficient disclosure requirements may have been missing. Second, in the boom leading up to the crisis, investors, as well as regulators, and bank CEOs may have underestimated the risks (e.g., Bordalo et al., 2018; Gennaioli and Shleifer, 2108). Third, it is possible that investors primarily fixate on recognition (i.e., income statement and balance sheet) and pay less attention to

disclosures. However, empirical evidence in the disclosure literature generally does not support this argument. For instance, there is evidence that the market adjusts accounting numbers when calculating leverage ratios (e.g., Blankespoor et al., 2013) and the market pricing of Level 3 fair values is not consistent with the view that investors naively interpret the numbers (e.g., Song et al., 2010). Fourth, and perhaps most importantly, government guarantees and implicit bailout expectations impede market discipline (e.g., Martinez-Peria and Schmukler, 2001; Demirgüç-Kunt and Huizinga, 2004; Martin et al., 2018). For disclosure to facilitate market discipline, investors need incentives to act upon the information.

In the pre-crisis period, market discipline was probably not given much of a chance, and hence it is likely also not a good time period to study the effects of market discipline. We nevertheless need more research on the role of market discipline and encourage researchers to seek settings, in which the concern about the incentives of market participants does not apply. One example is Granja (2018). He studies the effects of disclosure regulation on financial stability during the National Banking era in the U.S., which is before extensive implicit and explicit government guarantees arose. His results suggest that transparency leads to more stability and fewer failures and, thus, provide at least indirect evidence that disclosure can play an important role in disciplining bank managers' risk-taking.

5.3 Accounting measurement and funding structure

Following the crisis and despite an overhaul of key accounting standards (e.g., IFRS 9), the rules still seem to rely on the logic that FV is not relevant when banks do not intend to sell the asset or when banks have certain business models. For instance, IFRS 9 stipulates that if a bank has the intent to hold the asset until its maturity to collect its contractual cash flows, then it is not required to measure the asset at FV (if the asset's cash flows meet additional criteria). Thus, the

classification rule is still heavily based on intent and in this regard quite similar to the former “held-to-maturity” category. The continued reliance on managerial intent is surprising considering that this classification has proven to be problematic in the crisis (e.g., Basel Committee on Banking Supervision, 2013).

But even beyond practical and enforcement considerations, we highlight an important conceptual issue that deserves attention by future research. Most banks finance their assets with a substantial amount of short-term debt, even beyond retail deposits. As a result, the intention to collect the assets’ cash flows at maturity also depends on bank’s ability to constantly roll over its short-term debt, which is akin to refinancing the assets. The more highly levered the bank and the higher the fraction of short-term debt, the more the ability to refinance debt depends on the assets’ current values. Thus, it is not clear that the FV is not relevant even if the management has the intention to hold the assets for the collection of the cash flows. While the standard setter explicitly mentions the “ability” to hold an asset until maturity in addition to intent, this “ability” can quickly change in a crisis when the bank relies on short-term funding. Moreover, auditors or regulators could be reluctant to question a bank’s “ability” to hold on to the assets at the beginning of a crisis given the potential adverse consequences. These arguments illustrate that the measurement of asset values is not independent of a bank’s funding structure.

In sum, the funding structure plays an important role for a bank’s ability to hold on to assets in adverse markets. It could provide a more objective criterion and, from a financial stability perspective, the funding structure of a bank seems more relevant than managerial intent (or business model) alone. Thus, an important issue for further research is to study the interactions between accounting measurement and bank funding structure.³⁴

³⁴ The 11th Geneva Report on the World Economy proposes such an accounting concept (Brunnermeier et al., 2009).

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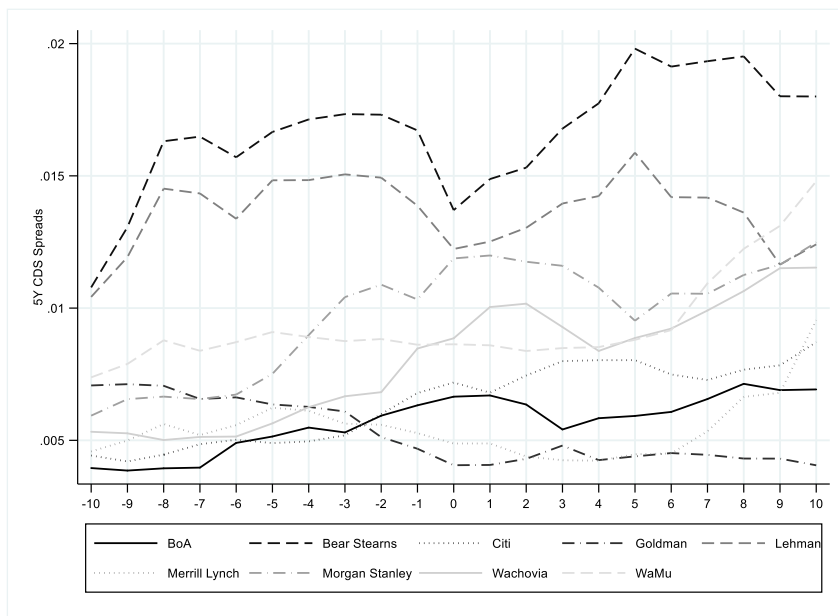
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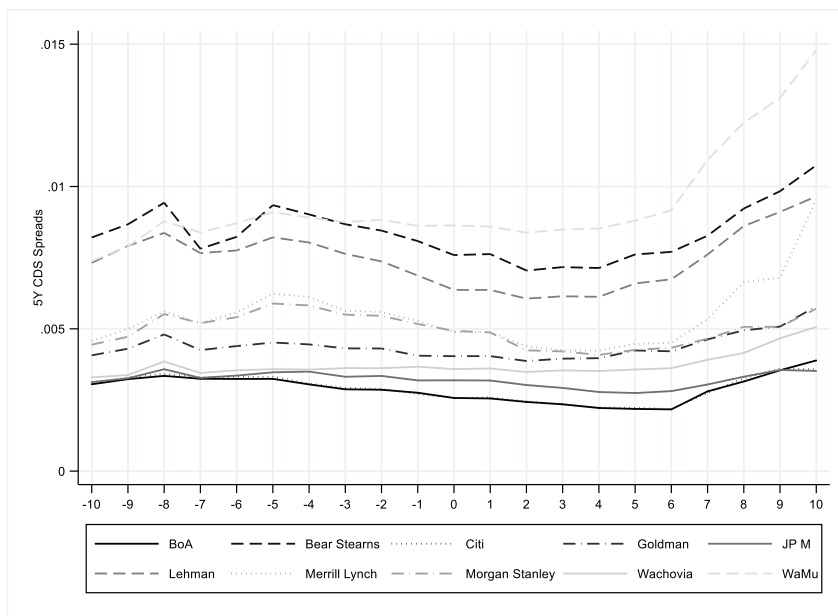
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Figure 1: Market Reactions around the Initial Disclosure of U.S. Banks' Subprime Exposures

Panel A: Individual Banks' Disclosures (in event time)

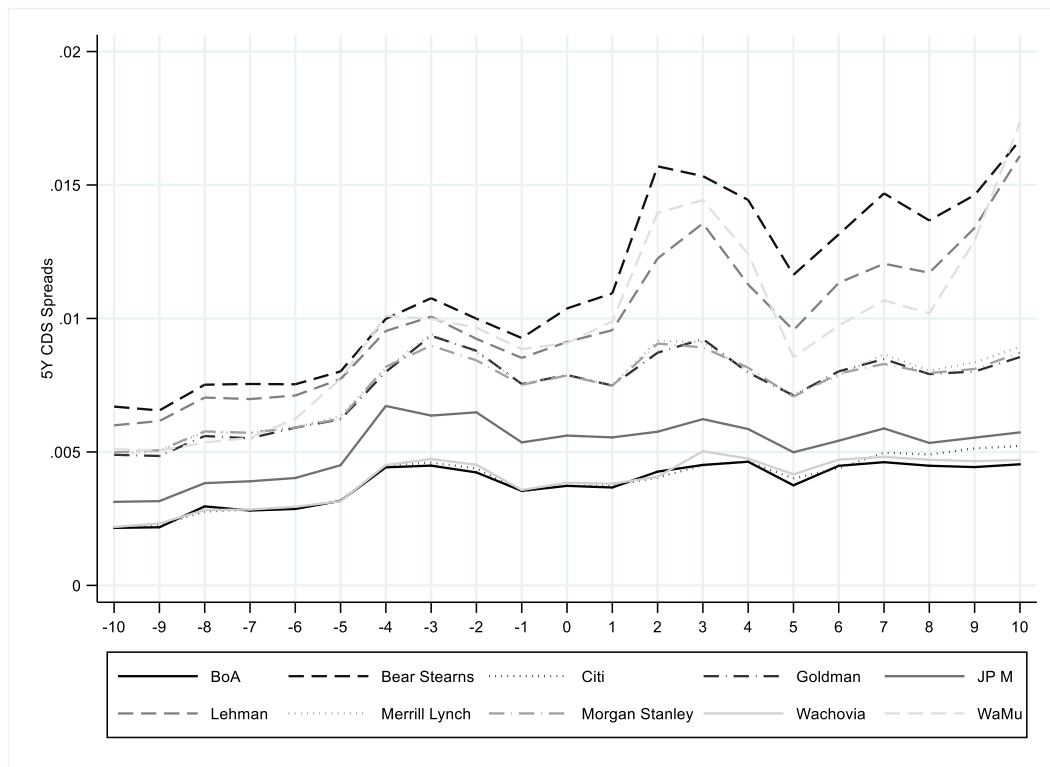


Panel B: Disclosures by Merrill Lynch and Washington Mutual on October 5, 2007



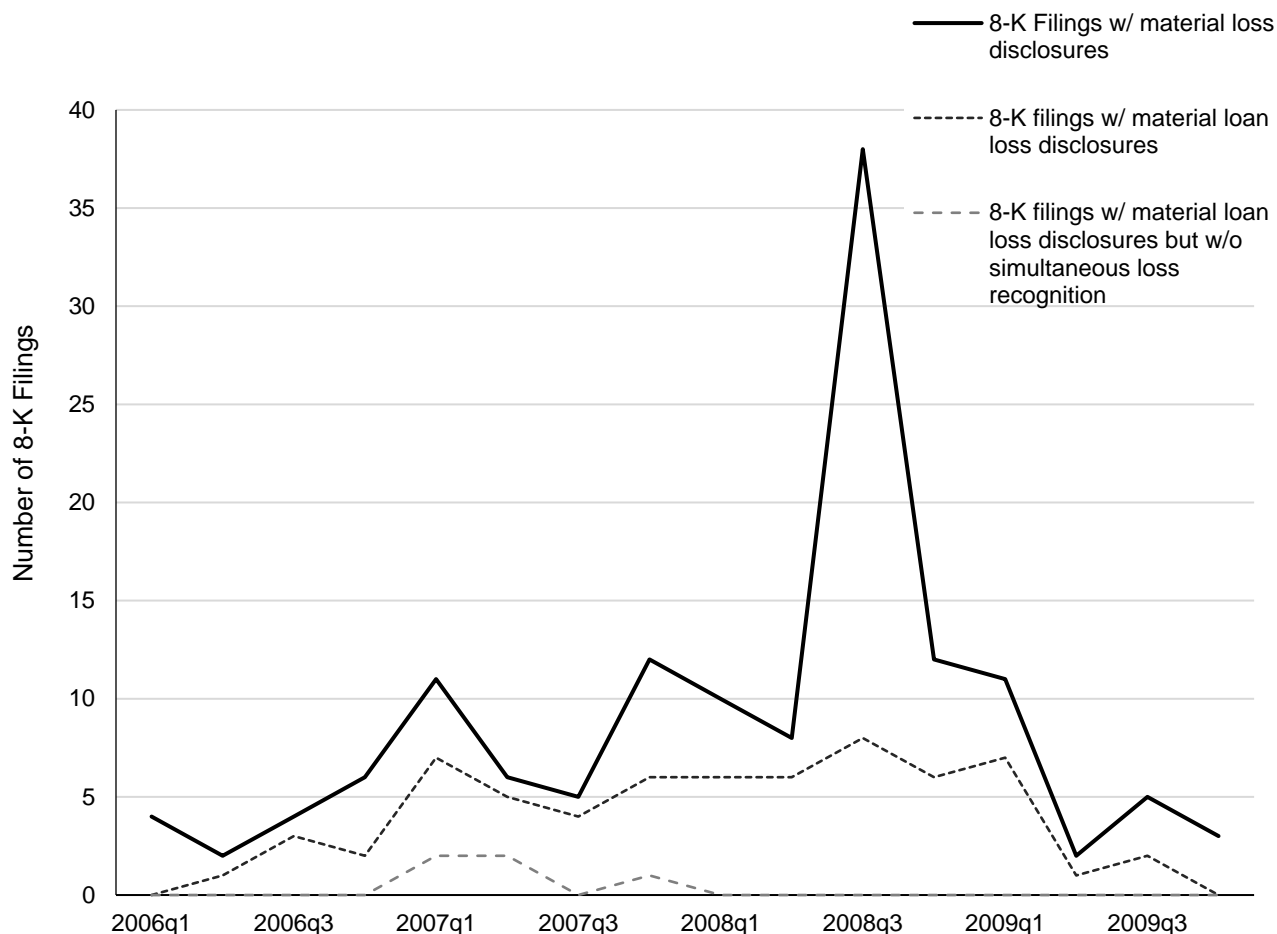
The figures plot the 5-year CDS spreads for nine US banks around their initial disclosures of subprime exposures (Panel A) and around the disclosures by Merrill Lynch and Washington Mutual on October 5, 2007 (Panel B). Panel A does not include JP Morgan because the initial disclosures came before 2007. All CDS pricing data come from IHS Markit. We restrict the data to 5-year CDS contracts denominated in USD, with modified restructuring clauses, and of senior unsecured debts.

Figure 2: Market Reactions around the SEC's Letter to Lehman



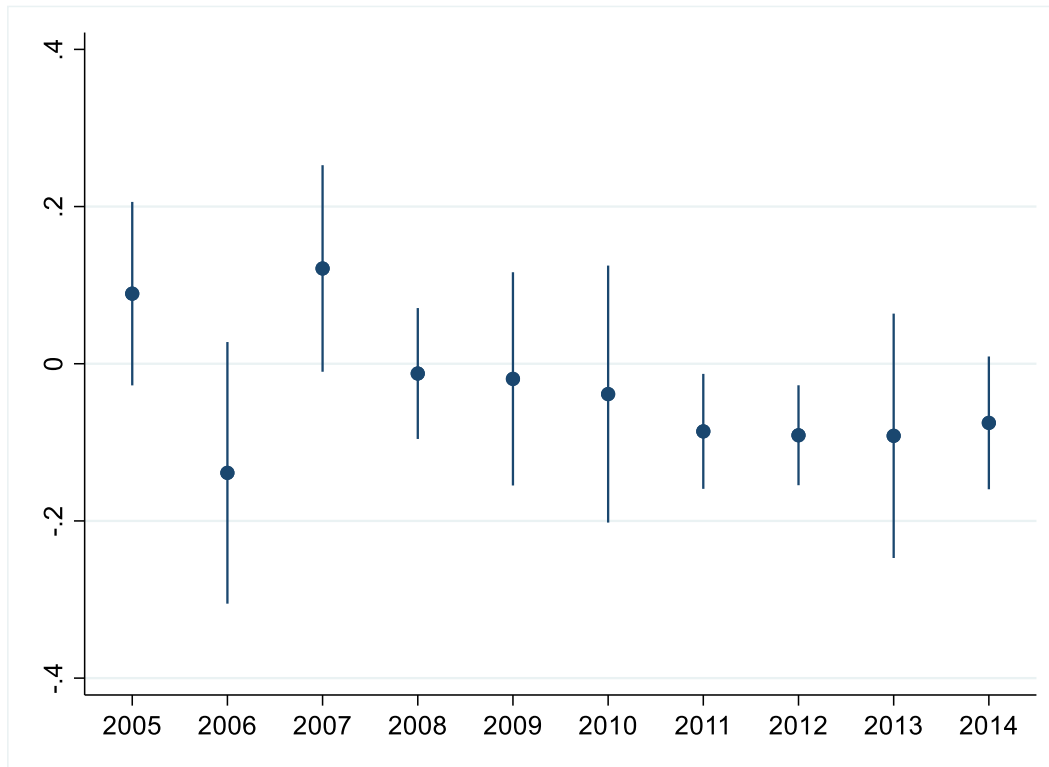
The figure plots the 5-year CDS spreads for ten US banks around the publication of the SEC's letter to Lehman on August 1, 2007. In the letter, the SEC expresses concerns about the adequacy of Lehman's disclosures with respect to their subprime exposure. All CDS pricing data come from IHS Markit. We restrict the data to 5-year CDS contracts denominated in USD, with modified restructuring clauses, and of senior unsecured debts.

Figure 3: 8-K Filings announcing Material Impairments by U.S. Commercial Banks



The figure presents the number of 8-K filings by U.S. commercial banks between 2006-Q1 and 2009-Q4 that include a material loss (or impairment) disclosure. The solid black line shows the number of all 8-K reports that relate to the disclosure of any losses from the valuation of assets (irrespective of the underlying assets). The dotted dark line shows the number of 8-K reports where the loss disclosure relates to loans. The dashed grey line shows the 8-K reports with loan loss disclosures where the bank did not recognize the loan loss in the same quarter (i.e., where the announcement is not simply a profit warning for the upcoming financial report).

Figure 4: Interaction between AFS Losses and Prudential Filters over Time



The figure maps out and presents the coefficient estimates and 90% confidence intervals from OLS regressions of equation (1) for the interaction term $AFS\ Loss_{i,t-1} \cdot Prudential\ Filter_{i,t-1}$ for each year. When estimating equation (1), we add a year dummy to the interaction term to obtain yearly point estimates for the interaction term. See the notes for Table 6 for further information about variable definitions and sample composition.

Table 1: Overview of Disclosures, Impairments, Reporting Choices and Corrective Actions by International Banks during the 2007-08 Crisis

Panel A: US Banks

| | Bank of America | Bear Stearns | Citigroup | Goldman | JP Morgan |
|--|----------------------------------|---|---------------------|--------------------------------------|--|
| <i>Failure Date</i> | - | 3/16/2008 | - | - | - |
| <i>Initial Disclosure of Subprime Exposure</i> | 11/09/2007 (10-Q) | 11/14/2007 (8-K) 1/29/2008 (10-K) | 11/05/2007 (10-Q) | 9/20/2007 (8-K) 10/10/2007 (10-Q) | before 2007 |
| <i>Initial Impairments</i> | Q3-2007 | 11/14/2007 (8-K) | Q3-2007 | Q3-2007 | Q1-2007 |
| <i>Disclosure of Funding Structure (2007-Q4)</i> | yearly time bands | yearly time bands | yearly time bands | quarterly time bands | yearly time bands |
| <i>Disclosure of Interest Rate Sensitivity (2007-Q4)</i> | parallel shifts (+/- 100 bps) | parallel shifts (+/- 50 and 100 bps) | 6 scenarios | 95% VaR | parallel shifts (+/- 100 and 200 bps) |
| <i>Discretionary Accounting Choices:</i> | | | | | |
| Reclassifications of Fair Value Assets | No | No | Q4-2008 | No | No |
| Transfers to Level 3 | 2007, 2008 | 2007 | 2007, 2008 | 2007, 2008 | 2007, 2008 |
| Gains from Increases in Own Credit Risk | No | No | 2007, 2008 | 2007, 2008 | 2007, 2008 |
| <i>Corrective Actions:</i> | | | | | |
| Dividend Cuts | Q4-2008 | n/a | Q4-2008 | Q3-2007 | Q1-2009 |
| Last Share Repurchase | Q4-2007 | Q4-2007 | Q1-2007 | Q4-2008 | Q3-2007 |
| Issuance of Equity (including Preferred Stocks) | Q1-2008, Q2-2008 | n/a | Q1-2008, Q2-2008 | every quarter | Q2-2008, Q3-2008 |
| Government Support | Q4-2008 (TARP) | n/a | Q4-2008 (TARP) | Q4-2008 (TARP) | Q4-2008 (TARP) |
| <i>Misstatement Litigation</i> | | | | | |
| Bank <i>thereof: Public prosecution</i> | Yes Yes (US SEC) | Yes Yes (US SEC) | Yes Yes (US SEC) | n/a n/a | Yes Yes (US SEC) |
| Auditors | Yes | Yes | n/a | n/a | n/a |

(continued)

Panel A: US Banks (cont'd)

| | Lehman | Merrill Lynch | Morgan Stanley | Wachovia | Washington Mutual |
|--|---------------------------------------|--------------------------------------|-------------------------------------|-------------------|--------------------------------------|
| <i>Failure Date</i> | 9/15/2008 | 9/15/2008 | - | 10/3/2008 | 9/25/2008 |
| <i>Initial Disclosure of Subprime Exposure</i> | 11/14/2007 (8-K) 12/13/2007 (10-K) | 10/5/2007 (8-K) 10/24/2007 (10-Q) | 11/7/2007 (8-K) 1/29/2008 (10-K) | 11/8/2007 (10-Q) | 10/5/2007 (8-K) 10/17/2007 (10-Q) |
| <i>Initial Impairments</i> | Q4-2007 | Q3-2007 | Q4-2007 | Q3-2007 | Q3-2007 |
| <i>Disclosure of Funding Structure (2007-Q4)</i> | yearly time bands | yearly time bands | yearly time bands | yearly time bands | yearly time bands |
| <i>Disclosure of Interest Rate Sensitivity (2007-Q4)</i> | 95% VaR | parallel shifts (+/- 100 bps) | 95% VaR | 3 scenarios | parallel shifts (+/- 100 bps) |
| <i>Discretionary Accounting Choices:</i> | | | | | |
| Reclassifications of Fair Value Assets | No | No | No | No | No |
| Transfers to Level 3 | 2007 | 2007, 2008 | 2007, 2008 | 2008 | 2008 |
| Gains from Increases in Own Credit Risk | 2007, 2008 | 2007, 2008 | 2007, 2008 | No | No |
| <i>Corrective Actions:</i> | | | | | |
| Dividend Cuts | n/a | n/a | Q2-2008 | Q2-2008 | Q1-2008 |
| Last Share Repurchase | Q3-2007 | Q4-2007 | Q3-2008 | Q3-2008 | Q4-2007 |
| Issuance of Equity (including Preferred Stocks) | Q1-2008, Q2-2008 | Q1-2008, Q2-2008 | every quarter | Q4-2007, Q1-2008 | Q4-2007, Q2-2008 |
| Government Support | n/a | n/a | Q4-2008 (TARP) | n/a | n/a |
| <i>Misstatement Litigation</i> | | | | | |
| Bank | Yes | Yes | Yes | Yes | Yes |
| <i>thereof: Public prosecution</i> | n/a | Yes (US SEC) | n/a | n/a | n/a |
| Auditors | Yes | Yes | n/a | n/a | n/a |

(continued)

Panel B: European Banks

| | BNP Paribas | Deutsche Bank | Dexia | Fortis Bank | HBOS |
|--|--|---|--|--|--|
| <i>Failure Date</i> | - | - | 10/1/2008 10/5/2011 | 9/29/2008 | 9/18/2008 10/8/2008 |
| <i>Initial Disclosure of Subprime Exposure</i> | 8/13/2007 (press release: "limited exposure") 1/30/2007 (earnings presentation: revision) | 8/4/2007 (press release: "not exposed") 10/3/2007 (press release: impairments) | 8/6/2007 (press release: "well protected") | 9/21/2007 (press release: "no direct exposure") 11/8/2007 (press release: revision) | 12/13/2007 (trading update) |
| <i>Disclosure of Funding Structure (2007-Q4)</i> | >/< 1 month, 3 months, 1 year | >/< 3 months, 1 year (only for liabilities) | >/< 3 months, 1 year (exakt liquidity gaps) | >/< 3 months, 1 year (exakt liquidity gaps) | >/< 1 month, 3 months, 1 year (only for liabilities) |
| <i>Disclosure of Interest Rate Sensitivity (2007-Q4)</i> | parallel shifts (+/- 100 bps, different maturity bands) | 99% VaR for trading | parallel shifts (+/- 1 bps), 99% VaR for trading | parallel shifts (+/- 100 bps) | parallel shifts (+/- 25 bps) |
| <i>Discretionary Accounting Choices:</i> | | | | | |
| Reclassifications of Fair Value Assets | Q4-2008 | Q3-2008, Q4-2008 | Q4-2008 | Q4-2008 | Q4-2008 |
| Transfers to Level 3 | No | No | No | No | No |
| Gains from Increases in Own Credit Risk | 2007, 2008 | 2008 | 2008 | No | No |
| <i>Corrective Actions:</i> | | | | | |
| Dividend Cuts | 2009 | 2009 | 2009 | 2009 | 2009 |
| Last Share Repurchase | n/a | n/a | n/a | n/a | n/a |
| Issuance of Equity (including Preferred Stocks) | n/a | Q3-2008 | n/a | Q3-2007 | Q2-2008, Q3-2008 |
| Government Support | Q4-2008 | n/a | Q4-2008 | Q4-2008 | n/a |
| <i>Misstatement Litigation</i> | | | | | |
| Bank | n/a | Yes | Yes | Yes | Yes (managers) |
| <i>thereof: Public prosecution</i> | n/a | Yes (US DOJ) | n/a | Yes (Belgium) | Yes (UK FSA) |
| Auditors | n/a | Yes | n/a | n/a | n/a |

(continued)

Panel B: European Banks (cont'd)

| | Hypo Real Estate | IKB | Northern Rock | Royal Bank of Scotland | UBS |
|--|--|--|--|--|--|
| <i>Failure Date</i> | 9/28/2008 | 8/1/2007 | 9/10/2007 2/22/2008 | 10/8/2008 | - |
| <i>Initial Disclosure of Subprime Exposure</i> | 8/3/2007 (press release: "no negative impact") 1/15/2008 (press release: impairments) | 7/20/2007 7/30/2007 | before 2007 (for securitizations) 9/13/2007 (press statement: CDO exposure) | 12/6/2007 (trading update) | 10/1/2007 (earnings announcement: impairments) |
| <i>Disclosure of Funding Structure (2007-Q4)</i> | >/< 3 months, 1 year (dispersed over report) | >/< 1 month, 3 months, 1 year (only for liabilities) | >/< 3 months, 6 months, 1 year (reference to exact liquidity gaps) | >/< 1 months, 1 year (reference to 1-month liquidity gaps) | >/< 1 month, 3 months, 1 year |
| <i>Disclosure of Interest Rate Sensitivity (2007-Q4)</i> | 99% VaR | 99.8% VaR | parallel shifts (+/- 100 bps) | parallel shifts (+/- 100 bps), VaR | 99% VaR |
| <i>Discretionary Accounting Choices:</i> | | | | | |
| Reclassifications of Fair Value Assets | Q3-2008, Q4-2008 | No | Q4-2008 | Q4-2008 | Q4-2008 |
| Transfers to Level 3 | No | No | No | No | No |
| Gains from Increases in Own Credit Risk | No | 2007, 2008 | No | 2007, 2008 | 2007, 2008 |
| <i>Corrective Actions:</i> | | | | | |
| Dividend Cuts | 2009 | 2008 | 2008 | 2009 | 2009 |
| Last Share Repurchase | n/a | n/a | n/a | n/a | 2007 |
| Issuance of Equity (including Preferred Stocks) | Q4-2007, Q3-2008 | n/a | n/a | n/a | Q1/2008, Q2/2008 |
| Government Support | Q3-2008, Q4-2008 | Q3-2007 | Q3-2007 | Q4-2008 | Q4-2008 |
| <i>Misstatement Litigation</i> | | | | | |
| Bank thereof: Public prosecution | Yes (managers) Yes (Germany) | Yes Yes (Germany) | Yes (managers) Yes (UK FSA) | Yes n/a | Yes Yes (US SEC) |
| Auditors | n/a | n/a | n/a | n/a | n/a |

(continued)

The table summarizes information about disclosures, asset impairments, other reporting choices, corrective actions and subsequent misstatement litigation during the 2007-08 crisis. Panel A presents the information for ten US banks. Panel B presents the information for ten European banks. We choose this sample based on bank size and financial difficulties during the crisis. We have collected the information about disclosures, impairments, discretionary accounting choices, and corrective actions from all SEC filings (when available; for U.S. banks) and from all reports available via a bank's website or other publicly available sources between 2006-Q4 and 2008-Q4. We have collected the information about litigation from the Audit Analytics Litigation Database, Stanford Law School's Securities Class Action Clearinghouse, and Bloomberg's Company Legal Search. We also screen the list of enforcement actions published by the SEC. We tabulate whether a bank was involved in a legal case that directly relates to misstatements in the financial reporting and disregard all other legal cases (e.g., about securities sales). We highlight if the legal case targets the bank managers, rather than the bank. We separately note cases where the bank is subject to prosecution by a public institution (e.g., a regulator, Attorney General) rather than sued by investors. We also tabulate whether bank auditors were involved in such a legal case.

Table 2: Market Reactions to Bank Disclosures and Economy-wide Events during the Crisis

| <i>Dependent Variable:</i> | Δ 5Y CDS Spreads | | | | Daily Share Return | | | |
|--|-------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Firm Disclosure | | 0.0000 (0.21) | | | | -0.0033 (-0.94) | | |
| First Firm Disclosure | | | -0.0001 (-0.70) | | | | 0.0001 (0.02) | |
| First 10Q/10K Disclosure | | | | 0.0004*** (2.67) | | | | -0.0125*** (-2.65) |
| Economy-wide Events: | | | | | | | | |
| 2/7/2007 | -0.0000 (-0.21) | -0.0000 (-0.20) | -0.0000 (-0.23) | -0.0000 (-0.14) | -0.0008 (-0.19) | -0.0009 (-0.22) | -0.0008 (-0.19) | -0.0010 (-0.25) |
| HSBC reports losses | | | | | | | | |
| 2/27/2007 | 0.0002 (1.11) | 0.0002 (1.12) | 0.0002 (1.09) | 0.0002 (1.17) | -0.0165*** (-4.18) | -0.0166*** (-4.21) | -0.0165*** (-4.18) | -0.0167*** (-4.24) |
| Freddie Mac announces problems | | | | | | | | |
| 3/12/2007 | 0.0001 (0.80) | 0.0001 (0.81) | 0.0001 (0.80) | 0.0001 (0.83) | -0.0133*** (-3.39) | -0.0133*** (-3.40) | -0.0133*** (-3.39) | -0.0134*** (-3.41) |
| New Century Financial shares suspended | | | | | | | | |
| 5/2/2007 | -0.0001 (-0.50) | -0.0001 (-0.50) | -0.0001 (-0.50) | -0.0001 (-0.50) | 0.0028 (0.70) | 0.0028 (0.70) | 0.0028 (0.70) | 0.0028 (0.70) |
| Shutdown of UBS Hedge Fund | | | | | | | | |
| 6/7/2007 | 0.0000 (0.24) | 0.0000 (0.24) | 0.0000 (0.24) | 0.0000 (0.24) | -0.0058 (-1.46) | -0.0058 (-1.46) | -0.0058 (-1.46) | -0.0058 (-1.46) |
| BS Hedge Funds stop redemptions | | | | | | | | |
| 7/11/2007 | 0.0002 (1.43) | 0.0002 (1.43) | 0.0002 (1.43) | 0.0002 (1.43) | -0.0004 (-0.09) | -0.0004 (-0.09) | -0.0004 (-0.09) | -0.0004 (-0.09) |
| S&P downgrades for 612 securities | | | | | | | | |
| 7/17/2007 | 0.0002 (1.22) | 0.0002 (1.22) | 0.0002 (1.22) | 0.0002 (1.23) | -0.0094** (-2.37) | -0.0094** (-2.37) | -0.0094** (-2.37) | -0.0094** (-2.38) |
| Losses by BS Hedge Funds | | | | | | | | |
| 7/20/2007 | 0.0003** (2.28) | 0.0003** (2.28) | 0.0003** (2.28) | 0.0003** (2.29) | -0.0106** (-2.55) | -0.0106** (-2.55) | -0.0106** (-2.55) | -0.0106** (-2.55) |
| Bernanke warning | | | | | | | | |
| 7/24/2007 | 0.0003** (2.19) | 0.0003** (2.19) | 0.0003** (2.19) | 0.0003** (2.20) | -0.0064 (-1.54) | -0.0064 (-1.54) | -0.0064 (-1.54) | -0.0064 (-1.54) |
| Countrywide profit warning | | | | | | | | |
| 7/30/2007 | -0.0002 (-1.26) | -0.0002 (-1.26) | -0.0002 (-1.26) | -0.0002 (-1.26) | -0.0032 (-0.77) | -0.0032 (-0.77) | -0.0032 (-0.77) | -0.0032 (-0.77) |
| IKB profit warning | | | | | | | | |
| 8/1/2007 | -0.0001 (-1.03) | -0.0001 (-1.03) | -0.0001 (-1.03) | -0.0001 (-1.04) | -0.0120*** (-2.89) | -0.0120*** (-2.89) | -0.0120*** (-2.89) | -0.0120*** (-2.90) |
| SEC letter to Lehman | | | | | | | | |
| 8/6/2007 | 0.0004*** (2.80) | 0.0004*** (2.80) | 0.0004*** (2.80) | 0.0004*** (2.80) | 0.0048 (1.21) | 0.0048 (1.21) | 0.0048 (1.21) | 0.0048 (1.21) |
| AHMI bankruptcy | | | | | | | | |
| 8/9/2007 | -0.0000 (-0.02) | -0.0000 (-0.02) | -0.0000 (-0.02) | -0.0000 (-0.02) | -0.0104*** (-2.64) | -0.0104*** (-2.64) | -0.0104*** (-2.63) | -0.0104*** (-2.64) |
| BNP freezes three funds | | | | | | | | |
| 8/21/2007 | -0.0005*** (-3.88) | -0.0005*** (-3.88) | -0.0005*** (-3.88) | -0.0005*** (-3.89) | -0.0018 (-0.44) | -0.0018 (-0.44) | -0.0018 (-0.44) | -0.0018 (-0.45) |
| Sharp rise in US subprime defaults | | | | | | | | |
| 8/28/2007 | 0.0004*** (2.95) | 0.0004*** (2.95) | 0.0004*** (2.95) | 0.0004*** (2.96) | -0.0160*** (-4.06) | -0.0160*** (-4.06) | -0.0160*** (-4.06) | -0.0160*** (-4.06) |
| SachsenLB failure | | | | | | | | |
| 9/13/2007 | 0.0000 (0.24) | 0.0000 (0.27) | 0.0000 (0.16) | 0.0000 (0.49) | 0.0017* (1.74) | 0.0016 (1.60) | 0.0017* (1.73) | 0.0014 (1.50) |
| Northern Rock failure | | | | | | | | |
| 11/20/2007 | 0.0010*** (6.84) | 0.0010*** (6.84) | 0.0010*** (6.82) | 0.0010*** (6.90) | -0.0242*** (-6.14) | -0.0244*** (-6.17) | -0.0242*** (-6.13) | -0.0245*** (-6.20) |
| Freddie Mac announces \$2bn losses | | | | | | | | |
| 12/3/2007 | -0.0001 (-0.96) | -0.0001 (-0.95) | -0.0001 (-0.98) | -0.0001 (-0.89) | 0.0012 (0.36) | 0.0011 (0.33) | 0.0012 (0.36) | 0.0010 (0.29) |
| Moody's downgrades for \$116bn of debt | | | | | | | | |
| 12/13/2007 | 0.0001 (0.92) | 0.0001 (0.91) | 0.0001 (0.90) | 0.0001 (0.65) | -0.0121*** (-3.53) | -0.0120*** (-3.49) | -0.0121*** (-3.52) | -0.0114*** (-3.31) |
| Fed announces TAF program | | | | | | | | |
| Firm FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| R ² | 0.048 | 0.048 | 0.048 | 0.051 | 0.050 | 0.050 | 0.050 | 0.053 |
| # Observations | 2,040 | 2,040 | 2,040 | 2,040 | 2,470 | 2,470 | 2,470 | 2,470 |

The table presents the results of OLS regressions of the daily change in CDS spreads (columns [1] to [4]) and daily share returns (columns [5] to [8]) on indicator variables for the 3-day time window [-1,+1] around bank disclosures and economy-wide events during the crisis. CDS spreads are from contracts denominated in USD, with modified restructuring clauses, and of senior unsecured debts. The daily change in CDS spreads is measured in basis points (source: IHS Markit). The daily share return is the raw return and also measured in basis points (source: CRSP). *Firm Disclosure* is any disclosure event for which a bank provides information about risk exposures to the subprime mortgage market. *First Firm Disclosure* represents the earliest of these events for each one of our sample banks (irrespective of the document in which the disclosure occurs). *First 10Q/10K Disclosure* represents the earliest of these events in which the disclosure is part of the bank's 10-Q or 10-K filing. The economy-wide events are major crisis-related news events, which we selected from the Factiva Global News Database. Our sample comprises daily observations of spread changes and returns for the 10 U.S. sample banks (Table 1) during calendar year 2007. The table reports OLS coefficient estimates and (in parentheses) *t*-statistics based on robust standard errors. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels (two-tailed).

Table 3: Reported Loan Losses of U.S. Banks and Market Expectations

| | Loans held | | Reported loss expectation | | Estimate for market expectation | | | | | | | | Future net charge-offs | | | |
|-------------------|-------------------------------------|----------------|---|---|---------------------------------|----------------------|--------------------------|-------------------------|------------------------------|---------------------|----------------------------------|--|-------------------------------|-------------------------------|--|---|
| | Net book value (amortized cost) [A] | Fair value [B] | Allowance for loan and lease losses [C] | Total implied loss [D] = ([A]-[B]) +[C] | SCAP prediction [E] | Citigroup report [F] | Goldman Sachs report [G] | S&P report (stress) [H] | % Loan portfolio covered [I] | Median estimate [J] | Median allowance [K] = [J] / [C] | Median estimate / implied loss [L] = [J] / [D] | Net charge-offs 2009-2010 [M] | Net charge-offs 2009-2011 [N] | Net charge-offs/ Loan loss allowance [O] = [N] / [C] | Net charge-offs/ Implied loss [P] = [N] / [D] |
| Bank of America | 866.2 | 841.6 | 23.1 | 47.7 | 104.1 | 83.8 | 94.0 | 49.4 | 92.9% | 95.67 | 4.14 | 2.01 | 68.0 | 89.7 | 3.88 | 1.88 |
| Citigroup | 660.9 | 642.7 | 29.6 | 47.8 | 79.4 | NA | 66.1 | 33.9 | 81.9% | 80.66 | 2.73 | 1.69 | 65.8 | 87.7 | 2.96 | 1.83 |
| JP Morgan | 721.7 | 700.0 | 23.2 | 44.9 | 79.3 | 111.9 | 76.1 | 39.0 | 87.9% | 88.41 | 3.81 | 1.97 | 46.6 | 58.9 | 2.54 | 1.31 |
| Wells Fargo | 849.6 | 835.5 | 21.1 | 35.2 | 74.3 | 51.5 | 78.0 | 42.4 | 91.6% | 68.70 | 3.26 | 1.95 | 35.9 | 47.2 | 2.24 | 1.34 |
| BB&T Bank | 94.4 | 96.3 | 1.6 | -0.3 | 8.5 | NA | 8.2 | 5.6 | 94.9% | 8.64 | 5.49 | NA | 4.3 | 6.0 | 3.79 | NA |
| Capital One | 96.5 | 86.4 | 4.5 | 14.6 | 13.0 | NA | 12.0 | 7.1 | 96.5% | 12.44 | 2.75 | 0.85 | 11.2 | 15.0 | 3.31 | 1.02 |
| Fifth Third Bank | 81.3 | 74.2 | 2.8 | 9.9 | 9.2 | 5.4 | 7.0 | 4.6 | 92.6% | 6.74 | 2.42 | 0.68 | 4.9 | 6.1 | 2.18 | 0.61 |
| KeyCorp | 74.7 | 65.9 | 1.8 | 10.6 | 6.5 | 3.6 | 5.3 | 3.7 | 81.2% | 5.52 | 3.06 | 0.52 | 4.1 | 4.8 | 2.64 | 0.45 |
| PNC Financial | 165.1 | 162.2 | 3.9 | 6.9 | 17.4 | 10.4 | 14.6 | 8.7 | 92.4% | 13.53 | 3.45 | 1.97 | 5.6 | 7.3 | 1.86 | 1.06 |
| Regions Financial | 94.9 | 79.9 | 1.8 | 16.8 | 9.0 | NA | 7.4 | 5.1 | 86.5% | 8.57 | 4.70 | 0.51 | 5.0 | 7.0 | 3.84 | 0.42 |
| SunTrust Banks | 124.6 | 110.9 | 2.4 | 16.1 | 11.8 | NA | 10.6 | 6.3 | 89.9% | 11.82 | 5.03 | 0.73 | 6.1 | 8.1 | 3.46 | 0.51 |
| U.S. Bancorp | 181.7 | 180.3 | 3.5 | 4.9 | 14.6 | 8.2 | 16.4 | 9.6 | 86.8% | 13.93 | 3.97 | 2.83 | 8.0 | 10.9 | 3.10 | 2.21 |
| Comerica | 49.7 | 50.9 | 0.8 | -0.3 | NA | 2.0 | 3.3 | 2.5 | 92.8% | 2.68 | 3.48 | NA | 1.4 | 1.8 | 2.29 | NA |
| First Horizon | 20.4 | 18.8 | 0.8 | 2.5 | NA | 1.2 | 1.9 | 1.1 | 93.9% | 1.25 | 1.47 | 0.50 | 1.4 | 1.7 | 1.98 | 0.68 |
| M&T Bank | 48.2 | 47.4 | 0.8 | 1.6 | NA | 2.1 | 3.9 | 2.7 | 93.4% | 2.86 | 3.62 | 1.84 | 0.9 | 1.1 | 1.43 | 0.72 |
| Northern Trust | 29.4 | 29.5 | 0.2 | 0.1 | NA | NA | 2.1 | 1.1 | 80.9% | 2.02 | 8.80 | 19.87 | 0.3 | 0.4 | 1.54 | 3.47 |
| City National | 12.2 | 12.5 | 0.2 | -0.1 | NA | NA | 1.0 | 0.6 | 95.9% | 0.80 | 3.59 | NA | 0.4 | 0.4 | 1.62 | NA |

(continued)

| | Loans held | | Reported loss expectation | | Estimate for market expectation | | | | | | | | Future net charge-offs | | | |
|-------------------|-------------------------------------|----------------|---|---|---------------------------------|----------------------|--------------------------|-------------------------|------------------------------|---------------------|---|--|-------------------------------|-------------------------------|--|---|
| | Net book value (amortized cost) [A] | Fair value [B] | Allowance for loan and lease losses [C] | Total implied loss [D] = ([A]-[B]) +[C] | SCAP prediction [E] | Citigroup report [F] | Goldman Sachs report [G] | S&P report (stress) [H] | % Loan portfolio covered [I] | Median estimate [J] | Median estimate / allowance [K] = [J] / [C] | Median estimate / implied loss [L] = [J] / [D] | Net charge-offs 2009-2010 [M] | Net charge-offs 2009-2011 [N] | Net charge-offs/ Loan loss allowance [O] = [N] / [C] | Net charge-offs/ Implied loss [P] = [N] / [D] |
| Marshall & Ilsley | 48.8 | 45.2 | 1.2 | 4.8 | NA | NA | 3.7 | 2.6 | 93.1% | 3.40 | 2.83 | 0.71 | 3.9 | 3.9 | 3.23 | 0.82 |
| Synovus | 27.3 | 27.2 | 0.6 | 0.7 | NA | NA | 2.1 | 1.9 | 96.4% | 2.06 | 3.45 | 2.98 | 2.8 | 3.4 | 5.71 | 4.93 |
| TCF Financial | 11.5 | 11.3 | 0.2 | 0.3 | NA | NA | 1.1 | 0.5 | 86.9% | 0.92 | 5.36 | 3.03 | 0.4 | 0.6 | 3.55 | 2.01 |
| Sample Average | 213.0 | 205.9 | 6.2 | 13.3 | 35.6 | 28.0 | 20.7 | 11.4 | 90.4% | 21.5 | 3.9 | 2.6 | 13.9 | 18.1 | 2.9 | 1.5 |
| Sample Median | 87.9 | 77.1 | 1.8 | 5.9 | 13.8 | 6.8 | 7.2 | 4.8 | 92.5% | 7.7 | 3.5 | 1.8 | 4.6 | 6.0 | 2.8 | 1.1 |

The table compares loan losses reported by U.S. banks for fiscal year 2008 and concurrent loan loss expectations by market participants (early 2009). We use accounting data from regulatory FR Y-9C filings for the *Net book value (amortized cost)* of banks' total loans (2008-Q4), the disclosed *Fair value* of the loan portfolio (2008-Q4), the *Allowance for loan and lease losses* (2008-Q4), and *Net charge-offs* (2009-Q4, 2010-Q4, and 2011-Q4). *Total implied loss* is the loan loss allowance (column [C]) plus the difference between the net book value and the disclosed fair value of the loan portfolio (column [A] minus column [B]). We use the following proxies for market expectations: predictions by the Federal Reserve System as part of their 2009 Supervisory Capital Assessment Program (*SCAP prediction*); the 2009 Citigroup report ("US Banks: Assessing Risk/Reward under Various Stress Test Scenarios", *Citigroup Report*), for which we adjust the four-year estimates for 2007 by subtracting the estimated losses for 2008; the 2009 Goldman Sachs report ("United States: Financial Services – As Mortgage Loss Estimates Continue to Rise, Further Policy Response Likely to Follow", *Goldman Sachs Report*), for which we predict bank-specific losses by multiplying the projected loss rates for each loan category by the loans held in that category as reported in the FR Y-9C filing for the fourth quarter of 2008; and the 2009 Standard & Poor's report ("What Stress Tests Reveal About U.S. Banks' Capital Needs", *S&P Report*), for which we choose the stress scenario (which at that point was close to concurrent market estimates). The *Median estimate* (column [J]) represents the median over all available forecasts. The sample comprises the 20 largest U.S. banks for which predicted loan losses are available in at least two of the four reports.

Table 4: Adjustments of Recognized Loan Losses in the ECB's Asset Quality Review

| | | Loan Loss Provisions | | | | |
|-------------------|-----|----------------------|-------------|----------|----------------|---------------------|
| | | Credit Risk RWA | LLP | | % of | % of Gross Loans |
| | | | Adjustments | % of LLA | Current LLP | |
| ABN Amro Bank | NL | 92,631.0 | 157.9 | 3.17% | 9.44% | 0.06% |
| Banco Popular | ESP | 73,553.0 | 614.8 | 7.35% | 54.22% | 0.56% |
| Banco Santander | ESP | 384,020.0 | 287.2 | 1.15% | 2.61% | 0.04% |
| BayernLB | GER | 82,388.0 | 655.9 | 30.87% | 204.97% | 0.48% |
| BBVA | ESP | 289,967.8 | 965.1 | 6.46% | 17.30% | 0.28% |
| BFA | ESP | 76,356.6 | 32.2 | 0.29% | 2.41% | 0.02% |
| BNP Paribas | FRA | 535,807.4 | 762.4 | 3.01% | 21.78% | 0.12% |
| BPCE | FRA | 343,616.5 | 1,118.2 | 8.96% | 55.08% | 0.19% |
| Caixabank | ESP | 95,968.0 | 78.1 | 0.52% | 2.51% | 0.04% |
| Commerzbank | GER | 158,998.0 | 1,492.2 | 22.43% | 85.71% | 0.59% |
| Crédit Agricole | FRA | 475,019.0 | 944.7 | 8.40% | 34.88% | 0.30% |
| Crédit Mutuel | FRA | 191,192.9 | 267.5 | 2.54% | 20.39% | 0.07% |
| Deutsche Bank | GER | 247,398.6 | 226.5 | 4.05% | 10.97% | 0.06% |
| Erste Group Bank | AT | 84,856.8 | 1,370.7 | 17.51% | 74.54% | 1.07% |
| ING Bank | NL | 247,742.0 | 1,101.0 | 17.95% | 48.10% | 0.21% |
| Intesa Sanpaolo | ITA | 241,492.5 | 972.2 | 3.35% | 14.52% | 0.26% |
| Rabobank | NL | 152,215.8 | 1,827.5 | 43.75% | 69.14% | 0.39% |
| Société Générale | FRA | 267,704.3 | 938.3 | 5.61% | 27.40% | 0.25% |
| UniCredit | ITA | 315,919.4 | 972.6 | 2.08% | 7.20% | 0.18% |
| VW Fin'l Services | GER | 73,770.0 | 184.2 | 8.62% | 29.96% | 0.24% |
| Sample Average | | 221,530.9 | 784.5 | 9.90% | 39.66% | 0.27% |
| Sample Median | | 216,342.7 | 850.3 | 6.04% | 24.59% | 0.23% |

The table summarizes the adjustments to the carrying amounts of banks' loan loss provisions for banks participating in the European Central Bank's (ECB) 2014 Asset Quality Review (AQR). The AQR formed part of the ECB's Comprehensive Assessment at the start of the Single Supervisory Mechanism in the Eurozone. *Credit Risk RWA* are a bank's total credit risk weighted assets including off-balance sheet items (in million Euros). *LLP Adjustments* are the additions to loan loss provisions on a bank's balance sheet for the fiscal year 2013 (in million Euros) according to the AQR. The additions are based on the ECB's individual assessment of a sample of non-performing loans, the projections of this assessment to the remaining portfolio of the banks, and additional provisions identified by a review of the provisioning models. We present the adjustments as a percentage of the total allowance for loan and lease losses (*LLA*), the current loan loss provisions for the fiscal year 2013 (*LLP*), and the gross carrying amount of the bank's loan portfolio before impairments (*Gross Loans*). We take all accounting data from the S&P Global Market Intelligence platform. Our sample includes the 20 largest European banks (measured in total credit risk weighted assets) that participated in the AQR.

Table 5: Prudential Filters and Country-Level Differences in Bank Characteristics

| | 100% AOCI Filter | | | | <100% AOCI Filter | | | |
|-----------------------------------|------------------|-------------|------------|-----------|-------------------|-------------|------------|-----------|
| | <i>N</i> | <i>Mean</i> | <i>P50</i> | <i>SD</i> | <i>N</i> | <i>Mean</i> | <i>P50</i> | <i>SD</i> |
| <i>Balance Sheet Composition:</i> | | | | | | | | |
| Total Assets | 172 | 197,393 | 14,525 | 415,983 | 496 | 43,723 | 2,354 | 169,621 |
| Cash & Cash Equivalents | 171 | 0.0353 | 0.0158 | 0.0477 | 496 | 0.0196 | 0.0128 | 0.0300 |
| AFS Securities | 160 | 0.1174 | 0.0892 | 0.1098 | 490 | 0.1099 | 0.0915 | 0.0996 |
| Trading Assets | 149 | 0.0849 | 0.0650 | 0.0891 | 392 | 0.0646 | 0.0342 | 0.0830 |
| Derivative Assets | 141 | 0.0291 | 0.0116 | 0.0408 | 377 | 0.0106 | 0.0025 | 0.0247 |
| Loans | 168 | 0.6647 | 0.6655 | 0.1603 | 495 | 0.7495 | 0.7765 | 0.1369 |
| Held-to-Maturity Assets | 91 | 0.0349 | 0.0050 | 0.0789 | 159 | 0.0389 | 0.0128 | 0.0593 |
| Risk-Weighted Assets | 147 | 0.5838 | 0.5695 | 0.2249 | 405 | 0.6975 | 0.7138 | 0.1933 |
| Long-Term Funding | 163 | 0.3449 | 0.2729 | 0.2571 | 469 | 0.6309 | 0.7049 | 0.2820 |
| Leverage | 172 | 0.9084 | 0.9241 | 0.0751 | 496 | 0.8969 | 0.9051 | 0.0594 |
| Tier 1 Ratio | 153 | 13.3477 | 10.2800 | 10.8418 | 463 | 13.8808 | 11.5300 | 10.5437 |
| <i>Equity Volatility:</i> | | | | | | | | |
| Balance Sheet Equity | 282 | 3.86 | 1.51 | 6.48 | 182 | 3.83 | 2.10 | 5.19 |
| Tier 1 Capital | 282 | 4.90 | 2.80 | 6.18 | 182 | 4.56 | 2.16 | 6.38 |
| Total Regulatory Capital | 282 | 5.66 | 2.83 | 8.94 | 182 | 5.77 | 2.57 | 9.63 |

The table provides summary statistics for bank characteristics, separately for countries that have a 100% AOCI filter as of the financial year 2006, and for other countries with different filter rules. Countries with a 100% AOCI filter include Bahrain, Belgium, China, Denmark, France, Netherlands, Norway, Oman, Philippines, Poland, Russia, Singapore, Slovakia, Slovenia, South Africa, Sweden, and United Kingdom. Countries without a 100% filter include Australia, Austria, Cyprus, Finland, Hong Kong, Hungary, Ireland, Jordan, Kazakhstan, Kuwait, Lithuania, Qatar, Saudi Arabia, Switzerland, Taiwan, Turkey, and United Arab Emirates. Germany, Italy, Portugal, and Spain lacked a 100% filter in 2006 but changed their regulation later during our sample period. We report *Total Assets* in million USD. *Cash & Cash Equivalents*, *AFS Securities*, *Trading Assets*, *Derivative Assets*, *Loans*, *Held-to-Maturity Assets*, and *Risk-Weighted Assets* are scaled by total assets. *Long-Term Funding* is scaled by total liabilities. *Leverage* is defined as the ratio of total liabilities to total assets. *Tier 1 Ratio* is defined as the ratio of tier 1 capital to total risk-weighted assets. For the computation of equity volatilities, we scale shareholders' equity by total assets and Tier 1 capital and total regulatory capital by total risk-weighted assets. Volatilities are computed as the standard deviation of these ratios over the 2001 to 2015 sample period and reported in percentage points. We require a minimum of five observations for each equity ratio for a bank to be included in the sample. We also require a minimum impact of the AFS portfolio on equity and exclude banks for which AFS assets make up less than 5% of total assets. In this descriptive table, we exclude banks from the four countries that changed the prudential filter rules during our sample period.

Table 6: Prudential Filters and Incentives for Early Corrective Actions

| <i>Dependent Variable:</i> | <i>Corrective Action Score (# Cuts)</i> | | | <i>Risk-Taking Score (PCA)</i> |
|---|---|-------------------------|----------------------|---|
| | <i>AFS Variable:</i> | <i>AFS Loss (Dummy)</i> | | <i>AFS Result / Total Assets (Continuous)</i> |
| | (1) | (2) | (3) | (4) |
| <i>Variables of Interest:</i> | | | | |
| AFS Variable [t-1] | 0.057*** (3.11) | 0.065*** (3.05) | 0.064*** (2.80) | 0.117*** (3.02) |
| AFS Variable [t-1] * Prudential Filter | -0.061*** (-2.98) | -0.069*** (-3.05) | -0.071*** (-3.08) | -0.070 (-1.24) |
| AFS Variable | | 0.030 (1.63) | 0.026 (1.57) | 0.085*** (2.80) |
| AFS Variable * Prudential Filter | | -0.056** (-2.05) | -0.058** (-2.08) | -0.120*** (-2.78) |
| Prudential Filter | 0.176 (1.59) | 0.198* (1.72) | 0.206* (1.70) | -0.001 (-0.42) |
| <i>Control Variables:</i> | | | | |
| Trading Result | -4.684*** (-3.10) | -4.787*** (-3.13) | -4.770*** (-3.20) | -0.011 (-0.16) |
| Return on Assets | -1.707* (-1.71) | -1.685* (-1.71) | -1.728* (-1.72) | 0.187*** (3.55) |
| Δ Return on Assets | 0.356 (0.85) | 0.358 (0.84) | 0.372 (0.86) | -0.101*** (-3.59) |
| Total Capital Ratio | 0.012*** (4.13) | 0.012*** (4.20) | 0.012*** (4.14) | -0.000** (-2.05) |
| Total Capital Ratio * Prudential Filter | -0.005 (-1.11) | -0.005 (-1.15) | -0.005 (-1.13) | -0.000 (-0.75) |
| Size | 0.075** (2.40) | 0.076** (2.49) | 0.076** (2.45) | -0.001 (-1.24) |
| Size * Prudential Filter | 0.001 (0.08) | 0.002 (0.19) | 0.001 (0.13) | 0.000 (0.13) |
| Time FE | Year | Year | Year | Year |
| Firm FE | Yes | Yes | Yes | Yes |
| Control for Continuous AFS Result | No | No | Yes | No |
| Constant | Yes | Yes | Yes | Yes |
| R ² | 0.094 | 0.097 | 0.098 | 0.181 |
| # Observations | 2,198 | 2,198 | 2,198 | 2,198 |

The sample comprises all banks from 39 countries with available firm-year observations over the 2001 to 2015 period (source: BvD Bankscope). *Corrective Action Score (# Cuts)* is the sum of the values of *Dividend Cuts*, *RWA Cuts*, *Leverage Cuts*, and *Capital Raising* scaled by 4. *Risk-Taking Score (PCA)* is a composite score for each bank-year, which is derived from principal component analysis using the following four variables: *Dividend Payouts*, *Risk-Weighted Assets*, *Leverage*, and *Share Capital*. The score is the sum of the first two principal components, each weighted by the relative magnitude of their eigenvalues. *Dividend Payouts* is the amount of dividends paid out for the current fiscal year, scaled by total assets. *Dividend Cuts* takes a value of 1 if *Dividend Payouts* are lower than in the previous period, 0 otherwise. *Risk-Weighted Assets* is the ratio of risk-weighted assets to total assets. *RWA Cuts* takes a value of 1, if *Risk-Weighted Assets* are lower than in the previous period, 0 otherwise. *Leverage* is the ratio of liabilities (excluding customer deposits) to total assets. *Leverage*

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