Banks’ Financial Reporting and Financial System Stability

Viral Acharya  
Stern School of Business, New York University  
vacharya@stern.nyu.edu

Stephen G. Ryan  
Stern School of Business, New York University  
sryan@stern.nyu.edu

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ABSTRACT

The use of accounting measures and disclosures in banks’ contracts and regulation suggests that the quality of banks’ financial reporting is central to the efficacy of market discipline and non-market mechanisms in limiting banks’ development of debt and risk overhangs in economic good times as well as mitigating the consequences of those overhangs with the potential to compromise the stability of the financial system in downturns. This essay examines how research on banks’ financial reporting, informed by the financial economics literature on banking, can generate insights about how to enhance the stability of the financial system. We begin with foundational discussion of how aspects of banks’ accounting for financial instruments, opacity, and disclosures may affect stability. We then develop a simple model of fair value and amortized cost accounting with regulatory forbearance that illustrates the complex interactions that can result among banks’ accounting treatments, investors’ willingness to fund banks’ assets, the incentives of banks and investors to gamble, and regulators’ policy of bailing out banks. We then evaluate representative papers in the existing empirical literature on banks’ financial reporting and stability, pointing out the research design issues that empirical accounting researchers (still) need to confront to develop well-specified tests able to generate reliably interpretable findings. We then provide examples of settings amenable to addressing these issues. We conclude with considerations for accounting standard setters and financial system policymakers.
1. Introduction

The financial crisis has motivated an ongoing and many-faceted debate about the actions that policymakers can take to increase the stability of the financial system ("stability"). We define stability as the consistent ability for firms with positive net present value projects to obtain financing for those projects across the phases of the business or credit cycle ("cycle"). Two points are generally agreed upon in this debate. First, banks, the primary backstop providers of liquidity in the economy and issuers of federally guaranteed deposits to households, are critical to stability. Second, stability is enhanced by restraining banks’ undisciplined investment financed by readily available credit in booms and, through this and other means, reducing the frequency and severity of their disinvestment in busts due to restricted credit availability, excessive leverage ("debt overhangs"), or unwanted holdings of illiquid problem assets ("risk overhangs"). The debate pertains to the relative efficacy of alternative means by which to improve banks’ health and decision-making, individually and especially collectively, thereby promoting stability.

This essay examines the role that research on banks’ financial reporting, both accounting and disclosure, informed by the financial economics literature on banking can play in this debate. We identify researchable questions that this literature suggests accounting researchers should examine. We emphasize questions that address substantive debates among academics and policymakers, including the relative benefits and costs of: (1) transparency versus opacity about banks’ risk exposures; (2) the use of financial reporting versus regulatory reporting or dynamic capital requirements as mechanisms to build countercyclical buffers in banks’ regulatory capital; (3) alternative financial reporting measurements that differentially introduce volatility, anticipation of cycle turns, or discretion in banks’ reported income and regulatory capital; and
(4) alternative financial reporting approaches that record financing on- rather than off-balance sheet or that present risk-concentrated exposures gross rather than net on the balance sheet. We explain research design issues that empirical accounting researchers must confront to develop well-specified tests of hypotheses bearing on these questions and thus to generate reliably interpretable findings. We also evaluate the limited success of the research to date in confronting these issues and the substantial opportunities that remain to do so. While researchers in accounting and finance are our primary intended audience, we hope that accounting standard setters and financial system policymakers will also find this essay useful.

Existing financial economics literature on banking regulation and crises stresses the perverse incentives of banks with debt and risk overhangs. Debt overhangs provide banks with incentives to remain under-capitalized, since the benefits of issuing equity primarily accrue to creditors, and to make investment decisions that effectively constitute gambles for resurrection (also called “risk shifting” or “asset substitution”), since their equity is an out-of-the-money call option that benefits strongly from volatility (Jensen and Meckling 1976; Dewatripont and Tirole 1993). Debt overhangs also provide banks with incentives to not make certain positive present value investments for which the benefits primarily accrue to creditors (Myers 1977; Admati et al. 2012). Risk overhangs limit banks’ willingness to make new positive present value investments in the types of asset involved in these overhangs (Gron and Winton 2001). Debt and risk overhangs that are highly positively correlated across banks especially strongly impair stability by limiting the opportunities for reintermediation within the banking sector and increasing the likelihood that banks receive taxpayer-funded bailouts when they fail en masse.

These perverse incentives can manifest in various ways depending on the extent of banks’ debt overhangs, the nature of the problem assets involved in banks’ risk overhangs, and
other contextual factors. Examples include banks avoiding recording loan loss accruals by rolling over non-performing loans (as occurred with U.S. banks’ lending to less-developed countries in the 1980s and with Japanese banks’ lending to zombie borrowers in their prolonged banking crisis beginning in the early 1990s) or doubling up bets on illiquid securities that have experienced significant adverse price shocks (as occurred with U.S. thrifts’ holdings of junk bonds and other risky assets in the 1980s deregulatory period prior to the thrift crisis). Banks are especially likely to engage in such behaviors if they rationally expect central banks to step in as lenders of last resort (“LOLRs”) by providing liquidity against pledged problem assets. Such intervention increases the market value of the assets without addressing the underlying reasons why they became problem and might even lead banks to increase their exposure to risky assets ex ante. In addition to making the individual banks involved fragile, gambles for resurrection reduce banks’ aggregate provision of liquidity to deserving sectors of the economy and lead to asset price decreases when banks fail or the gambles are otherwise unwound. Decreases in the prices of widely held illiquid assets make banks collectively fragile. Limiting banks’ development of debt and risk overhangs ex ante and ability to gamble for resurrection ex post are thus critical to ensuring stability.

A key assumption in this literature is that banks’ leverage and risk are not perfectly observable (e.g., Diamond and Dybvig 1983). Imperfect observability occurs for various reasons, including the difficulties of measuring the value and risk of banks’ exposures when the relevant markets are illiquid and the cycle-contingent nature of many of their exposures, such as loan commitments, credit and liquidity support in securitizations, and margin calls on derivatives. While imperfect observability implies that market discipline, private contracts, and bank regulation cannot ensure that banks maintain optimal risk levels, banks’ contracts and regulation
still regularly employ accounting measures of their capitalization and risk exposures. These measures range from simple book measures based on bank-level bottom-line accounting numbers, such as leverage ratios, to sophisticated market or book measures based on portfolio-level modeling, such as Value at Risk. Similarly, the Basel Committee (2015) recently expanded risk disclosure requirements in order to enhance market discipline under Basel III’s Pillar 3. The use of accounting measures and disclosures in banks’ contracts and regulation suggest that the quality of banks’ financial reporting is central to the efficacy of market discipline and non-market mechanisms in limiting the debt and risk overhang problems.

Little consensus currently exists among accounting researchers and policymakers as to what financial reporting approaches exacerbate or mitigate the debt and risk overhang problems. In our interpretation, this lack of consensus stems from differences in views about three underlying questions. First, what accounting approaches are most robust across the cycle? For example, fair value and amortized cost accounting are differentially sensitive to market illiquidity for the financial instruments being measured and prone to banks opting to exercise discretion over these measurements. Fair value accounting could facilitate banks’ gambling for resurrection by enabling “mark to myth” level 3 fair value measurements or due to distortions in market prices resulting from LOLRs providing liquidity against problem assets. On the other hand, amortized cost accounting could facilitate such gambling by allowing banks to defer impairment write-downs of problem assets while realizing gains by selling non-problem assets that have appreciated in value due to flights to quality, thereby reducing the quality of their asset mix.

Second, what is the primary role of financial reporting, providing accurate information on a timely basis to market participants or facilitating contracting and regulation, given the potential
for adjustments to reported accounting numbers in contracts and the existence of (in principle separate) regulatory reporting requirements? For example, bank regulators have proposed policies that would require or enable banks to build countercyclical regulatory capital buffers in boom times that would cushion their capital in busts. Some of these proposals would build these buffers through financial reporting, typically by accruing in booms for losses expected to be realized in future busts, for example, through dynamic provisioning for loan losses or by recognizing fair valuation discounts for potential future market illiquidity. Such proposals generally would violate the FASB’s conceptual framework and, absent separate disclosure of the incremental capital buffers created, might reduce the transparency of the information available to market participants and thus market discipline. These buffers could alternatively, and in our view preferably, be built through regulatory reporting or by requiring higher regulatory capital ratios in booms than busts.

Third, do alternative accounting approaches that yield more volatile capital ratios or income for banks also yield more frequent or severe adverse feedback effects? Such effects can occur through various channels, such as increases in illiquidity premia if banks sell problem assets to avoid recording future losses and more frequent violations by banks of debt covenants and regulatory capital requirements. The potential for illiquidity premia to increase depends on the effects of banks’ incremental capital and income volatility on market participants’ understanding of banks’ solvency and performance, as well as on how banks’ beliefs about these effects affect their decisions whether or not to sell illiquid problem assets. The potential for debt covenants and regulatory capital requirements to be violated depends on whether and how contracts and regulation adjust for differences in the volatility of accounting numbers generated under different accounting approaches.
While the third question is usually framed in terms of *ex post* adverse feedback effects, financial and regulatory reporting requirements can also yield better *ex ante* decision-making by banks. For example, well-chosen risk reporting requirements could induce banks and their regulators to better understand how potential future macroeconomic conditions, financial market illiquidity, or commonality among banks’ exposures map into losses on these exposures and liquidity requirements for banks. Financial and regulatory reporting could convey this understanding, perhaps in an aggregated form, to market participants. Better *ex ante* understanding by all parties can mitigate the bank opacity that arises when the cycle turns, thereby reducing the likelihood and severity of adverse feedback effects.

Various significant research design issues arise in empirically identifying the effects of existing and potential alternative financial reporting requirements on stability. We mention three of the most fundamental and pervasive issues here. The first two are quite general, while the third applies specifically to banks’ lending activities.

First, empirical results on the association of cross-sectional variation in banks’ financial reporting *choices* under existing accounting requirements for stability need not generalize to the effects of alternative financial reporting *requirements* for stability. Banks’ financial reporting choices reflect their characteristics (such as capitalization, risk, and balance sheet composition), economic conditions (such as cycle phase and uncertainty about financial asset values), and other factors (such as contracts and regulation). Researchers typically control at best partially for these contextual variables in empirical work. As a consequence, extant empirical results can often be interpreted as stronger banks make both better financial reporting choices and less cyclical decisions given the context examined, rather than as better required financial reporting approaches lead to less cyclical decisions regardless of the context. This internal-validity issue
results from the fact that we cannot observe the counterfactual accounting treatments holding the context constant.

Second, many financial reporting approaches intended to enhance stability would do so by suppressing banks’ accounting volatility or transparency regarding the effects of changing economic conditions across the cycle. This suppression likely would cushion normal business cycles through which virtually all banks survive and prosper. However, it would also suppress the ability for financial reporting to provide early warning of changing economic conditions, potentially lulling banks and their regulators into false senses of security during unsustainable booms driven by asset price bubbles or increasing their incentives and abilities to downplay the appearance of cracks in banks’ business models and the overall economy as those bubbles begin to deflate. Severe busts such as the recent financial crisis tend to be accompanied by a high degree of bank opacity that, if unchecked by financial reporting, motivate banks and other market participants to take self-protective actions, such as racing to the exits to sell assets or withdrawing financing for other banks’ assets, that impair stability. Hence, it is difficult to generalize findings obtained in normal cycles to extreme cycles, and vice versa. More generally, this external-validity issue pertains to the difficulty of generalizing documented effects of financial reporting approaches for stability obtained from analysis of samples drawn from particular contextual settings to alternative settings.

Third, the direct causal effects of banks’ financial reporting approaches on stability predominantly occur through banks’ ability and willingness to supply loans for borrowers’ positive net present value projects (“positive present value loans”), not borrowers’ loan demand. Banks’ ability to supply such loans depends on their current levels and available sources of capital and liquidity. Researchers cannot simply use banks’ current levels of capital and liquidity
as loan demand-independent measures of loan supply, however, because banks’ past satisfaction of loan demand naturally reduces their capital ratios and liquidity, all else being equal. As discussed in Sections 5 and 6, the literature employs various approaches to distinguish loan supply from loan demand, including controlling for explanatory variables related to loan demand, partitioning on size or other variables primarily related to loan supply, employing loan-level data on loan applications (loan demand) as well as loan originations (loan supply meeting loan demand), and examining plausibly exogenous shocks to loan supply.

The need to identify the effects of banks’ financial reporting approaches on loan supply raises three subsidiary but still important issues for accounting researchers to consider and, if salient in the setting under examination, incorporate into their research designs. First, identifying the effect of banks’ accounting treatments on their regulatory capital and thus ability to supply loans poses difficulties akin to those addressed by the sizeable theoretical and empirical literature examining the effects of monetary policy on loan supply. This “macroprudential” literature finds that the effects of macroeconomic policy on loan supply primarily obtain for smaller, less well capitalized, and less liquid banks. Accounting researchers should either ensure that documented effects of banks’ financial reporting approaches on loan supply conform to these analogous findings in the macroprudential literature or credibly explain why they do not.

Second, incremental to their ability to supply loans, banks’ willingness to supply positive present value loans depends on their current understanding of the relevant risk attributes of the loans and their comfort that this understanding will be borne out by subsequent loan performance. Banks’ understanding of these risks likely is influenced by their accounting treatments and the overall quality of their financial reporting systems. We encourage accounting
researchers to give thought as to how to identify the effects of banks’ accounting treatments and systems on banks’ willingness to supply loans.

Third, loan supply and demand are interrelated with each other and with the accounting for loans in ways that these constructs are not for typical economic goods. Loan supply and demand are interrelated with each other because a bank generally does not view a loan to one borrower as substitutable with a contractually identical loan to another borrower; the two borrowers will exhibit loss rates with different average levels, cyclicality, and uncertainty based on the bank’s prior lending relationships with them and other information. In other words, borrower attributes affect the loan potentially supplied from the bank’s perspective. This is a concern for empirical researchers because banks with different locations, sizes, risk tolerances, or other attributes often lend to different types of borrowers. Loan supply and demand are interrelated with the accounting for loans because FAS 5’s incurred loss model works differently for different types of loans. Ideally, accounting researchers should conduct empirical analysis by type of loan or at least controlling for loan portfolio composition.

Although the research design issues threatening valid inference about the relationship between banks’ financial reporting and stability are individually and collectively formidable, we emphasize that attention to sound empirical identification can yield credible results in individual studies that examine this relationship in specific settings using specific designs. Because individual studies cannot possibly describe such a complex relationship completely, however, it is most important that the literature as a whole generates results that generalize or otherwise can be understood to cohere across alternative settings and designs. We believe researchers in individual studies can most effectively advance the literature toward this end by focusing less on controlling for the kitchen sink and more on identifying and examining the primary causal force
at play in the setting examined and by applying the rules for valid inference developed in the philosophy of science. We mention particularly John Stuart Mill’s (1843) three methods for eliminating alternative explanations for hypothesized causal relationships; show the hypothesized effect is: (1) present when the hypothesized cause is present (Method of Agreement), (2) absent when the hypothesized cause is absent (Method of Difference), and (3) stronger when the hypothesized cause is stronger (Method of Concomitant Variation). As discussed in Section 5, the literature often neglects Mill’s latter two methods.

Given the inherent economic importance and current salience of stability for policymakers and accounting standards setters, there is a good chance that credible empirical research on the relationship between banks’ financial reporting and financial system stability will influence financial reporting requirements and thereby stability. We have the individual and collective responsibility to ensure that our research is as reliable and interpretable as possible.

The remainder of this essay is organized as follows. Section 2 provides foundational discussion of how general aspects of banks’ accounting for financial instruments affect stability. Section 3 provides similarly motivated discussion of bank opacity and disclosure. Section 4 discusses a simple (but expandable) model of fair value and amortized cost accounting with regulatory forbearance that illustrates the complex interactions that can result among banks’ accounting treatments, investors’ willingness to fund banks’ assets, the incentives of banks and investors to gamble, and regulators’ policy of bailing out banks. Section 5 evaluates extant empirical work on banks’ financial reporting and stability, and Section 6 provides examples of opportunities for future empirical work on this topic. Section 7 concludes with considerations for accounting standard setters and financial system policymakers.
2. Description of General Aspects of Banks’ Accounting Salient to Stability

In this section, we describe two general aspects of banks’ accounting for financial instruments that affect banks’ financial statements and regulatory capital in ways related to stability: (1) alternative accounting measurement bases for financial instruments; and (2) gross versus net balance sheet presentation of financial instruments with concentrated risks or that are covered by netting agreements. We define the second aspect broadly. For example, we include retained asset and liability interests in securitizations that credit enhance the securities sold to outside investors. These retained interests are presented net under sale accounting for the securitization and non-consolidation of the securitization entity. These interests are presented gross as the securitization entity’s assets and liabilities under secured borrowing accounting for the securitization or consolidation of the securitization entity. We also include the non-recognition of certain risk-concentrated financial instruments such as loan commitments as an extreme case of net presentation. While the first aspect has received more attention in the accounting literature to date, in our view the second aspect has more direct and significant implications for stability due to its greater effects on banks’ regulatory capital ratios. This is especially true for the most systemically important banks that hold large amounts of risk-concentrated financial instruments, many of which are covered by netting agreements with key counterparties.

Both of these aspects of banks’ accounting are associated with currently required financial report and regulatory disclosure requirements and could be enhanced by additional disclosures. We discuss certain aspects of banks’ disclosures in Section 3.
2.1 ALTERNATIVE ACCOUNTING MEASUREMENT BASES

Alternative accounting measurement bases for financial instruments differentially introduce volatility, anticipation of cycle turns, and discretion in banks’ reported capital. In this section, we consider two choices that accounting standard setters face with respect to alternative accounting measurement bases: (1) the general choice between amortized cost and fair value accounting for financial instruments and (2) the specific choice of accruing for loan losses under FAS 5’s current incurred loss model versus an expected loss model or dynamic loss provisioning. While strongly akin to the first choice, the second choice is of particular importance for stability and thus worthy of separate discussion for several reasons: loans are banks’ dominant asset; loan loss accruals are the most significant accounting estimates for all but a few very large trading-oriented banks, and they are the second most significant estimates even for these banks; and loan loss accruals are directly related to banks’ lending and thus to stability. For these reasons, the extant research on the relationship between banks’ provisioning for loan losses and stability (discussed in Section 5.1) is more focused and yields crisper conclusions than does the extant research on the relationship between banks’ fair value versus amortized cost accounting and stability (discussed in Section 5.2). We briefly describe these alternative measurement bases in the remainder of this section; see Ryan (2011, Sections 3.1 and 4.1-4.3) for lengthier descriptions.

In its pure form, amortized cost accounting measures financial instruments throughout their lives using information available at the inception of the instruments. Pure amortized cost measurement suppresses all volatility associated with unrealized gains and losses, involves no anticipation of cycle turns, and limits banks’ discretion to the realization of gains and losses. Under the U.S. GAAP rules governing most of banks’ financial assets, however, amortized cost
accounting is subject to various required forms of impairment accounting, which cause some unrealized losses to be recognized for accounting purposes. To the extent that unrealized losses are recognized, amortized cost accounting takes on some of the aspects of fair value accounting with respect to the recognition of bad news.

In contrast, fair value accounting measures financial instruments each period using current information about future cash flows and relevant interest rates. Absent issues that arise when the markets for the instruments involved are illiquid, fair value measurement incorporates all volatility associated with unrealized gains and losses and anticipates cycle turns insofar as they are predictable based on current information. When the relevant markets are illiquid, fair value measurement shifts banks’ discretion to the estimation of fair values given limited market discipline over these estimates. Depending on the type of financial instrument involved, the form of fair value accounting required by U.S. GAAP records unrealized gains and losses in either net income or other comprehensive income, bypassing the income statement. Banks’ regulatory capital generally is unaffected by unrealized gains and losses recorded in other comprehensive income.

FAS 5’s incurred loss model requires banks to accrue for credit losses on loans only if those losses are incurred, probable of being realized, and capable of reasonable estimation (“estimable”) based on current conditions. The requirement that banks meet all three of these conditions to accrue for loan losses largely restricts anticipation of cycle turns, and focuses banks’ discretion on identifying and quantifying incurred, probable, and estimable losses.

In contrast, the FASB’s proposed expected loss model would entirely eliminate FAS 5’s probable condition for loss recognition. This proposal would also substantially weaken the

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1 Under Basel III as applied internationally, unrealized gains and losses recorded in other comprehensive income are included in banks’ regulatory capital. In July 2013, the U.S. bank regulators decided to require this aspect of Basel III only for the few large U.S. banks applying Basel III’s advanced methods.
standard’s incurred and estimable conditions by requiring banks to use “reasonable and supportable forecasts” of future credit losses, including “factors such as management’s evaluation of the current point in the economic cycle.” The proposal would not suppress much if any volatility, requires significant anticipation of cycle turns, and focuses banks’ discretion on determining when and how strongly the cycle will turn and other factors affecting future credit losses.

Absent measurement issues associated with market illiquidity or the exercise of judgment, fair value accounting and expected provisioning for loan losses should provide earlier warning of deterioration in economic conditions than do amortized cost accounting and provisioning for loan losses under the incurred loss model, respectively. Earlier warning should limit banks’ gambling for resurrection and other behaviors with adverse effects on stability. The relevant markets may be illiquid, however, either temporarily due to a credit market dislocation or persistently due to a structural market incompleteness (e.g., non-agency mortgage-backed securities usually are illiquid after their initial issuance). When this is the case, fair value accounting may require banks with the ability to hold financial instruments to any recovery of market liquidity or maturity, whichever comes first, to record losses attributable to illiquidity premia that exceed the losses that they ultimately will realize on the instruments. This requirement could impair stability if it causes banks to sell financial assets to raise capital ratios or in a race to the exits to avoid potential future fair value losses, further increasing illiquidity premia. As discussed in Section 5.2.4, extant research suggests that fair value accounting did not yield such adverse feedback effects to any meaningful extent during the crisis. Market illiquidity also provides banks with the ability to exercise discretion over fair value measurements. Whether this discretion has more significant adverse effects on stability than does banks’ discretion over
the realization of gains and losses on their instruments measured at amortized cost is arguable based on the limited extant empirical evidence.

Fair value accounting for assets has procyclical impacts on banks’ regulatory capital in certain cases (IMF 2008); (optional) fair value accounting for liabilities has the opposite effect due to the incorporation of banks’ own credit risk. However, at least four a priori strong reasons exist to believe that fair value accounting has had relatively minor effects on capital and thus stability to date. First, banks’ primary types of financial instruments (loans and deposits) are measured at amortized cost not fair value; reflecting this fact, during the financial crisis incremental provisions for loan losses considerably exceeded unrealized fair value losses even for the largest banks with the highest proportion of fair valued assets (Shaffer 2010; Laux and Leuz 2010; Badertscher, Burks, and Easton 2012). Second, FAS 157 defines fair value as the price that would be paid in an “orderly transaction,” not a fire sale, reducing the effect of market illiquidity on fair value estimates. Third, banks’ regulatory capital excludes unrealized gains and losses (including the noncredit portion of other-than-temporary impairment losses on investment securities under FSP FAS 115-2 and FAS 124-2) recorded in accumulated other comprehensive income. This exclusion applies to unrealized gains and losses on available-for-sale (AFS) debt securities, banks’ only commonly held type of financial instrument recognized at fair value. Fourth, riskless interest rates typically rise in good times, yielding losses on low-credit-risk debt securities and loans, and fall in bad times, yielding gains on those assets. These losses and gains

2 We use “procyclicality” and “cyclicality” as antonyms for “stability,” particularly in the discussion in Section 5 of the extant empirical literature, which typically refers to procyclicality.
3 We do not discuss fair value accounting for liabilities further in this essay due to the absence of any research of which we are aware on the relationship between banks’ fair value accounting for liabilities and stability. See Barth et al. (2008) for a differently motivated empirical analysis of fair value accounting for liabilities.
4 With rare exceptions, only very large banks hold significant amounts of financial instruments, such as trading securities and derivatives, for which unrealized fair value gains and losses are recorded in net income and regulatory capital. Bank regulators state in various documents, however, that they may consider a bank’s unrealized gains and losses in evaluating its regulatory capital adequacy (e.g., Office of the Comptroller of the Currency 1994).
have counter-cyclical effects on regulatory capital (Xie 2012, 2015). In contrast, the FASB’s proposal to require expected provisioning for loan losses could have sizeable effects on capital depending on how expansively banks implement the proposed requirement to incorporate “reasonable and supportable forecasts” of future credit losses. As discussed in Section 5.1, empirical evidence suggests that banks that record timelier provisions for loan losses under FAS 5’s incurred loss model make stability-enhancing decisions such as originating additional positive present value loans during recessions and issuing more capital during both recessions and non-recession periods.

Bank regulators in Spain have employed dynamic provisioning for loan losses since 2000. In its simplest form, dynamic provisioning uses historical average loss rates across one or more prior economic cycles to estimate current loan loss accruals. Dynamic provisioning for loan losses suppresses volatility associated with the current stage of the economic cycle, requires anticipation of cycle turns following the pattern of one or more recent prior cycles, and focuses banks’ discretion on identifying and quantifying the relevant average loss rates. The FASB has rejected dynamic provisioning due to its inconsistency with accounting concepts; specifically, CON 6’s definitions of assets and liabilities require that recognition be based on past transactions or events.

Dynamic provisioning for loan losses has both attractiveness and risks as a regulatory tool. Its purpose is to smooth banks’ regulatory capital across the cycle, decreasing capital in good times and increasing it in bad times. These accrual adjustments to banks’ regulatory capital ratios (“accrual capital”) do not directly affect their economic capital. Accrual capital may induce banks to make decisions with counter-cyclical effects on economic capital, however,

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5 Allowances for loan losses are included in Tier 2 capital up to a cap; under Basel III, the cap differs for banks using the standardized versus advanced approaches.
such as curtailing excessive lending and issuing additional equity on favorable terms in good
times or promoting positive present value lending and issuing less equity on unfavorable terms in
bad times. Although regulators intend dynamic provisioning to look forward to the next cycle
turn, it invariably does so by looking backward to prior cycles. Such backward-looking capital
smoothing should promote stability as long as the current cycle turns out to be similar to or less
severe or prolonged than the recent prior cycles used to estimate average loss rates. It likely will
exacerbate instability, however, if the current cycle turns out to be much more severe or
prolonged than the prior cycles used to estimate average loss rates. In particular, if the additional
accrual capital created by dynamic provisioning in prior economic good times induces banks to
defer issuing economic capital early in what turns out to be an unexpectedly severe downturn,
banks will ultimately be less able and perhaps unable to deal with the full force of that downturn.
Hence, regulators employing dynamic provisioning as a regulatory tool to enhance stability need
to pay vigilant attention to the severity of the current cycle as it develops.

2.2 GROSS VERSUS NET PRESENTATION OF RISK-CONCENTRATED FINANCIAL
INSTRUMENTS AND INSTRUMENTS COVERED BY NETTING AGREEMENTS

Gross presentation of risk-concentrated financial instruments and instruments covered by
netting agreements has sizeable effects on banks’ regulatory capital ratios, particularly simple
leverage ratios that do not distinguish instruments based on their risks. Relative to net
presentation, gross presentation increases banks’ assets and liabilities, in most cases by identical
amounts, thereby decreasing banks’ capital ratios. In cases where gross presentation corresponds
to secured borrowing accounting and net presentation corresponds to sale accounting, net
presentation also increases owners’ equity by any after-tax gain on sale compared to gross
presentation, further increasing banks’ capital ratios.
The reduction of capital ratios that generally results from gross presentation of risk-concentrated financial instruments could, if not undone by regulators, put appropriate brakes on banks’ accumulation of debt and risk overhangs during good times and/or curtail desirable financial intermediation during bad times. Gross presentation might also result in greater overall transparency than net presentation, because users of financial reports can net financial instruments presented gross but not gross up instruments presented net. Gross presentation is particularly informative when accompanied by footnote disclosures or other information indicating the extent to which the financial instruments involved offset economically.

Banks hold two general types of risk-concentrated financial instrument that tend to be accounted for differently and to have qualitatively different implications for stability. The first type includes instruments with zero or small initial values that expose banks to the price risk of higher valued underlying positions but do not require banks in liability positions (i.e., for which the prices of the underlying positions have moved in unfavorable directions) to purchase or otherwise fund the entire amounts of those positions. The primary example of this type of instrument is net cash-settled derivatives. U.S. GAAP typically requires banks to recognize this type of instrument at fair value on the balance sheet, a net presentation for a risk-concentrated instrument. These recognized fair values change with the prices of the underlying positions and thus capture the expected liquidity requirements for holders of financial liabilities. For example, banks holding derivative liabilities typically are contractually required to post collateral equal to a percentage of the fair value of the liability that rises as the bank’s credit rating deteriorates.

The second type of risk-concentrated financial instrument includes option-like instruments that require, upon demand of banks’ counterparties or under specified triggering conditions, banks to purchase or fund the entire amount of underlying positions. Examples
include loan commitments and the provision of credit and liquidity support in securitizations. U.S. GAAP often does not require banks writing these instruments to recognize them on balance sheet; for example, commitments to originate loans other than agency mortgages are largely or entirely unrecognized.6

The second type of risk-concentrated financial instrument likely has stronger effects on stability than does the first type for four reasons. First, the first type of instrument often is involved in hedging relationships or netting agreements; when this is the case, liquidity may be required for a given instrument in the relationship or agreement but not for the relationship or agreement as a whole assuming it remains intact (e.g., all counterparties perform on all contracts). Second, when triggered, the second type of instrument imposes greater liquidity requirements by demanding the writers of the instruments to purchase or fund the entire underlying positions. Third, this type of instrument is unlikely to be triggered in favorable economic times when liquidity is readily available in the market, perhaps lulling banks and their regulators into false senses of security, but is likely to be triggered in a highly correlated fashion across counterparties in sufficiently bad economic times such as credit crises. For example, during the financial crisis, non-financial firms made precautionary draws on loan commitments (Ivashina and Sharfstein 2010) and sponsors of asset-backed commercial paper conduits and special investment vehicles provided both contractual and noncontractual liquidity support to those vehicles (Acharya and Schnabl 2010; Acharya, Schnabl, and Suarez 2013). Fourth, as discussed above, this type of instrument often is unrecognized, out of sight and mind.

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6 These loan commitments constitute loss contingencies for which FAS 5 requires recognition of an accounting liability for incurred, probable, and estimable losses. Credit and liquidity support retained in securitizations accounted for as sales are recognized at fair value at inception under FAS 140 and FAS 166. Banks’ provision of credit and liquidity support to securitization or similar entities might also increase the likelihood that the banks consolidate the entities under FIN 46(R) and FAS 167. If a bank consolidates an entity, the assets and liabilities of the entity are separately recognized at their gross fair values on-balance sheet.
Gross (net) balance sheet presentation of financial instruments covered by typical netting agreements between counterparties under IFRS (U.S. GAAP) constitutes the single largest difference between large banks’ financial statements under the two accounting systems. IFRS requires gross presentation of financial instruments unless they economically offset in all circumstances (i.e., not just in the event of default), which rarely occurs, whereas U.S. GAAP allows net presentation if the instruments offset only conditional on default, as is specified under typical netting agreements. Although the default of one of the counterparties to a netting agreement generally is the time that offsetting of financial instruments becomes most salient, the size of the gross positions between the counterparties can affect the non-defaulting counterparty’s behavior both prior to (e.g., in requiring maximum collateral) and after (e.g., in closing out positions given its contractual control rights) the default of the other counterparty, as occurred around the demises of both Bear Stearns and Lehman Brothers (Parsons 2013). A recent statement by FDIC Vice Chairman Thomas Hoenig (2015) emphasizes the significantly lower solvency of systematically important banks at the end of 2014 portrayed by the FDIC’s use of gross rather than net presentation of the banks’ financial instruments covered by netting agreements.


One of the primary channels by which banks’ financial (and regulatory) reporting can affect stability is by increasing the publicly available information about banks’ exposures and relevant economic conditions. An increase in such information is most likely to affect stability...
when those exposures and conditions exhibit significant Knightian (1921) uncertainty (i.e., “unknown unknowns”), at least for some key market participants some of the time, so that bank contracts and regulation do not and logically cannot anticipate all possible outcomes. We refer to such uncertainty simply as “bank opacity.” An ongoing debate exists in the literature regarding whether reducing bank opacity by increasing publicly available information about banks’ exposures and relevant economic conditions enhances versus impairs stability. In this section, we describe this debate and also discuss several types of bank opacity that, while non-mutually exclusive, have distinct relationships to financial reporting and possible effects on stability.

The traditional view is that bank opacity impairs stability. For example, Morgan (2002) states “the opacity of banks exposes the entire financial system to bank runs, contagion, and other strains of ‘systemic’ risk. Take away opacity and the whole story unravels.” Nier and Bauman (2006) state that “banks are prone to engage in moral hazard behavior,” but that “a bank that discloses its risk profile exposes itself to market discipline and will therefore be penalized by investors for choosing higher risk.” This view is consistent with our discussion of the destabilizing effects of debt and risk overhangs in the introduction. It is also reflected in the Basel Committee’s (2015) recently expanded risk disclosure requirements and in other recent proposals to expand banks’ public disclosure of their risks, such as the reports of the Enhanced Disclosure Task Force (2012, 2013) established by the Financial Stability Board.

Taking the opposing view, Dang et al. (2014) and Holmström (2015) argue that one of banks’ central roles in the financial system is the creation of highly liquid, money-like debt claims, including FDIC-guaranteed deposits, and that bank opacity is a necessary condition for banks to fulfill this role. Specifically, these authors state that, to fulfill this role effectively,

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8 Although it is clear that households and other parties demand highly liquid, money-like claims, and that banks have historically provided these claims in large amounts, particularly when alternatives such as U.S. Treasury
these bank debt claims must be sufficiently collateralized so that their value is “information insensitive” enabling investors to invest in the claims with “no questions asked.” Asking and answering questions takes time, impairing liquidity. The authors state that, to the extent that the collateralization of bank debt claims may not suffice to ensure that the claims remain insensitive to all possible future events, any sensitivity should be mitigated by: (1) bank regulation and supervision that does not publically reveal information about banks’ exposures and relevant economic conditions, because this revelation could cause the claims to become information sensitive and thus less liquid; and (2) governmental guarantees of losses borne by bank debt claimants that arise \textit{ex post} when extreme events occur. The authors argue further that, to the extent that banks learn information about the value of their loans and other assets that explicitly or implicitly collateralize their debt claims, the banks should be “secret keepers” to ensure that investors remain symmetrically uninformed about the value of those claims, thereby maintaining liquidity.

These diametrically opposed views result in large part from the two sets of authors focusing on distinct aspects of banks’ exposures and roles in the financial system. The traditional view focuses on banks’ accumulation of debt and risk overhangs, especially correlated overhangs across banks—essentially the (leveraged) asset side of banks’ economic balance sheets. Under this view, market discipline is central to providing banks with \textit{ex ante} incentives to invest in and finance assets in ways that do not compromise their own solvency. The opposing view focuses on banks’ issuance of highly liquid, money-like debt claims—essentially the liability side of their securities are in short supply, it is arguable whether the provision of these claims by banks issuing guaranteed deposits rather than alternative governmental or non-governmental alternatives is socially desirable. For example, Krishnamurthy and Vissing-Jorgensen (2012) provide evidence, consistent with the traditional view, that banks’ mismatch of illiquid assets and liquid liabilities predicts financial crises, suggesting that this role impairs stability. We discuss related distinctions between the traditional and opposing views below.

\footnote{Similarly, Hanson et al. (forthcoming) say that investors can “remain ‘sleepy’: they do not have to pay attention to transient fluctuations in the mark-to-market value of bank assets.”}
economic balance sheets. Under this view, market discipline could _ex post_ yield stability-compromising actions such as bank runs. Naturally, financial intermediation inherently involves both sides of banks’ economic balance sheets, and problems with either side can impair stability. The theoretical literature examining whether banks’ stress test results should be disclosed to the market emphasizes this point, showing that such disclosure entails both benefits and costs (e.g., Goldstein and Sapra 2014). Moreover, the two sides of banks’ balance sheets can interrelate in subtle ways. For example, Diamond and Rajan (2001) develop a model in which the financing fragility that results from banks’ issuing highly liquid liabilities helps resolve recontracting problems between banks and their borrowers and thereby enables banks to more fully finance their illiquid assets. Overall, however, we concur with Shleifer’s (2011) conclusion that the primary problem generally arises with banks’ accumulation of debt and risk overhangs on the asset side, and that liquidity problems arising on the liability side tend to follow from that primary problem.

We discuss three general types of bank opacity that raise distinct problems for stability. The first type is “symmetric ignorance” in which essentially no market participant, including banks, knows much about banks’ exposures and relevant economic conditions. This type of opacity may arise from unalloyed Knightian uncertainty; from behavioral biases, such as the representativeness heuristic, that cause market participants to neglect certain risks (e.g., Shleifer 2011; Gennaioli, Shliefer, and Vishny 2014); or from incentive issues that cause market participants to avoid gathering information (e.g., Rajan 2005; Gallemore 2013). Regardless of the source, symmetric ignorance renders banks’ internal risk management undisciplined, for example, focusing on material events that have (recently) occurred rather than on the unknown

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10 Our version of “symmetric ignorance,” which involves all market participants, including banks, is broader than the version discussed by Holmström (2015), which involves only different classes of bank debt claimants.
possible future events whose occurrence would have the most significantly adverse effects on bank solvency. This lack of discipline can lead individual banks to accumulate debt and risk overhangs unwittingly. Moreover, because all banks exhibit the same ignorance, these overhangs are likely to be correlated across banks. The provision of financial report or other public information about banks’ exposures, individually and collectively, that reduces this type of opacity early enough to enable markets to discipline banks’ accumulation of correlated overhangs—an essential role of a financial stability monitor—surely would enhance stability. In contrast, the provision of such information after significant overhangs have developed could induce banks to dump assets and take other actions that impair stability at least in the short run, similar to the third type of opacity discussed below.

An obvious example of symmetric ignorance that arose prior to the financial crisis was the widespread view that house prices could not decline nationally to any significant extent, and certainly not by an amount close to the 30 plus percent decline that actually occurred. A more specific (although highly related) example was the view at various large securitization sponsors that the provision of liquidity and credit support to securitization entities was unlikely to yield appreciable losses. This view may explain why Citigroup’s directors and regulators were unaware of Citigroup’s provision of liquidity puts to special investment vehicles (SIVs), a significant failure of bank governance in retrospect.

These examples suggest that symmetric ignorance typically results from widespread misperceptions about relevant economic conditions, perhaps partly due to underlying behavioral or incentive issues. Assuming that any such issues are not so great as to prevent accounting standard setters from improving the effectiveness of bank-level financial reporting requirements, such improvements should reduce this type of bank opacity. For example, the FASB could
expand FAS 140 and FAS 166’s requirement to disclose the sensitivity of the fair value of
retained interests from securitizations to unfavorable changes in certain assumptions to require
banks to disclose the sensitivity of their individual and aggregate positions to changes in house
prices or other economic conditions deemed relevant at the time. Similarly, the FASB could
more clearly specify what FAS 166 and FAS 167’s requirement to disclose the “[t]erms of
arrangements…that could require the enterprise to provide financial support (for example,
liquidity arrangements and obligations to purchase assets) to” securitization entities entails for
securitization sponsors that provide liquidity and credit support to those entities.

The second type of bank opacity arises when banks’ debt claimants know less about
banks’ exposures and relevant economic conditions than do banks. Under this type of opacity,
the primary concern is that banks are or may become insufficiently solvent to pay their debt
claimants in full. If this concern becomes sufficiently salient to a bank’s debt claimants, they
may engage in a run on the bank. The best approach to mitigating any adverse effect of this type
of opacity on stability differs under the traditional versus opposing views discussed above. Under
the traditional view, this type of opacity is destabilizing and the provision of public information
about banks’ exposures and relevant economic conditions should mitigate the concern of bank
debt claimants as long as banks are sufficiently solvent; if not, banks must be either recapitalized
or resolved. Under the opposing view, this type of opacity is desirable and the concern of debt
claimants is best mitigated through collateralization, bank regulation and supervision, and
governmental guarantees.

Banks’ state-contingent and customizable margin requirements on over-the-counter
(OTC) derivatives constitute a type of exposure susceptible to this type of opacity (Acharya
The most famous instance of this type of exposure is AIG’s written credit default swaps (CDS) on “super senior” referenced exposures, which experienced massive and rapid losses and liquidity requirements during the financial crisis. In its financial reports during the financial crisis (but not before), AIG provided three disclosures about these CDS: (1) notional amounts by broad class of referenced exposure, (2) fair values by broad class of referenced exposure, and (3) sensitivity of margin requirements to downgrades in AIG’s credit rating. For example, in its 2008Q2 Form 10-Q filing on August 6, 2008, 40 days prior to its takeover by the federal government, AIG disclosed a $447 billion notional amount and $26 billion loss of fair value on its written CDS, distinguishing four primary types of referenced exposure: corporate loans ($173 billion notional value, $0 fair value loss); prime residential mortgages ($133 billion notional value, $0 fair value loss); corporate debt/collateralized loan obligations ($54 billion notional value, $1 billion fair value loss); and multi-sector CDOs ($80 billion, $25 billion fair value loss). AIG disclosed that a one-notch (two-notch) downgrade by both Moody’s and S&P would yield a collateral call of $13.3 billion ($14.5 billion). These disclosures located AIG’s risk primarily in its multi-sector CDS and indicated the liquidity requirements of a credit rating downgrade. However, they scarcely enabled market participants to anticipate the reasons for and effects of S&P’s two-notch downgrade of AIG’s credit rating from AA minus to A minus on September 15, 2008, the day of Lehman’s bankruptcy filing, which causing AIG to experience an immediate $8.6 billion increase in collateral calls from counterparties on its written CDS on multi-sector collateralized debt obligations, one of the two primary reasons for the federal government’s takeover of AIG on September 16, 2008 (McDonald and Paulson 2014).

11 The International Swaps and Derivatives Association (ISDA) master agreement for OTC derivatives includes a credit support annex specifying margin requirements. In practice, the counterparties to an agreement often customize this annex to include thresholds for posting margin and/or margin percentages that depend on the counterparties’ credit ratings. For example, McDonald and Paulson (2014) describe AIG’s distinct customized margining agreements with RBS, Goldman Sachs, and Merrill Lynch.
The third type of bank opacity arises when some investors, including banks, have less information or learn more slowly than other investors about the value or risk of commonly held assets. Under this type of opacity, banks’ primary concerns are that their assets are less valuable or riskier than current market prices suggest and that those prices will fall if other holders of the assets receive adverse information and/or are able to sell on a timelier basis than are the banks. Banks and other investors that receive even slightly adverse or ambiguous news about the value or risk of assets may take individually protective behaviors, such as racing to the exits to dump the assets, with adverse consequences for stability.

Banks’ counterparty risk on purchased CDS is an example of this type of bank opacity. Banks are not required to and generally do not disclose the identities of their counterparties. Although a given bank knows its bilateral exposure to a key counterparty on a given type of purchased CDS, the bank does not know the counterparty’s aggregate exposure across banks on that type of CDS unless the counterparty publicly discloses its exposure. Hence, banks with larger or more frequently modified exposures to a key counterparty likely know more about that counterparty. This type of opacity could be mitigated by central clearing of derivatives to the extent it yields transparency about counterparties’ aggregate exposures (Acharya, Shachar, and Subramanyam 2011).

Two standards effective in 2009, FAS 161 and FSP FAS 133-1 and FIN 45-4, mandate enhanced disclosures of derivatives. These standards likely have reduced the second and third types of bank opacity to some extent. We note, however, that financial reports can only convey what banks already know or can be required to learn. In this regard, financial reporting requirements that promote bank learning can enable superior disclosure, both mandatory and voluntary. We expect this is most likely to be the case for financial reporting requirements that
require banks to model or otherwise measure their risks and to evaluate the quality of their
tools and measurements in ways they would not otherwise due to the costs involved or
complacency. For example, to satisfy fair value accounting requirements for their individual
exposures for which the relevant markets are insufficiently liquid to directly provide the
exposures’ fair values, banks must model the value-relevant risks of those exposures. To satisfy
risk concentration disclosure requirements, banks must evaluate these risks at the bank level. To
satisfy requirements to disclose backtesting and stress testing of valuation models, banks must
evaluate their models’ historical and potential future performance, respectively. As discussed in
Section 5.1.2, Bhat, Ryan, and Vyas (2014) provide evidence that banks’ credit risk modeling
disclosures are positively associated with their provision for loan loss timeliness and negatively
associated with their loan origination procyclicality, consistent with these disclosures being
positively associated with banks’ understanding of their credit risks.12 We encourage researchers
to find ways to examine directly the possibility that financial reporting requirements that
promote bank learning enable superior disclosure.

4. A Stylized Model of Fair Value and Amortized Cost Accounting with Regulatory Forbearance

4.1 MODEL MOTIVATION

In this section, we describe a stylized model, developed fully in the Appendix, that
captures the most salient difference between fair value and amortized cost accounting for
financial instruments: fair value accounting provides timelier information about changing
economic conditions affecting those instruments.13 Our primary purpose is to show how the

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12 Bhat and Ryan (forthcoming) provide related evidence that banks’ market and credit risk modeling disclosures
enhance the returns relevance of recognized and disclosed unrealized fair value gains and losses.
13 The Appendix refers to fair value accounting as mark-to-market (MTM) and amortized cost accounting as no-
information (NI).
distinct effects of these accounting approaches depend on contextual variables. The empirical literature examining aspects of banks’ financial reporting and stability discussed in Sections 5 and 6 of this essay must control for a wide range of such variables to generate reliable inferences. Obviously, a limited number of contextual variables can feasibly be incorporated in any model. We chose to incorporate the possibility of regulatory forbearance, because one of the most highly debated policy issues in academia and industry alike concerns the suspension of fair value accounting during a period of economic turmoil in favor of amortized cost-based accounting. As was the case during the recent financial crisis, such a suspension is likely to occur coincident with various forms of regulatory forbearance. Hence, the effects of a suspension of fair value accounting are likely to be tangled up, both theoretically and empirically, with the effects of regulatory forbearance.

4.2 MODEL DESCRIPTION AND DISCUSSION

The model involves three dates (t = 0, 1 and 2). A continuum of projects that could become available to a single representative firm at date 0 is indexed by project quality parameter θ (a probability related to project success, as described below). To be implemented, a project requires financing of 1 unit at date 0. The representative firm decides whether to undertake the single project that becomes available and, if it decides to do so, the firm must raise the required financing from a risk-neutral external debt investor. The face value of debt, F, is determined in equilibrium to meet the investor’s individual rationality constraint. The firm receives a high signal H (low signal L) with probability θ (1 – θ) at date 1, where θ is common knowledge. Depending on the accounting approach used, the firm may or may not report this signal to the investor, as discussed below. If the investor receives the signal, she may choose to continue

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14 Because we do not specify any other features of the investor, we do not refer to her as a “bank.” Our incorporation of a bailout probability later suggests, at a minimum, that the investor is systemically important in some respect.
funding the project to date 2 or to liquidate the project at date 1. Conditional on the investor continuing project funding when the firm receives signal H (L), the project yields a cash payoff of R, i.e., is successful, with probability $q_H$ ($q_L$) and yields a cash payoff of 0, i.e., fails, with probability $1 - q_H$ ($1 - q_L$) at date 2. Without loss of generality, H (L) also represents the liquidation value, i.e., the cash received by the investor from liquidating the project, conditional on receiving signal H (L) at date 1.

Under fair value accounting, the firm reports the signal received and thereby provides the investor with the option of state-contingent liquidation at date 1. Under amortized cost accounting, the firm does not report the signal and the investor must continue or liquidate the project at date 1 based on predetermined date 0 information. For simplicity, we assume: (1) conditional on the investor receiving signal H (L), it is optimal for her to continue (liquidate) the project at date 1; and (2) for a project optimally funded at date 0, the expected project cash flow is higher under continuation than liquidation at date 1. The first assumption implies that under fair value accounting the investor continues funding the project conditional on receiving signal H and liquidates the project conditional on receiving signal L at date 1. The second assumption implies that under amortized cost accounting the investor unconditionally continues the project at date 1.

We first determine how the two accounting approaches impact the financing provided by the investor at date 0. The face value of debt, F, must be high enough to satisfy the investor’s individual rationality constraint. If project quality, θ, is sufficiently low, the debt face value required to meet this condition exceeds the maximum possible payoff, R, so the project will not be funded. This constraint determines the lower bound on the quality of projects that can be financed in equilibrium. The lower bound differs for fair value and amortized cost accounting.
due to the existence of the liquidation option at date 1 for the former accounting approach but not the latter. Comparison of the funding sets and costs of funding under the two accounting approaches illustrates their relative efficiency.

Our first main set of results is the investor funds projects with a wider range (i.e., a smaller lower bound) of quality, $\theta$, at a lower face value of debt, $F$, under fair value accounting than under amortized cost accounting.\textsuperscript{15} Intuitively, the investor’s option to liquidate at date 1 under fair value accounting makes it easier to meet the investor’s individual rationality constraint and thereby yields a wider funding set. It also increases the expected cash payoff in the low state, $L$, enabling a larger payment to the investor in that state. Since the investor makes zero expected profit in equilibrium, the face value of debt, which equals the payment to the investor in the high state, $H$, is also lower under fair value accounting. Thus, the model indicates that fair value accounting improves efficiency by providing the investor with timelier information about the project’s prospects, enabling more projects to be funded and reducing the cost of debt financing for those projects.

These results change in interesting ways once we extend the benchmark model described above to include the possibility of regulatory forbearance. To do this, we augment the model by introducing an \textit{ex post} form of forbearance we refer to as “bailout.” Specifically, conditional on the project failing at date 2, the regulator pays the face value of the debt, $F$, to the investor with an exogenous probability $b$.

The results describe below reflect the combined effects of two important changes to the benchmark model: (1) the suspension of fair value accounting in favor of amortized cost accounting; and (2) the introduction of the probability of bailout. Considered separately, these

\textsuperscript{15} See Appendix, Lemma B.1 and Proposition B.2. For explicit expressions of the funding set lower bound, see page A-3.
changes produce opposing effects on the likelihood of project funding. Suspending fair value accounting eliminates the investor’s option to liquidate the project at date 1 and reduces the funding set. The bailout probability, b, by increasing the payoff to the investor in the event of project failure at date 2, relaxes the investor’s individual rationality constraint and expands the funding set. Which of these opposing effects dominates depends on the level of the bailout probability. When this probability is sufficiently low, the effect of suspending fair value accounting dominates the effect of bailout and the likelihood of project funding falls. For a sufficiently high bailout probability, the effect of bailout dominates.\(^\text{16}\)

Our second main set of results pertains to how the bailout probability, b, impacts the face value of debt, F, which occurs for two reasons. First, by increasing the payoff to the investor in the event of project failure at date 2, the bailout probability decreases the required payoff to the investor if the project succeeds, i.e., the debt face value. This effect occurs under both fair value accounting and amortized cost accounting. Second, and more subtly, the bailout probability makes the firm more willing to increase the debt face value to induce the investor to continue project financing at date 1 even when she receives the low signal, L, under fair value accounting. When the bailout probability is sufficiently high, the firm sets the face value at the level that induces the investor to continue funding the project even in this case. Intuitively, above this threshold bailout probability the investor joins the firm, which always prefers continuation of project funding to date 2, in gambling for a good outcome despite receiving the low signal, knowing that if the gamble fails she will be bailed out with probability b. Since this effect only occurs under fair value accounting, the equilibrium debt level under fair value accounting becomes higher than under amortized cost accounting above this threshold bailout probability.\(^\text{17}\)

\(^{16}\) Table 1 in the Appendix shows how the variation in the bailout probability impacts the funding constraints.\(^{17}\) See Appendix, Figure 2.
Our third and most important set of results compares the relative costs and benefits of institutionalizing a bailout program under the two accounting approaches. While such a program provides valuable insurance \textit{ex post} and expands project financing \textit{ex ante}, it also yields costly bailouts of failed projects that must be funded through higher taxes or other means. The expected benefits of a bailout program equal the expected incremental project cash payoff attributable to the bailout probability. This incremental payoff stems from two sources: (1) the expected cash payoff generated by the additional (i.e., lower \( \theta \)) projects funded as a consequence of the bailout program; and (2) the excess expected cash payoff generated by projects that would be financed without bailout due to the reduced face value of debt. The expected cost of the bailout program is the expected cash payments to investors in failed projects that are bailed out. For a low bailout probability, fair value accounting dominates amortized cost accounting with both more projects funded and lower expected bailout costs.\(^\text{18}\) However, as the bailout probability rises the two accounting approaches converge in terms of the projects that are funded; for sufficiently high bailout probability, all projects are funded regardless of the accounting approach used. For sufficiently high bailout probability, however, the expected bailout cost is substantially higher under fair value accounting than amortized cost accounting, because the firm sets the face value of debt higher under fair value accounting to ensure the investor continues project funding at date 1.\(^\text{19}\)

The discussion suggests the following generally important considerations for policymakers. The effect of suspending fair value accounting during a period of economic

\(^{18}\) Lower expected bailout costs result under fair value accounting due to both lower face value of debt and lower bailout probability. For sufficiently low bailout probability, the investor always liquidates the project conditional on receiving a low signal at date 1 under fair value accounting; hence, bailout occurs only when the project fails despite receiving a high signal at date 1 under this accounting approach.

\(^{19}\) See Appendix, Figure 3. Be aware that the third portion of this figure depicts the incremental net benefit resulting from the bailout probability \( b \) increasing above the benchmark probability of zero, not the net benefit for a given bailout probability.
turmoil on funding availability depends on the regulatory environment. Our stylized model predicts that fair value accounting yields tighter (looser) financing when combined with a sufficiently low (high) bailout probability. Hence, the combination of fair value accounting and a sufficiently high bailout probability provides the investor with the incentive to gamble along with the firm by continuing financing for an inefficient project, yielding higher expected bailout costs. These costs could make amortized cost accounting relatively desirable when the bailout probability is sufficiently high. More generally, the implications of fair value accounting or any other accounting approach cannot be assessed in isolation, but must be considered in conjunction with the regulatory environment and other salient contextual factors.

This point translates into the following implication for empirical tests, the subject of Sections 5 and 6 of this essay. An observed increase in the availability of financing around the suspension of fair value accounting might be attributable to coincident changes in the regulatory environment.

4.3 POSSIBLE MODEL EXTENSIONS

Our stylized model of a representative firm’s funding of projects under fair value and amortized cost accounting given an exogenous level of regulatory forbearance could be extended in various ways. For example, the level of regulatory forbearance that optimally trades off benefits and costs could be determined endogenously. One way to do this would be to allow for multiple firms with multiple correlated projects, which would enable analysis of whether and how one firm’s accounting for project-related assets affect other firms’ ability to raise and maintain financing and for their projects.20 We believe this is essentially a necessary feature for the model to allow for correlated debt and risk overhangs that compromise stability to develop,

20 See Acharya, Mukherjee, and Sundaram (2015) for a model that includes two firms with correlated assets.
as discussed in the introduction. Another possibility is to explicitly make the accounting approach a discretionary choice of the firm. This would be particularly important if the investor was modeled as bank with capital requirements or the investor’s regulator were modeled as having cycle-inconsistent incentives. Lastly, opacity of the sorts discussed in Section 3 might be incorporated.

Even (and likely more so) in such an expanded model, we expect the following key insight from our model and analysis to survive. It is crucial to assess the effects of fair value accounting and other accounting approaches in the context of the regulatory environment.


5.1 PROVISIONING FOR LOAN LOSSES

Provisioning for loan losses is the most extensively researched aspect of bank accounting in general, and it has been a primary focus of recent research on how bank accounting affects stability. This focus stems from the fact that many bank regulators and others (e.g., Laeven and Majnoni 2003; Dugan 2009) argue that FAS 5’s incurred loss model exacerbates the severity of economic downturns by requiring or allowing banks to reserve too little for loan losses during economic good times, thereby necessitating that banks record large credit losses, reducing their regulatory capital and compromising their ability to originate loans, during economic downturns. Responding to political pressure arising during the financial crisis, the FASB continues to redeliberate its December 2012 proposed standard on accounting for credit losses on financial instruments. This proposed standard would require lenders to record impairments for “expected” credit losses over the remaining lives of loans and various other types of financial assets. The IASB issued a similarly motivated final standard in July 2014.
In this section, we describe and evaluate in detail one study examining the relationship between banks’ provisioning for loan losses and stability, Beatty and Liao (BL, 2011), the most influential study conducted to date on the relationship between any aspect of banks’ accounting measurement and stability. We describe how even this carefully executed study, as the first serious attempt to address a highly complex question, does not address many of the research design issues raised in the introduction. We indicate the substantial opportunities that remain for future research to address these difficult issues. We more briefly summarize two other studies that examine other interesting aspects of this relationship and offer similar research opportunities for similar reasons.

5.1.1 Beatty and Liao (2011). BL’s key finding is that, within a size-stratified subset of banks whose loan growth during recessions is positively related to their regulatory capital, banks that record timelier provisions for loan losses (measured relative to changes in non-performing loans) under FAS 5’s incurred loss model also exhibit lower loan origination procyclicality as reflected in higher loan growth during recessions. Specifically, BL find that U.S. banks with assets above $500 million, but not those with assets below $500 million, exhibit loan growth during recessions that decreases as their regulatory capital decreases, a phenomenon they refer to as the “capital crunch” effect. Restricting their focus to these larger banks that exhibit this effect, BL find that banks that record timelier provisions for loan losses originate more loans during recessions and those originations are less sensitive to the banks’ regulatory capital levels. BL conclude that “the capital crunch effect is weaker for banks” with timelier provisioning for loan

21 BL’s key finding is somewhat akin to Laeven and Majnoni’s (2003) prior finding that banks’ provision for loan loss level (deflated by assets) is negatively associated with their loan growth. Laeven and Majnoni characterize this negative association as suggesting that banks’ provisioning has procyclical (or imprudent) effects on their capital.

22 BL’s measure of loan origination procyclicality is somewhat narrower than the association of loan growth with GDP growth used in prior research (e.g., Bikker and Metzemakers 2005).
losses. Extending this key result, BL partition larger banks into well- versus poorly-managed subsamples based on pre-provision profitability and find that both subsamples exhibit the capital crunch effect as well as mitigation of this effect by timelier provisioning for loan losses. BL find that banks that record timelier provisions for loan losses, especially poorly managed banks in non-recession periods, issue more capital in both non-recession and recession periods. These findings link the effects of banks’ provisioning for loan losses on their accrual capital to changes in their economic capital, nicely closing the inferential loop by demonstrating the channel through which timely loan loss provisioning affects stability.

We describe several research design and other issues raised by BL’s study, each of which constitutes an opportunity for future research.

BL’s finding that the capital crunch effect is limited to larger banks appears to be at odds with the findings of prior research that the effects of macroeconomic policy on loan supply primarily obtain for smaller banks (e.g., Kashyap and Stein 2000). BL explain their distinct findings as attributable to the samples in prior research being primarily or entirely drawn from the period prior to the issuance of the Federal Deposit Insurance Corporation Improvement Act of 1991 (FDICIA), whereas their 1993-2009 sample is entirely drawn after the passage of FDICIA. FDICIA reduced bank regulators’ ability to exercise forbearance for large banks (Kishan and Opiela 2006). While it is true that FDICIA should have reduced the difference in the strength of the capital crunch effect for smaller banks versus larger banks, there is no obvious reason why this act would reverse the relative strengths of this effect for the two size groups. Presumably other factors correlated with bank size are also involved. We conjecture that one of these factors is loan portfolio composition, which varies considerably across larger versus smaller banks. For example, larger banks hold greater amounts of commercial and industrial
loans and smaller amounts of commercial real estate loans than do smaller banks (Ryan and Keeley 2013).

Loan portfolio composition could affect BL’s results for at least three reasons. First, prior research shows that loan portfolio composition is strongly associated with BL’s measure of the timeliness of provisions for loan losses. Bhat, Lee, and Ryan (2014) find that banks record timelier provisions for loan losses for commercial and industrial loans than for mortgages such as commercial real estate loans. However, they also find that modifying BL’s measure of provision for loan loss timeliness to incorporate loan portfolio composition strengthens rather than weakens BL’s key finding. Second, different loan types exhibit differential loan origination cyclicality. For example, banks held a large overhang of non-agency mortgage-related assets going into the crisis and largely ceased extending these mortgages during the crisis. This state of affairs has only recently began to change, more than five years after the end of the crisis, perhaps because governmental provision of liquidity against pledged problem assets allowed banks to keep their previously developed overhang of non-agency mortgage-related assets on balance sheet. Third, different loan types exhibit differential pre-provision profitability, BL’s measure of bank management quality, because competition causes loan yields to vary with expected credit losses, which vary considerably across loan types (Ryan 2007, Chapter 5). We encourage future researchers to incorporate salient aspects of banks’ loan portfolio composition (e.g., heterogeneous versus homogeneous and collateralized versus not) as these aspects significantly impact the timeliness and amount of banks’ loan loss accruals as well as the cyclicality of loan originations.

Banks that choose to record timelier provisions for loan losses likely are better managed and healthier banks with fewer financial constraints and better future prospects (e.g., Liu and
Ryan 2006). Banks’ management quality includes the sophistication of their risk management systems. Banks’ health may result from their loan portfolio composition, the geographical markets they serve, and other factors that likely are associated with loan origination procyclicality. As is typical in the literature, BL include only size as a control for banks’ management quality and risk management sophistication and only size and capital as controls for banks’ health. While a nontrivial task, future researchers aiming to demonstrate a causal relationship between banks’ financial reporting and stability should try to develop more robust sets of controls or other identification strategies to distinguish these economic aspects of banks from their financial reporting.

Future researchers can extend BL’s research design to maximize the validity of a causal interpretation for and the robustness of BL’s key finding that provision for loan loss timeliness mitigates the capital crunch effect. BL do not apply John Stuart Mill’s Method of Difference discussed in the introduction, i.e., they do not show that the timeliness of provisions for loan losses does not affect (or less significantly affects) loan origination procyclicality for the smaller banks for which they find no capital crunch effect. In addition, BL apply Mill’s Method of Concomitant Variation in a relatively weak fashion. BL document a significant negative coefficient on the interaction of the capital crunch effect variables with a dichotomous provision for loan loss timeliness variable, rather than partitioning banks into multiple groups based on provision for loan loss timeliness and showing that the capital crunch effect is mitigated more for banks with timelier provisions.

Following prior studies examining the effects of monetary policy on loan supply, BL distinguish the effects of loan demand and loan supply by partitioning on bank size to vary
banks’ loan supply but arguably not loan demand (Kashyap and Stein 2000), and by including a macroeconomic variable, the change in the national unemployment rate, as a control for loan demand (Bernanke and Lown 1991). Prior banking research provides three general approaches to more robustly disentangle loan demand and supply that accounting researchers can apply to empirical analyses of the relationship between banks’ financial reporting and stability.

First, additional controls can be included for loan demand, which varies by loan type and geographical region (usually defined as state or metropolitan statistical area). Variables researchers have used to control for demand for consumer loans include local unemployment rates, growth in personal income, and growth in population or other demographic variables (e.g., Loutskina and Strahan 2009). Variables researchers have used to control for demand for commercial loans include local income growth and business starts and failures, the characteristics of banks’ existing commercial borrowers, and macroeconomic variables such as industrial production, interest rates, and credit spreads (e.g., Berger and Udell 2004; Ivashima and Scharfstein 2010). Alternatively, Federal Reserve survey data on national changes in banks’ credit standards for commercial loans can be used as to control for commercial loan supply (e.g., Lown and Morgan 2006).

Second, loan-level applications and originations data by bank, when available, can be used to distinguish loan demand (number of loan applications to a bank) from loan supply (number or percentage of loan applications funded by that bank). Loan approval rates likely also capture loan demand to some extent, however; for example, higher demand in boom periods may

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23 Because borrowers receive cash up front when loans are funded, they generally do not care about the size or strength of their bank with respect to an individual funded loan, suggesting that bank size captures only loan supply. Borrowers may care about the size or strength of their bank, however, to enhance the likelihoods that their current loan commitments are funded and that they receive future loans. This concern is most salient during economic downturns, when banks favor (typically commercial) borrowers with preexisting relationships in determining who will receive the limited amount of loans they are willing to originate (Fama 1985; Dell’Ariccia and Marquez 2006). Borrowers may also desire to have cost-effective access to larger banks’ broader set of financial product offerings.
lead to applications by lower quality borrowers, with corresponding effects on the loan approval rates. Loutksina and Strahan (2009), Xie (2015), and Yeung (2013) examine mortgage-level data provided under the Home Mortgage Disclosure Act (HMDA). Loutksina and Strahan also examine the difference between originations of more easily securitized conforming mortgages versus non-conforming jumbo mortgages (in some analyses restricting the sample to loans from 50% to 250% of the maximum conforming loan amount to maintain similarity of borrower and property characteristics), assuming that variation in this difference across banks and time reflects loan supply rather than loan demand. Two prior studies examine data on individual banks’ funding of loan applications obtained from international bank regulatory sources. Puri, Rocholl, and Steffen (2011) obtain retail loan-level data for local savings banks from German regulators. Jimenez et al. (2012) obtain commercial loan-level data for essentially all banks from Spanish regulators. A notable feature of Jimenez et al.’s data is that different banks or the same bank in different time periods can be observed to lend to the same commercial borrower, significantly increasing the authors’ ability to distinguish loan demand from loan supply. In particular, it is possible to observe different banks’ decisions whether or not to satisfy loan applications from the same borrower at a point in time as well as the same bank’s decisions whether or not to satisfy loan applications from the same borrower in different periods.

Third, plausibly exogenous shocks to loan supply can be identified and exploited. Puri et al. (2011) use shocks to German savings banks’ capital and liquidity during the financial crisis associated with their ownership of the Landesbank in their federal state (they cannot own Landesbanken in other federal states); these shocks varied in magnitude across savings banks based on the size of the ownership of the Landesbank and whether that Landesbank was adversely affected by its holdings of subprime-mortgage-related assets during the crisis (only
three of 11 Landesbanken were so affected). Jimenez et al. (2012) use shocks to Spanish banks’ capital associated with the inception of dynamic provisioning for loan losses and two subsequent revisions to dynamic provisioning guidelines (a “loosening” in 2005 and a reduction of the floor during the crisis); these shocks varied across banks based on the mix, growth, and performance of their loan portfolios as well as their preexisting loan loss accruals. We discuss Puri et al. and Jimenez et al. in more detail in Section 6.

5.1.2. Other Studies. We briefly discuss two other studies that examine notable aspects of the relationship between banks’ provisioning for loan losses and stability. We also highlight additional concerns that these studies raise for valid inference about this relationship without reiterating the general concerns discussed in detail above in the context of BL.

Bushman and Williams (2012) examine the association between measures of two potentially forward-looking aspects of banks’ provisioning for loan losses, the timeliness of provisions for loan losses (measured relative to changes in non-performing loans, similar to BL) and income smoothing using provisions for loan losses (measured as the correlation of the provision for loan losses with earnings before the provision for loan losses, consistent with extensive prior research summarized in Ryan 2011, Section 3.3.1),24 and two measures of banks’ risk taking, the change in financial leverage and the change in the value of actuarially fair deposit insurance premia. Bushman and Williams estimate their provision timeliness and income-smoothing measures at the country level for 27 different countries. In their primary analyses, Bushman and Williams estimate how these country-level provisioning measures interactively influence the associations between a measure of banks’ underlying risk, the change in asset

24 This measure of income smoothing could capture either actual forward-looking provisioning for loan losses that anticipates the next cycle turn or discretionary behavior that records higher (lower) provisions when pre-provision income is high (low) relative to some benchmark desired by bank management. As discussed below, Bushman and Williams’s (2012) results are more consistent with the latter possibility.
volatility, and the two measures of changes in banks’ risk taking. Banks optimally should offset increases in underlying risk with decreases in risk taking, and vice versa. Bushman and Williams’ provide evidence suggesting that forward-looking provisioning for loan losses is a double-edged sword with respect to banks’ risk taking. Banks in countries with provisioning that reflects timely recognition of expected future loan losses appear to exhibit improved risk-taking as evidenced by reduced leverage and the fair value of deposit insurance premia when asset volatility increases. In contrast, banks in countries with provisioning that smooths income appear to exhibit deteriorated risk-taking, suggesting that such provisioning is discretionary rather than forward-looking. Bushman and Williams further show that both these positive and negative effects are stronger for banks with lower capital and profitability; the strengthened positive effect is consistent with BL’s finding that the positive association of provision for loan loss timeliness with capital issuance is stronger for less profitable (more poorly managed) banks.

Bushman and Williams’ (2012) analysis involves two generalizable features worthy of consideration by future researchers: (1) identification and analysis of measures of both favorable (timeliness) and unfavorable (income smoothing) aspects of banks’ provisioning for loan losses and (2) a cross-country approach. The first feature is akin to Mill’s Method of Difference. Specifically, because Bushman and Williams obtain distinct predicted results for both provisioning for loan loss measures, the likelihood that unmodeled bank characteristics drive this more intricate set of results is lessened. However, Illueca, Norden, and Udell (2012) conduct analysis similar to that of Bushman and Williams for Spanish banks around the initial adoption of dynamic provisioning for loan losses in Spain in 2000 and find that timelier provisions are associated with greater risk taking and income smoothing using provisions is associated with less
risk taking, i.e., essentially opposing results, suggesting that research design and context matter considerably in this analysis.

Bushman and Williams’ (2012) cross-country approach involves trade-offs in generating valid inferences about the effects of banks’ provisions for loans losses. On the plus side, banks in different countries often apply different accounting requirements in different institutional settings, which the descriptive evidence provided in Bushman and Williams suggests yields interesting variation in banks’ provisioning for loan losses. Estimation of attributes of banks’ provisioning such as timeliness is more feasible at the country level than at the bank level. The latter benefit is substantially reduced, however, by the relative paucity of banks and bank-year observations with readily available data for many countries. For example, the U.S. and Japan together represent almost 95% of Bushman and Williams’ bank-year observations, with 12 of their 27 countries having fewer than 22 banks or 100 bank-year observations (compared to 1,954 banks and 49,414 bank-year observations for the U.S.). In addition, banks’ loan portfolio composition, health, and other characteristics likely vary considerably across countries.

Two non-mutually exclusive explanations exist for the findings of both BL and Bushman and Williams (2012). Banks that record timelier provisions for loan losses: (1) are better capitalized or (2) better understand the credit risks of the loans that they currently or might hold. The first possibility has received the bulk of researchers’ attention to date. We believe the second possibility merits further consideration by accounting researchers, although the limited evidence available from existing studies suggests that the relationship between banks’ understanding of loan credit risks and their willingness to originate loans is a complex one that depends on banks’ investment opportunity sets and other factors. For example, Bhat, Ryan, and Vyas (2014), discussed in more detail below, find that the (presumably better informed) banks that provide
better credit risk modeling disclosures in their financial reports exhibit lower loan origination procyclicality, consistent with better informed banks being more willing to originate loans in the down portion of the cycle. In contrast, Abbassi et al. (2015) find that the (presumably better informed) trading-oriented banks in Germany reduced loan supply more than other banks during the financial crisis, apparently because they found investments in distressed debt securities to offer greater opportunity for profit.

Bhat, Ryan, and Vyas (2014) provide evidence that the timeliness of banks’ loan loss accruals reflects the attributes and quality of their internal credit risk modeling (CRM). Bhat et al. identify two primary types of CRM based on banks’ financial report disclosures: (1) statistical analysis of the ability of the banks’ historical data on loan and borrower attributes, loan statuses, and other variables to predict the probability of default and loss given default on loans (MODEL); and (2) forward-looking stress tests of the ability of models of the probability of default and loss given default on loans to capture possible severely adverse future events (STRESS). They argue that these two types of CRM have complementary strengths and weaknesses. The statistical analysis employed in MODEL provides discipline on banks’ provisions for loan losses that mitigates the tendency of FAS 5’s incurred loss model to delay banks’ provisions for loan losses. Such analysis generally works well for homogeneous loans, for which banks reserve for loan losses at the loan-pool level, and in stable periods when credit loss parameters change relatively little from the estimation period to the balance sheet date. However, it is of limited use for heterogeneous loans, for which banks reserve for loan losses at the individual-loan level, or when credit loss parameters change rapidly, as occurred during the early stages of the financial crisis. STRESS, while highly judgmental, is essential for heterogeneous
loans and for all loan types at sharp turns in economic cycles when credit loss parameters change rapidly. Forward-looking CRM enhances banks’ abilities to diagnose and respond to these turns.

Reflecting the discipline that statistical analysis of historical data provides on banks’ loan loss accruals, Bhat, Ryan, and Vyas (2014) predict and find that MODEL is associated with timelier PLLs on average across their 1996-2010 sample period and late in the financial crisis after banks had experienced heightened credit losses for several quarters. Bhat et al. also predict and find that MODEL is associated with less procyclical loan originations, particularly for homogeneous loans for which statistical analysis of historical data is most feasible. Bhat et al. predict and find that STRESS is associated with timelier provisions for loan losses early in the financial crisis. They also predict and find that STRESS is associated with less procyclical originations of heterogeneous loans for which statistical analysis of historical data is least feasible.

The primary concern with Bhat, Ryan, and Vyas’ (2014) analysis is that banks generally do not describe their credit risk modeling in detail in their reports and often do not describe it at all. Hence, disclosed MODEL and STRESS are at best noisy signals of the intensity of actual CRM. We encourage future accounting researchers to develop more robust proxies for banks’ understanding of loan credit risks and to empirically demonstrate how these proxies relate to the timeliness of banks’ provisions for loan losses and stability.

In summary, banks’ provisioning for loan losses is the aspect of their financial reporting whose implications for stability have been examined in the most depth by accounting researchers to date. Despite this fact, many substantive and research design issues remain to be addressed in order for researchers to attain sufficient understanding of this complex relationship to be able to make recommendations with confidence about the desirability of alternative provisioning
approaches for stability. To this end, we provide examples of opportunities for future research on this topic in Section 6.

5.2 FAIR VALUE ACCOUNTING

In this section, we discuss four areas of extant research on the relationship between fair value accounting and stability. These areas examine the effects of banks’ fair value accounting, typically compared to amortized cost accounting, for financial instruments on their: (1) risk taking, (2) loan growth procyclicality, (3) leverage procyclicality, and (4) financial instrument liquidity.\(^{25}\) While many of the same research design issues arise as in the literature on banks’ loan loss provisioning just discussed, to avoid repetition we focus on the incremental issues raised in each of these areas.

5.2.1. Banks’ risk taking. This area of research examines the distinct effects of fair value accounting and amortized cost accounting on banks’ risk taking, particularly their accumulation and financing of risky assets during economic good times and the amounts and timeliness of their (potential fire) sales of these assets as economic conditions begin to deteriorate. This area is analogous to Bushman and Williams’ (2012) examination of the effect of banks’ provisioning for loan losses on their risk taking discussed in Section 5.1.2.

This area addresses the most commonly stated criticism of fair value accounting: the recognition of unrealized losses during economic bad times, especially periods of market illiquidity, reduces banks’ regulatory capital and thus induces the banks involved or their providers of financing to take actions such as fire sales or runs on the bank, respectively, with adverse effects on stability. This criticism generally reflects the restrictive assumption that

\(^{25}\) This is a small portion of the prior literature on banks’ fair value accounting. The bulk of this literature focuses on the value-, returns-, and risk-relevance of fair values and unrealized gains and losses compared to amortized costs and realized gains and losses. See Ryan (2011, Sections 4.4-4.6) and Beatty and Liao (2014, Section 4.2) for summaries of this literature.
banks’ asset holdings and economic capitalization prior to recognizing unrealized losses are insensitive to the required accounting for those assets. A more holistic view is that banks acquire, finance, and sell assets taking into consideration the required accounting for the assets. Under this view, fair value accounting, by \textit{ex post} recording more volatile income on given assets than does amortized cost accounting, should \textit{ex ante} induce banks to acquire less risky portfolios of assets or to hold more economic capital. Moreover, by recognizing unrealized gains and losses as they occur rather than the typically later date on which they are realized, fair value accounting reduces banks’ incentive to sell appreciated assets and hold depreciated assets compared to amortized cost accounting, further reducing the risk of banks’ overall holdings.\textsuperscript{26}

Ideally, research on fair value accounting and banks’ risk taking would examine banks’ individual decisions to acquire, finance, and sell assets as well as the correlation of these decisions across banks. Incorporating this correlation is important because the criticism leveled against fair value accounting with potentially the most adverse implications for stability is that fair value accounting induces positive correlation in banks’ acquisition and disposal of currently or potentially illiquid assets, artificially pumping up the liquidity of these assets in economic good times and exacerbating their illiquidity in bad times (e.g., Plantin, Sapra, and Shin 2008).\textsuperscript{27}

This area has been subject to relatively little research to date, with most studies examining the association between fair value accounting-related reductions of banks’ regulatory capital and their (potential fire) sales of securities during the financial crisis. These studies generally find that such sales and the associated realized losses were economically insignificant, particularly when compared to banks’ much larger incremental provisions for loan losses during

\textsuperscript{26} As discussed below, however, Merrill et al. (2014) provide evidence that, compared to amortized cost accounting, fair value accounting increases capital-constrained insurers’ incentive to sell illiquid assets with high risk weights, if necessary at fire sale prices, to meet risk-based capital requirements.

\textsuperscript{27} This importance is emphasized in the literature examining the covariance of Value-at-Risk across banks, i.e., CoVaR (e.g., Adrian and Brunnermeier 2011 and Bushman and Williams forthcoming)
the crisis (Laux and Leuz 2010; Laux 2012; Badertscher et al. 2012). These findings are explained by the fact that fair value accounting has little or no effect on regulatory capital for most banks. Despite the limited research to date, in our view this area has the potential to provide the most direct evidence on the relationship between banks’ fair value accounting and stability. Accordingly, we discuss examples of the limited research that has been done as well as the research that could be done in more depth than for the other three research areas.

We emphasize the research design issues that arise in this area in the context of the study that confront these issues most directly and completely, Ellul et al. (2014), as well as a related but more focused study by Merrill et al. (2014) that examines insurers’ (potential fire) sales of non-agency mortgage-backed securities during the financial crisis, similar to the banking studies mentioned above. Both of these studies examine insurers to exploit desirable institutional features of the insurance setting described below. Because insurers compete against banks in various ways and are subject to similarly motivated risk-based capital requirements, researchers potentially can make inferences about banks’ likely behavior from insurers’ observed behavior.

Ellul et al. (2014) and Merrill et al. (2014) exploit two aspects of insurers’ regulatory reporting for securities under statutory accounting principles (SAP). First, SAP requires insurers

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28 Only a few large banks hold appreciable trading portfolios or other asset types for which unrealized fair value gains and losses affect regulatory capital. Although most banks hold appreciable amounts of available-for-sale securities that are recognized at fair value, in the absence of other-than-temporary impairments unrealized fair value gains and losses on these securities did not affect regulatory capital during the financial crisis and still do not for most U.S. banks under the U.S. implementation of Basel III. Banks’ largest asset, loans held for investment, is measured at an impaired amortized cost basis, not fair value.

29 Another study on this topic, Bhat, Frankel, and Martin (2011), provides evidence that quarterly changes in banks’ holdings of non-agency mortgage backed securities were modestly positively correlated with contemporaneous liquidity related changes in the value of the subprime-mortgage-related ABX indices from the fourth quarter of 2006 to the first quarter of 2009 for banks. Bhat et al. chose the end of their sample period to precede the April 9, 2009 issuance of FSP FAS 115-2 and FAS 124-2, which eased other-than-temporary impairment accounting rules for these securities. Bhat et al. obtain somewhat stronger but still modest effects for subsamples of banks with high holdings of these securities, high non-performing loans, or low regulatory capital. It is unclear to what extent these findings are attributable to banks’ desire to avoid future impairment accounting write-downs as opposed to the economic losses from holding these securities. In this regard, the issuance of the FSP coincides rather neatly with the nadir of the financial crisis.
to disclose the book value and fair value of each security (i.e., CUSIP) they hold, acquire, or sell during the period, as well as realized gains and losses on each security sale. Hence, highly granular information is publicly available about insurers’ primary type of assets. Ellul et al. [Merrill et al.] obtain this information from the National Association of Insurance Commissioners (NAIC) [Thomson Reuters EMaxx]. Second, SAP requires life and PC insurers to account differently for certain securities. SAP requires life insurers to account for available-for-sale (AFS) debt securities in NAIC classifications 3-5 (i.e., below-investment grade but not yet in or near default) at amortized cost but property-casualty (PC) insurers to account for these securities at the lower of amortized cost or fair value with any unrealized losses recorded in statutory surplus (through the asset valuation reserve). In addition, Ellul et al. exploit the fact that state insurance commissioners have considerable discretion to amend SAP as codified nationally by the NAIC for use in their state. Some insurance commissioners require insurers operating in their state to recognize debt securities at fair value in cases where NAIC-codified

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30 The NAIC based its classifications of all types of debt securities on credit ratings until the end of 2009. As of the beginning of 2010 (2011), the NAIC bases its classifications for residential (commercial) mortgage-backed securities on the difference between the statutory carrying values and third-party supplied measures of the intrinsic value of the security (Becker and Opp 2013). In the discussion in the text, we assume NAIC classifications are based on credit ratings, as is the case during the bulk of Ellul et al.’s (2014) 2004-2010 sample period and the entirety of Merrill et al.’s (2014) analysis of potential fire sales by insurers from 2007Q1-2009Q3.

31 SAP requires both types of insurers to account for AFS debt securities in NAIC classifications 1-2 (i.e., investment grade) and in NIAC classification 6 (i.e., in or near default) at the lower of amortized cost or fair value.

32 SAP also requires insurers to evaluate their debt securities for other-than-temporary (OTT) impairment each period. These requirements differ for loan-backed and structured securities versus other debt securities and have changed over time. For example, under Statement of Statutory Accounting Principles (SSAP) No. 43, OTT impairment accounting requirements for loan-backed and structured securities prior to 2009Q3 were very weak; whether a security was OTT impaired and the amount of any OTT impairment was based on undiscounted cash flows. SSAP No. 43R became effective in 2009Q3 making these requirements similar but not identical to U.S. GAAP requirements with respect to the recognition of credit losses. Specifically, if holders have the intent and ability to hold impaired securities to recovery of their cost bases, OTT-impaired AFS debt securities are measured at the present value of the expected cash flows with credit losses reducing statutory income and surplus. After the effective date of SSAP No. 43R, OTT impairments of securities in NAIC classifications 3-5 by both types of insurers should have reduced the amortized cost bases of these securities, thereby reducing the difference between life and PC insurers’ statutory carrying values of these securities.

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SAP specifies amortized cost. Hence, it is possible to observe variation in the application of fair value accounting for the same securities across insurers of a given type (life or PC).

Ellul et al. (2014) and Merrill et al. (2014) conduct empirical analyses to determine whether PC insurers and life insurers acquire and sell debt securities differently due to PC insurers’ recognition of depreciated debt securities in NAIC classifications 3-5 at fair value. The primary research design issue confronting these analyses is that PC and life insurers vary in their business models, not just their accounting. Compared to life insurers, PC insurers typically bear more insurance risk and less investment risk. As a consequence, PC insurers generally hold more liquid securities in order to be reliably able to pay their shorter-duration and more variable claims (Ryan 2007, Chapter 14). This business model difference is particularly likely to affect the two studies’ analyses of insurers’ sales of securities during the financial crisis, because PC insurers are more likely to sell securities that experience losses or exhibit increased risk sooner than life insurers regardless of the accounting used for those securities. Ellul et al. provide some comfort regarding this concern by showing that the securities portfolios of PC and life insurers exhibit similar percentages of debt securities that are non-investment grade or that experience greater than 20% price drops each year. Even so, this business model difference, which almost certainly is the reason why the statutory accounting for debt securities in NAIC classifications 3-5 differs for PC and life insurers, is so profound that simple comparisons of PC and life insurers’ acquisition and sale of those securities cannot, by themselves, be ascribed to the two types of insurers’ differential accounting approaches for those securities. To make such ascriptions, researchers must find ways to distinguish the applicability of fair value versus amortized cost accounting within each type of insurer. As discussed below, Ellul et al. attempt

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33 Subtler differences between PC and life insurers’ business models may also affect the empirical analyses in Ellul et al. (2014) and Merrill et al. (2014). For example, compared PC insurers, life insurers focus more on generating interest-rate spread (Ryan 2007, Chapter 14) and so may be more likely to reach for yield.
to do this in two distinct ways: (1) by also examining the two types of insurers’ investments in equity securities, which SAP requires both types to account for at fair value; and (2) by identifying variation across states in the application of NAIC-codified SAP for AFS debt securities.

Ellul et al. (2014) provide evidence that PC insurers acquired lower-risk debt securities and managed their debt securities holdings more actively as economic conditions deteriorated during 2004-2010. Specifically, Ellul et al.’s findings suggest that, compared to life insurers, PC insurers: (1) tilted their debt securities holdings away from asset-backed securities and non-investment grade corporate bonds during the period immediately prior and during the financial crisis, more so when their adjusted risk-based capital ratio based on the fair values of invested assets was lower than their reported risk-based capital ratio; (2) were more likely to sell debt securities that experienced large price drops prior to and during the crisis; (3) were less likely to engage in regulatory arbitrage by acquiring A to AAA-rated debt securities with higher-than-typical yields (i.e., “reaching for yield”) when they had experienced cumulative net unrealized losses on AFS securities that were not yet reflected in their regulatory capital; and (4) experienced lower losses on debt securities with less effect on their risk-based capital ratios during the financial crisis. These findings all support the idea that PC insurers hold less risky securities and manage their holdings of those securities on a timelier basis as conditions change than do life insurers. Ellul et al. do not directly link these findings to PC insurers’ use of fair value accounting, however.

One way that Ellul et al. (2014) try to demonstrate such a link is by also examining the two types of insurers’ investments in equity securities, which SAP requires both types to account for at fair value. Ellul et al. find that PC insurers are more likely to acquire equity securities with
higher beta and lower liquidity than life insurers. Essentially an application of Mill’s Method of Difference, Ellul et al.’s opposing results for debt and equity securities heighten confidence that their findings for debt securities are attributable to the two types of insurers’ differential use of fair value accounting, rather than their distinct business models.

Related to Ellul et al.’s (2014) second analysis described above, Merrill et al. (2014) examine life and PC insurers’ sales of (generally senior) non-agency mortgage-backed securities during the financial crisis period 2007Q1-2009Q3. They argue that the combination of insurers’ risk-based capital requirements, which impose steeply increasing capital requirements as securities are downgraded,34 with statutory fair value accounting for certain downgraded securities, provide incentives for capital-constrained insurers to sell those securities, if necessary below intrinsic value in fire sales. It is more accurate to say that insurers’ positive incentive to sell downgraded securities comes from regulatory capital requirements, and that statutory amortized cost accounting provide disincentives for insurers to sell depreciated securities that are not present with statutory fair value accounting. Because realized losses on securities reduce insurers’ regulatory capital, Merrill et al. measure capital constraints using instrumental variables: negative shocks to operating income for life insurers and negative shocks to underwriting income for PC insurers. Although Merrill et al. provide evidence that these shocks are associated with the insurers’ regulatory capital, these shocks need not be large enough to cause meaningful capital constraints for insurers. Moreover, these shocks may induce or otherwise affect income management by insurers.

Consistent with Ellul et al.’s (2014) finding that PC insurers were more likely than life insurers to sell debt securities that experienced large price drops prior to and early in the crisis,

34 For example, life insurers must hold capital of 1.2% and 23% for NAIC classification 2 (BBB rated) and 5 (CCC rated) debt securities (Becker and Opp 2013).
Merrill et al. (2014) provide evidence that capital-constrained PC insurers were more likely than other PC insurers to sell downgraded non-agency mortgage-backed securities throughout the financial crisis (2007-2009), but that capital-constrained life insurers were more likely than other life insurers to sell downgraded non-agency mortgage-backed securities only in 2009. Merrill et al. attribute these differential findings to PC insurers accounting for non-agency mortgage-backed securities (in NAIC classifications 3-5) at fair value for regulatory purposes throughout 2007-2009 but life insurers accounting for these securities at fair value beginning in 2009; we note that this attribution is based on inaccurate characterizations of the relevant statutory accounting requirements.35 Regardless, we think both studies’ findings for pre-2009 sales likely are attributable in part to PC insurers’ (life insurers’) use of lower of cost or fair value (amortized cost) accounting for AFS debt securities in NAIC classifications 3-5. The question remains what portion of capital-constrained PC insurers’ pre-2009 sales constituted undesirable fire sales in the teeth of illiquid markets, as Merrill et al. argue, supporting this argument with evidence of post-sale market price increases, versus desirable disposals of risky securities as economic conditions deteriorate, as Ellul et al. suggest and is consistent with PC insurers’ business model. Given the severe market dislocation and the evolving fundamentals and market expectations that occurred during the financial crisis, this is a difficult question to answer, as acknowledged by Merrill et al. and discussed by Laux (2012).

35 Merrill et al.’s (2014) characterization of statutory accounting requirements is inaccurate in two significant respects. First, the primary difference in the two types of insurers’ use of fair value accounting for statutory purposes pertains to debt securities in NAIC classifications 3 to 5, which life insurers account for at cost and PC insurers account for at lower of cost or fair value. This differential accounting treatment did not change in 2009 or afterwards for that matter. Second, the significant change in accounting requirements occurring in 2009 was the effective date of SSAP 43R in the third quarter, not at the beginning, of the year. This change strengthened SAP’s other-than-temporary impairment requirements for loan-backed and structured securities in a way that rendered the first difference less significant, as discussed in footnote 32.
Recognizing the difficulty of fully addressing concerns that their results reflect the two types of insurers’ distinct business models, Ellul et al. (2014) also conduct within-group analyses for each of the two types of insurers. Ellul et al. identify variation across states in the application of NAIC-codified SAP for AFS debt securities; some states are more likely than others to require insurers to recognize risky debt securities at fair value when NAIC-codified SAP specifies amortized cost. The primary concern with this analysis is that states likely vary in the intensity of their regulation in other ways that may be correlated with their requirement that insurers recognize risky debt securities at fair value when NAIC-codified SAP specifies amortized cost.

Ellul et al. calculate the percentages of insurers’ asset-backed securities and below-investment grade corporate bonds securities that are measured at fair value, separately for the life and PC insurers operating in the state. Applying Mill’s Method of Concomitant Variation, Ellul et al. find that both life and PC insurers are more likely to reach for yield in states with a lower average incidence of fair value accounting for these securities, consistent with fair value accounting reducing this form of regulatory arbitrage.

Overall, Ellul et al.’s (2014) results suggest that SAP-required fair value accounting for debt securities causes insurers to acquire less risky securities and to be more likely to dispose of securities that experience price drops. The former behavior can only enhance insurers’ stability, individually and collectively, and thus the stability of the financial system. The implications of the latter behavior for stability could go either way. If insurers dispose of problem securities early enough in bad times, it should enhance their stability and that of the financial system. If insurers instead dispose of problem securities in the teeth of illiquid markets, as Merrill et al. (2014) argue, it likely would increase illiquidity and reduce the stability of the financial system.

We encourage future accounting researchers to further explore the insurance setting examined by
these studies, and to attempt to identify analogous research than can be done in the banking setting.

5.2.2. Loan growth procyclicality. This area of research examines whether the extent of banks’ fair value accounting, typically proxied by the magnitude of recognized unrealized net gains or the percentage of assets recognized at fair value, is positively associated with banks’ loan growth procyclicality. This area is analogous to BL’s examination of the effect of the timeliness of banks’ provisions for loan losses on their loan origination procyclicality discussed in Section 5.1.1, and so the research design issues discussed in that section are particularly relevant to this area. A negative association between fair value accounting and stability would obtain most naturally if the following three assumptions all hold: (1) banks’ unrealized gains (losses) primarily occur in good (bad) times; (2) these net gains are included in banks’ regulatory capital; and (3) banks primarily achieve their target regulatory capital ratios by adjusting the amounts of their assets and liabilities, not equity. Adrian and Shin (2011) find that banks’ equity is much stickier than their assets and liabilities, implying that the third assumption holds to a reasonably close approximation. The first two assumptions generally do not hold, however, because AFS securities are the primary type of asset measured at fair value for most banks and most of their AFS securities are near credit riskless governmental debt securities and agency mortgage-backed securities. Specifically, the first assumption generally does not hold because riskless interest rates typically rise (fall) in good (bad) times, yielding countercyclical losses (gains) on near riskless securities (Xie 2012, 2015). Although credit spreads typically move in the opposite directions yielding procyclical gains (losses) on credit risky securities, most banks hold too few of these securities for them to yield meaningful procyclicality at the bank level. The
second assumption generally does not hold because regulatory capital excludes unrealized gains and losses on AFS debt securities for most banks.36

Xie (2012, 2015) and Yeung (2013) are papers in this area. Xie (2012) examines the association between recognized unrealized net gains and loan growth. Loans are banks’ main asset and loan growth is also BL’s primary dependent variable. Xie’s setting differs from that of BL, however, in that loans are not fair valued for financial accounting purposes. Hence, the only plausible mechanism for unrealized net gains to affect loan growth is through the effects of these gains on banks’ regulatory capital. In contrast, BL’s findings may partly result from banks that record timelier provisions for loan losses understanding the credit risks of their loans better than do other banks. Xie finds that unrealized net gains are positively associated with loan growth, but that these unrealized net gains are not procyclical because they primarily reflect changes in riskless rates. Riskless rates typically rise in good times, causing unrealized losses, and fall in bad times, causing unrealized gains.

Xie (2015) and Yeung (2013) examine the association between proxies for the extent of banks’ fair value accounting (banks’ unrealized net gains and the percentage of assets that are fair valued, respectively) and banks’ mortgage approval rates calculated using HMDA mortgage-level applications and originations data. This loan-level approach distinguishes loan supply from loan demand, an important research design issue discussed in the introduction and Section 5.1.1. Xie separately examines: (1) her entire 1992-2012 sample period; (2) the 2003-2006 pre-financial crisis period, to capture any abnormally high loan approval associated with fair value accounting during booms; (3) the 2007-2009 crisis period, to capture any abnormally low loan approval associated with fair value accounting during downturns; and (4) small (less than $1

36 Under Basel III as applied internationally, unrealized gains and losses recorded in other comprehensive income are included in banks’ regulatory capital. In July 2013, the U.S. bank regulators decided to require this aspect of Basel III only for the few large U.S. banks applying Basel III’s advanced methods.
billion total assets) and/or highly leveraged (below-median tier 1 leverage ratio) banks during the

crisis period to capture any abnormally low loan approval associated with fair value accounting
during downturns by weak banks. Despite employing a loan-level approach with a very large
number of observations that should exhibit high power, Xie finds no evidence that the
proportions of fair valued assets (trading or available-for-sale securities) or unrealized net gains
or unrealized net losses on available-for-sale or held-to-maturity securities are associated with
mortgage approval rates in any of these samples.

In contrast, Yeung (2013) finds that banks in the bottom tercile of the total regulatory
capital ratio exhibit mortgage approval rates that fall weakly significantly (p=0.054) with the
proportion of fair valued assets (trading or available-for-sale securities) during the 2007-2008
financial crisis period. It is not clear why Yeung’s significant finding obtains given the

corresponding insignificant finding in Xie (2015). One possibility is Yeung’s significant finding
is simply due to the very large number of loan-level observations, although this possibility seems
unlikely given that the finding implies that a one-standard increase in the proportion of fair
valued assets yields an appreciable 3.4% decrease in the mortgage approval rate from a crisis
sample mean of 74%. A more likely possibility is that Xie estimates separate models for each of
her subsamples (e.g., small and highly levered banks in the crisis period is one sample), thereby
allowing the coefficients on each of the test and control variables to vary across the subsamples,
whereas Yeung estimates pooled models for crisis and non-crisis subsamples interacting an
indicator for high leverage with the proportion of fair valued assets but not the control variables.
Hence, Yeung’s significant finding may reflect the proportion of fair valued assets being
correlated with the control variables and omitted interactions of the control variables with the
indicator for high leverage explaining loan approval rates. This possibility suggests that it is
important for researchers working in this area to identify and control for variables associated with banks’ use of fair value accounting using appropriately demanding (e.g., interactive) functional forms.

Overall, this research area finds minimal evidence that banks’ recognized unrealized net gains are positively associated with their loan growth or loan approval rates.

5.2.3. Leverage procyclicality. This area of research, which is related to but distinct from the second, examines whether proxies for the extent of banks’ fair value accounting are associated with banks’ well-documented leverage procyclicality. Adrian and Shin (2010) define leverage procyclicality as a positive association between asset growth and leverage growth. Adrian and Shin (2011) provide visual evidence of a strong positive association close to one for commercial banks but do not link fair value accounting to leverage procyclicality. Fair value accounting should yield leverage procyclicality only if banks that use fair value accounting set more procyclical target leverage ratios (Amel-Zadeh, Barth, and Landsman 2014). In our reading, the literature does not provide any convincing theoretical reason for why this would be the case or empirical evidence that it is the case. In contrast, the literature provides at least three credible reasons why banks’ leverage procyclicality is explained by substantive economic phenomena: (1) banks’ average risk weights on assets fall in good times when banks are flush with liquid assets and rise in bad times when banks sell liquid assets to deleverage or because they need cash (Amel-Zadeh et al. 2014); (2) banks raise their target leverage ratio in good/stable times and lower this ratio in bad/unstable times in an attempt to equate a potential loss construct such as Value at Risk to equity (Adrian and Shin 2014);37 and (3) banks’ collateral and other

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37 Procyclicality of target leverage ratios is one manifestation of the more general “volatility paradox”, in which banks build up risks during low volatility periods that manifest during high volatility periods. See Adrian and Ashcroft (2012) for a nice discussion of banks’ building up of tail risks through structured finance transactions during the low volatility period prior to the financial crisis. We discuss this phenomenon further in Section 5.3.
liquidity requirements fall in good times and rise in bad times (Brunnermeier and Pedersen 2009).

Two accounting research papers, Amel-Zadeh et al. (2014) and Laux and Rauter (2014), examine the association between fair value accounting and leverage procyclicality. Both studies find no evidence that the extent of banks’ leverage procyclicality increases with the extent of their fair value accounting as proxied by unrealized net gains. The two studies identify different primary economic drivers of leverage procyclicality, however. Amel-Zadeh et al. show theoretically that if regulatory leverage capital constraints are binding, procyclical leverage results if and only if banks’ average risk weights of assets fall in good times and rise in bad times. Consistent with this theoretical relation, Amel-Zadeh et al. provide empirical evidence that the positive association between banks’ asset growth and leverage growth observed by Adrian and Shin (2011) falls by about 60% and becomes insignificant when the change in the average risk weight of assets is added to the empirical model, consistent with changes in banks’ average risk weights across the cycle being the primary driver of leverage procyclicality. Moreover, Amel-Zadeh et al. find that unrealized net gains recorded in other comprehensive income are negatively associated with the growth in leverage, inconsistent with fair value accounting driving leverage procyclicality. Both of these findings obtain in both up and down markets. Finally, Amel-Zadeh et al. find that unrealized gains and losses recorded in comprehensive income do not interact with growth in non-fair valued assets in explaining leverage growth.

Laux and Rauter (2014) provide similar evidence that unrealized net gains do not yield leverage procyclicality. They find that unrealized net gains on AFS securities and realized net gains on sales of loans as well as AFS and held-to-maturity (HTM) securities are negatively
associated with leverage growth for their overall sample, as well as for subsamples of savings banks, commercial banks with below 20% fair valued assets, and commercial banks with above 20% fair valued assets. These results are consistent with the direct effects of changes in equity associated with fair value accounting on leverage being less than fully offset by proportional changes in assets and liabilities. Most interestingly, Laux and Rauter find that unrealized net gains on AFS securities interact *negatively* with asset growth in explaining leverage growth, whereas realized net gains on loan sales interact *positively* with asset growth in explaining leverage growth. Hence, it is banks’ realized net gains, which are recorded in net income under amortized cost accounting, that are positively associated with their leverage procyclicality, not their unrealized net gains recorded under fair value accounting. This result is most naturally explained by banks’ realizations of net gains on loan sales, which mostly occur when loan sale markets are liquid during credit booms, being associated with increased leverage, and vice-versa.

Laux and Rauter (2014) find that changes in banks’ average risk weights of assets have a much weaker effect on banks’ leverage growth than do Amel-Zadeh et al. (2014). Laux and Rauter also find that leverage growth is highly associated with the change in gross domestic product, i.e., the business cycle, consistent with Adrian and Shin’s (2014) explanation and evidence that banks raise their target leverage ratio in good/stable times and lower it in bad/unstable times. It is unclear what differences in the designs of Amel-Zadeh et al. and Laux and Rauter yield the different results in the two studies regarding the primary economic driver of banks’ leverage procyclicality. The simplest possible explanation is that changes in banks’ average risk weights and changes in GDP are correlated, making the results sensitive to sample and model specification.
5.2.4. Illiquidity. The area of research examines whether banks recorded unrealized losses during the financial crisis before or following drops in relevant market indices. The former possibility suggests these reported losses exacerbated market illiquidity, whereas the latter is more consistent with these losses reflecting deteriorating fundamentals or liquidity. Determining whether unrealized losses recognized under fair value accounting lead or follow declines in asset prices raises a difficult research design issue: riskier and more affected exposures generally yield larger losses sooner. For this reason, it is difficult to determine whether fair value losses that are recognized on a timely basis relative to observable changes in asset prices are driven by the exposure being riskier or more affected than the assets for which prices are observed or by firms recording timelier write-downs under fair value accounting. To date, this issue is best addressed by Vyas (2011), who makes a valiant attempt, given the available data, to match banks’ assets to observable indices such as the ABX, CMBX, and LCDX. His evidence suggests that changes in these indices generally led recognized fair value losses during the financial crisis, inconsistent with fair value accounting yielding adverse feedback effects.

Laux and Leuz (2010) describe several types of “circuit breakers” in fair value accounting requirements and summarize a range of empirical evidence that is also consistent with asset price declines leading recognized fair value losses. These circuit breakers include: (1) FAS 157’s definition of fair values as based on orderly transactions; (2) FAS 157, as amended in April 2009 by FSP FAS 157-4, providing firms with the ability to measure fair values using level 3 inputs when markets are illiquid; and (3) FAS 115 providing firms with the ability to reclassify investment securities out of categories for which fair value accounting is required. This empirical evidence includes: (1) several studies showing that the market discounted banks’ recognized level 2 and level 3 fair value measurements of assets during the financial crisis and (2) several
studies showing that banks exhibited reluctance to write down or disclose fair value losses for various types of assets during the crisis. For example, Huizinga and Laeven (2012) provide evidence that during the financial crisis banks understated write-downs on mortgage-backed securities, and that banks with large holding of these securities understated provisions for loan losses.

5.3 SECURITIZATIONS

Prior accounting research on securitizations focuses on the market’s assessment of the risk implications of banks’ volume of and retained interests in securitizations accounted for as sales and with the securitization entities unconsolidated. This research generally assumes that the market possesses sufficient information and ability to evaluate these risk implications. A logical consequence of this assumption is that the market should exercise reasonable discipline over banks’ securitizations. Hence, with the exception of a few studies that examine the association between securitization and information risk, this research has rather indirect implications for stability.

Accordingly, in this section we primarily discuss finance research that suggests three non-mutually exclusive channels by which banks’ financial reporting for securitizations might affect stability. We encourage future accounting researchers to attempt to empirically document the extent to which these channels exist and are distinct from the channels by which banks’ financial reporting for securitizations affect regulatory capital, managerial compensation, and other arrangements. Although in practice these other channels often employ financial reporting

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38 Prior studies have examined the association of banks’ securitizations with their economic leverage, systematic and idiosyncratic equity risk, credit risk, and information risk or opacity. See Ryan (2011, Section 5.3.3) and Beatty and Liao (2014, Section 4.3) for summaries of this literature.
numbers, these channels logically could and in our view should adjust financial numbers when necessary to serve regulatory and contractual purposes adequately.

The first channel by which banks’ financial reporting for securitizations might affect stability is that securitizations accounted for as sales, with securitization entities unconsolidated, allow the issuer to record gains on sale of securitized loans instead of earning interest income over time on retained loans (Dechow and Shakespeare 2009; Dechow, Myers, and Shakespeare 2010). This ability to front-load income may cause banks to relax their stated underwriting criteria or apply these criteria with less discipline to originate more securitizable loans and thereby generate larger gains on sale. Such income-management-motivated loan origination is more likely to occur when banks believe that they can transfer more of the risks of loans to securitization investors. Prior research evidence, while mixed, generally supports the idea that the loans banks originate to securitize are riskier than the loans they originate to retain. Specifically, research finds that: (1) banks were more likely to securitize subprime and lower documentation mortgages and exerted less effort to collect and evaluate soft borrower information for securitized mortgages prior to the financial crisis and (2) securitized mortgages performed worse than retained mortgages with similar observable underwriting criteria during the crisis (Mian and Sufi 2009; Keys et al. 2010; Elul 2011; Jiang, Nelson, and Vytlačil 2014). All else being equal, lower quality loans are more likely to exhibit highly correlated defaults and to become illiquid during economic downturns, reducing stability.

The second channel by which banks’ financial reporting for securitizations might affect stability is banks’ desire to keep securitization entities off-balance sheet may cause them to

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39 Several studies find that banks’ retained loans perform the same as or worse than their securitized loans, in large part because banks typically have to retain (buy back) loans that exhibit delinquency immediately after origination (securitization) (Jiang et al. 2014 and other studies cited in footnote 2 of that paper). This evidence does not conflict with the overall evidence summarized in the text; loans that banks originally intend to securitize but ultimately determine not to be securitizable naturally perform more poorly than loans they securitize.
develop securitization structures in which they retain the downside tail risks, i.e., losses that are triggered infrequently but are very large when triggered, of the securitized assets. Banks are most likely to accumulate tail risks during favorable economic times when volatility appears low, thereby exacerbating the increase in volatility that inevitably occurs when the cycle turns (Adrian and Ashcroft 2012).

Over time, the FASB has substantially reduced the amount of risk that a bank could retain in a securitization entity without being required to consolidate the entity. Specifically, prior to the issuance of FIN 46, effective in February 2003, banks could easily avoid consolidation of their sponsored non-qualifying special purpose entity (QSPE) securitization entities by retaining less than substantially all of the risks and rewards of the entities. In contrast, under FIN 46 and its December 2003 amendment FIN 46(R) (hereafter, FIN 46(R)), banks had to retain less than a majority of the risks and rewards of non-QSPE securitization entities to avoid consolidating these entities. This tightening of consolidation requirements appears to have been a factor contributing to sponsoring banks’ development of securitization structures in which they retained tail risks. To avoid consolidation under FIN 46(R), banks generally induced third parties to assume interests that bore relatively frequently triggered but predictably small risks that constituted a majority of risk and rewards of the securitized assets according to the banks’ models. The most common approach was for third parties to purchase “expected loss notes” that bore first risk of loss on the securitized assets up to the lowest cap that, according to the banks’ models, justifies non-consolidation of the securitization entities by the sponsoring banks. The sponsoring banks retained difficult-to-assess tail risks on the securitized assets through means

40 Prior to February 2003, various standards, notably EITF 90-15, governed consolidation of non-QSPE securitization entities.

41 FAS 125 created QSPEs as a distinct class of special purpose entities for accounting purposes. From the January 1, 1997 effective date of FAS 125 to the November 15, 2009 effective date of FAS 166 and FAS 167, securitization QSPEs were explicitly immune from consolidation under FAS 125 or its successor, FAS 140, as well as FIN 46(R).
including the provision of liquidity and credit support, implicit recourse, and representations and warranties that typically are triggered only in credit crises and other severe economic downturns. For example, for their non-QSPE securitization entities that issued liabilities with maturity shorter than that of the securitized assets, such as asset-backed commercial paper (ABCP) conduits, banks sold small expected loss notes to third parties but retained tail risks through the contractual or non-contractual provision of liquidity support.42

Finance research provides evidence that banks increasingly retained tail risks during the period over which FIN 46(R) governed consolidation of securitization entities. However, this research identifies bank regulatory capital requirements rather than FIN 46(R) or other aspects of financial reporting as the primary reason for this retention. For example, Acharya and Schnabl (2010) and Acharya et al. (2013) examine bank-sponsored ABCP conduits in which banks retain tail risks primarily through the provision of liquidity support. They show that the volume of outstanding ABCP almost doubled from $624 billion in September 2004 to $1.2 trillion in July 2007, and they ascribe this rapid increase primarily to changes in regulatory capital requirements effective on September 30, 2004 (Department of Treasury et al. 2004). The new requirements treated ABCP conduits that banks consolidated for financial reporting purposes under FIN 46(R) as off-balance sheet for regulatory purposes (the “ABCP exclusion”). In addition, these requirements applied a credit conversion factor of only 10% to eligible liquidity facilities with a term of less than one year provided to ABCP conduits. Hence, under these requirements banks

42 The following is an example of sponsoring banks’ non-consolidation of securitization entities in which they retain tail risk under FIN 46(R). SunTrust Banks did not consolidate its Three Pillars ABCP conduit from the conduit’s March 1, 2004 sale of an expected loss note to a third party to the effective date of FAS 167. Throughout the period of non-consolidation, the committed amount of the expected loss note was a very small percentage of the assets of Three Pillars, e.g., $20 million (0.4%) of the conduit’s $5.3 billion of assets on December 31, 2007. Moreover, this committed amount was less than one-seventh of the $144.8 million loss that SunTrust bore from repurchasing assets from the conduit in 2007Q4 under its contractual liquidity support (see SunTrust’ 2007 Form 10-K filing, pp. 54-56). SunTrust also provided liquidity support to Three Pillars without bearing losses at several other points during the financial crisis.
could hold very little capital against ABCP conduits even when they consolidated the conduits for financial reporting purposes and retained tail risks through the provision of liquidity support.

Acharya and Schnabl (2010) and Acharya et al. (2013) also show that banks sponsoring ABCP conduits experienced negative stock returns in proportion to the liquidity support they provided to the conduits around the severe shock to the market liquidity of ABCP in early August 2007. Due to the losses borne by banks from their provision of liquidity support to ABCP conduits issuing short-term paper during the crisis, U.S. bank regulators eliminated the ABCP exclusion effective March 29, 2010. This occurred shortly after the November 15, 2009 effective date of FAS 167, which amended FIN 46(R) to require the consolidation of essentially all ABCP conduits.

Although this evidence suggests that banks respond more to regulatory capital requirements than to financial reporting standards, regulatory reporting and thus capital requirements often are based on financial reporting standards. Regulatory reporting and capital requirements sometimes deviate from financial reporting standards to achieve policy goals, as occurred with the ABCP exclusion in September 2004. Regulatory capital requirements sometimes converge back toward accounting standards when those goals are not met or when unexpected consequences arise, as occurred with the elimination of that exclusion in March 2010.

The third channel by which banks’ financial reporting for securitizations might affect stability is the cash flows on sponsoring banks’ retained interests in securitizations are determined through complex interactions among the characteristics of the securitized assets, securitization waterfalls, and economic conditions. As a practical matter, these interactions
cannot be fully disclosed in banks’ financial reports. Hence, retained interests in securitizations are inherently opaque and thus likely to become illiquid during credit crises and other severe economic downturns, exacerbating instability.

Consistent with this view, Cheng, Dhaliwal, and Neamtiu (2011) provide evidence that banks that securitize loans for which it is more difficult to evaluate the degree of risk transfer—as proxied by the volume of securitizations, the credit risk of the assets securitized, and the amount of retained interests—face greater information risk as measured by larger bid-ask spreads and analyst forecast dispersion. Oz (2013) provides evidence that these effects diminished after the November 15, 2009 effective date of FAS 166 and FAS 167 due to the enhanced information about issuers’ continuing involvements with securitized assets provided by those standards. Studies examining the effect of new disclosure requirements must confront the fact that those requirements tend to be imposed after prior disclosures have been demonstrated to be inadequate in severe economic downturns such as the financial crisis. It is difficult to distinguish the effect of new disclosures from mean reversion of economic conditions toward normal levels.


To attempt to overcome the research design issues described in the introduction and Section 5, accounting researchers can exploit variation in financial reporting across banks, countries, regulatory settings, and other market or non-market mechanisms to draw meaningful
conclusions about the desirability of the effects of alternative financial reporting approaches for stability. In this section, we discuss three alternative settings for such research, indicating the opportunities and also the pitfalls they present.

6.1 DYNAMIC PROVISIONING FOR LOAN LOSSES IN SPAIN

The Spanish banking setting is amenable to research on the relationship between provisions for loan losses and stability for two primary reasons. First, as discussed in Section 5.1.1, Spanish bank regulators have required Spanish banks to employ dynamic provisioning for loan losses since 2000Q3.44 Because 2000Q3 was a favorable time economically, the inclusion of the countercyclical general provisions required by dynamic provisioning on top of the provisions required by normal accounting requirements caused banks’ provisions for loan losses to more than double from 1999 to 2001 (Illueca et al. 2012). Regulators twice amended these dynamic provisioning requirements, generally “loosening” them during good times in 2005Q1 and lowering the provisioning floor during deeply bad times in 2008Q4 (Jiminez et al. 2012). The imposition and two amendments of dynamic provisioning constitute three plausibly exogenous shocks to individual banks’ loan supply that manifest through banks’ provisioning for loan losses and the effects of that provisioning on banks’ regulatory capital. The second amendment is tied up with the regulatory response to the crisis, however, and thus likely is endogenous with respect to banks’ aggregate loan supply (and perhaps also aggregate loan demand).

Second, prior to the financial crisis the Spanish banking industry exhibited two dominant types of banks: (1) large commercial banks that are similar to large banks elsewhere and (2) local

44 Fernandez de Lis et al. (2000) and Saurina (2009) describe the methods used as of 2000 and 2005, respectively, to calculate countercyclical general provisions for loan losses under dynamic provisioning in Spain. These general provisions are included in the recorded provision for loan losses for both regulatory and financial reporting purposes. Required disclosures in financial reports enable users to undo these provisions if desired.
not-for-profit savings banks (cajas) that often are captured by municipalities and exhibit other governance failures due to the semi-political process by which their directors are elected and the absence of equity market discipline (Garcia-Cestona and Sagarra 2014). These two types of banks differed substantially in their performance during the crisis and ultimate survival rates, as discussed below.

As a result of dynamic provisioning, Spanish banks entered the financial crisis with robust allowances for loan losses considerably in excess of those recognized by banks in other countries under the incurred loss model (Garcia-Herrero and Fernandez de Lis 2008; Balla and McKenna 2009). Evidence as to whether these higher allowances contributed to the stability to the Spanish financial system prior to and during the crisis is mixed, however, depending on whether one examines variation in risk taking across banks or the aggregate level of risk taking by banks. Jiminez et al. (2012) find that banks that recorded larger provisions due to the imposition of dynamic provisioning, especially cajas with weaker governance, appear to have curtailed lending on a relative basis during the pre-crisis period. After the 2000Q3 and 2005Q1 shocks, however, there appears to have been no appreciable effect on aggregate lending after a few quarters, suggesting that loan demand, rather than going unsatisfied, was quickly satisfied by banks less affected by the imposition of dynamic provisioning during good times. That is, dynamic loan loss provisioning appears to have induced close to zero-sum effects on loan supply across banks during the pre-crisis period.

Jiminez et al. (2012) examine a sample of commercial borrowers with outstanding loans from multiple banks, so their results may not generalize to borrowers with fewer or less established banking relationships. On the other hand, Jiminez et al. find a persistent contraction of loan supply after the 2008Q4 shock, consistent with lender substitution being more difficult in
bad times. This finding is akin to the well-documented ineffectiveness of monetary policy when nominal interest rates approach zero (e.g., Bernanke, Reinhart, and Sack 2004); it is easier for dynamic provisioning to constrain loan supply in good times than to “push on a string” in order to generate loan supply in sufficiently bad times.

Despite the imposition of dynamic provisioning for loan losses, during the period leading up to the financial crisis a majority of the Spanish banking industry switched to a business model that emphasized high loan growth financed by debt rather than deposits (Martin-Oliver, Ruano, and Salas-Fumás 2014). This accumulation of risk led to the insolvency of many Spanish banks during the crisis, particularly cajas. While 45 cajas existed in 2008, only 12 cajas remained in 2012, and only two of those remained in their pre-crisis form (García-Cestona and Segarra 2014). The relatively poor outcomes for cajas appear to be attributable in large part to their not-for-profit charters, which reduce their ability to raise liquidity and capital from market sources when needed in bad times.

The features of the Spanish banking setting discussed above enable future researchers to mitigate all three of the threats to valid inference regarding the relationship between provisioning for loan losses and stability discussed in the introduction and Section 5.1.1. First, the concern that banks with more favorable characteristics record larger or timelier provisions for loan losses does not directly arise in this setting, because all Spanish banks must record dynamic provisions for loan losses calculated using specified formulas.

Second, this setting enables researchers to test whether volatility suppression mechanisms such as dynamic provisioning for loan losses lull banks into false senses of security during bubble periods or cause them to downplay the appearance of cracks in their business models as those bubbles begin to deflate. Jimenez et al. (2012) provide preliminary evidence along these
lines, showing that the imposition of dynamic provisioning had the effect of reducing loan supply by certain banks but not by the banking system as a whole. They do not design their tests, however, to show whether volatility suppression has favorable or unfavorable effects across the entire cycle. Spanish banks’ high, debt-fueled growth during the pre-crisis period and the large number of those banks, particularly cajas, that experienced insolvency as a consequence of the financial crisis suggests that these effects were unfavorable at least for some banks. A number of important questions that have not yet been convincingly tested in the literature can be tested in this setting. For example, did Spanish banks that entered the crisis with higher loan loss allowances due to dynamic provisioning experience lesser or greater likelihood or severity of insolvency as a consequence of the crisis? If greater, was the relationship between excess loan loss allowances and insolvency more severe for cajas, given their poorer governance and lesser ability to raise funds from market sources?

Third, this setting provides two distinct ways to separate loan supply from loan demand. The imposition and two subsequent amendments of dynamic provisioning for loan losses constitute plausibly exogeneous shocks to individual banks’ loan supply, not loan demand. Alternatively, it may be possible to obtain commercial loan-level application and origination data from bank regulators, as do Jiminez et al. (2012), and examine loan acceptance rates rather than loan originations as a proxy for loan supply.

6.2 LANDESBANKEN IN GERMANY

The Landesbanken are banks operating in one or more federal states (Lander) in Germany. Each Landesbank is jointly owned by the state government(s), municipally owned savings banks, and possibly other governmental entities in the state(s) in which it operates. The states created the Landesbanken in the 19th century to raise and invest funds to support various
public purposes in the state, such as financing state infrastructure projects and providing wholesale banking services to the smaller savings banks in the state. To facilitate these purposes, each Landesbank received explicit guarantees of its debt issuances and ongoing capital adequacy from the governmental entities that directly or indirectly owned the Landesbank until July 2005, at which point the July 2001 Brussels Agreement of the European Commission disallowed explicit guarantees of new debt issuances (Fischer et al. 2014). During the July 2001-July 2005 interim period, this agreement allowed the Landesbanken to continue to issue guaranteed debt maturing up to year-end 2015. After year-end 2015, only debt issued prior to July 2001 and still outstanding will remain guaranteed.

These explicit guarantees substantially lowered the Landesbanken’s cost of funds, increasing their relative ability to compete for business against other banks (International Monetary Fund 2006). Despite the public purposes motivating these guarantees, since the 1960s the Landesbanken came to operate in much the same way as other banks (International Monetary Fund 2006). For example, in the years leading up to the financial crisis a number of Landesbanken acquired subprime-mortgage related assets that they financed through short-term debt on-balance sheet or that they securitized in some fashion (e.g., through ABCP conduits) while retaining most of the risk of the assets by providing credit or liquidity support to the securitization entities (Puri et al. 2011).

The Landesbanken, and the German banking context more generally, exhibit three features that provide opportunities for research that addresses the research design issues discussed in the introduction as well as inherently interesting questions. The first two features are exogenous shocks that have been examined by finance researchers that accounting researchers might exploit for their purposes. First, Puri et al. (2011) use decreases in the value of ownership
stakes in Landesbanken most adversely affected by the financial crisis as exogenous shocks to the loan supply of the savings banks that own those ownership stakes. Unlike the imposition of dynamic provisioning for loan losses in Spain, however, these shocks are not directly related to an aspect of accounting.

Second, Fischer et al. (2014) use the July 2001-July 2005 interim period in which explicit guarantees of new debt issued by the Landesbanken are allowed for a known finite period as an exogenous shock to the Landesbanken’s risk-taking incentives. Specifically, Fischer et al. argue that the looming elimination of the explicit guarantees that have long provided the Landesbanken with competitive advantages, combined with minimal market discipline while the explicit guarantees remained outstanding, reduced the Landesbanken’s franchise values and provided them with incentives to issue low-cost guaranteed debt and gamble with the proceeds. Consistent with this argument, Fischer et al. provide evidence, using a difference-in-differences research design, that the Landesbanken increased the risk of the loans they issued and their leverage compared to other banks during the July 2001-July 2005 period. The expiration of most remaining debt guarantees at the end of 2015 may provide a predictable, albeit perhaps less exogenous, event worth examining.

Third, and most importantly for accounting research, the German banking context enables banks to be sorted into groups based on whether they apply the same or different accounting principles for financial reporting versus regulatory reporting purposes, as well as the extent to which they apply fair value accounting versus amortized cost accounting for financial instruments. As discussed by Georgescu and Laux (2013), since January 2005 German banks that are publicly traded on European Union (EU) exchanges must prepare their public financial

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45 Kömer and Schnabel (2013) provide evidence of similar increases in risk taking at German savings banks associated with the Landesbanken most affected by the crisis.
reports using IFRS, which is similar to U.S. GAAP in the extent of required fair value accounting for financial instruments. Other banks typically prepare their potentially non-public financial reports using German accounting principles (HGB). HGB primarily requires amortized cost accounting for financial instruments, although it requires lower of cost or fair value accounting for current financial assets and reversible other-than-temporary impairment write-downs for non-current financial assets. Banks may choose to prepare their (often non-public) regulatory reports using either IFRS or HGB.

In practice, German banks fall into three groups based on their use of IFRS and HGB for financial and regulatory reporting purposes. A few publicly traded and typically large banks (e.g., Deutsche Bank and Commerzbank) use IFRS for both financial and regulatory reporting purposes. For these banks, IFRS’s fair value accounting provisions affect their net income, owners’ equity, and regulatory capital. Other publicly traded banks typically use IFRS for financial reporting purposes and HGB for regulatory reporting purposes. For these banks, IFRS’s fair value accounting provisions affect their net income and owners’ equity but not their regulatory capital. Other banks typically use HGB for both financial reporting and regulatory reporting purposes. For these banks, IFRS’s fair value accounting provisions do not affect their net income, owners’ equity, or regulatory capital.

Georgescu and Laux (2013) exploit some of these differences in financial and regulatory reporting across banks in their case-study analyses of the failures of three large German banks during the financial crisis: Landesbank Sachen Girozentrale (Sachen LB), Deutsche Industriebank AG (IKB), and Hypo Real Estate Holding AG (HRE). As a non-publicly traded Landesbank, Sachen LB applied HGB for both financial and regulatory accounting purposes. As

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46 IFRS and U.S. GAAP differ in the extent to which offsetting derivatives and other financial instruments recognized at fair value covered by netting agreements are presented gross versus net on the balance sheet, however, as discussed in Section 2.2.
publically traded banks, IKB and HRE applied IFRS for financial reporting purposes but HGB for regulatory reporting purposes. Georgescu and Laux conclude that the failures of these banks were not attributable to fair value accounting in part because regulation of these banks was based on HGB, not IFRS, and in part because these failures can be directly traced to the banks financing their investments in risky assets on-balance sheet through the issuance of short-term debt or off-balance sheet through the provision of credit or liquidity support to ABCP conduits or other securitization entities.

To the extent that non-public banks’ financial reports and all banks’ regulatory reports can be obtained, the German banking context provides researchers with unusual ability to identify the distinct effects of fair value versus amortized cost accounting for financial instruments for financial reporting versus regulatory purposes.

6.3 OCTOBER 2008 IFRS-SANCTIONED RECLASSIFICATIONS OF FINANCIAL ASSETS

Under extreme pressure from the European Commission and the political leaders of EU countries, and with extraordinary abandonment of its normal due process, on October 13, 2008 the IASB amended IAS 39 to allow banks (and other firms) to reclassify financial assets from categories for which a relatively extensive form of fair value accounting is required to categories for which a less extensive form of fair value accounting or amortized cost accounting is required. This amendment allowed reclassifications of financial assets for fiscal periods ending on or before October 31, 2008 to be retroactive to July 1, 2008, that is, to be made with hindsight as to actual losses experienced from July 1, 2008 to the time of the reclassification decision. Due to the dramatic acceleration of the financial crisis around Lehman’s bankruptcy filing on September 15, 2008, reclassified financial assets typically had experienced significant

47 See Brüeggemann (2011) for extensive discussion of the pressure causing this amendment to IAS 39.
unrealized losses and/or impairment write-downs during this period, and we assume this is the case in the discussion that follows. Depending on both the pre- and post-reclassification categories, reclassifications generally increased banks’ regulatory capital due to increases in one or both of banks’ income and owners’ equity.

Specifically, the amendment of IAS 39 allowed three general types of reclassifications that diminish or eliminate the use of fair value accounting. First, banks could reclassify non-derivative trading assets to AFS assets. Trading assets are recognized at fair value on the balance sheet with periodic realized and unrealized gains and losses recorded in net income. AFS assets are also recognized at fair value on the balance sheet but only realized gains and losses (including write-downs of any other-than-temporarily [OTT] impaired assets to fair value) are recorded in net income; unrealized gains and losses are recorded in other comprehensive income. Hence, these reclassifications increased banks’ net income but had no effect on their owners’ equity. This type of reclassification generally increased banks’ regulatory capital because country-specific prudential filters usually exclude part or all of unrealized losses recorded in other comprehensive income.

Second, banks could reclassify non-derivative trading assets to HTM assets or (if they met the definition) to loans and receivables. HTM assets and loans and receivables are recognized at amortized cost on the balance sheet with realized gains and losses (including write-downs of any OTT-impaired HTM assets or of impaired loans and receivables to a basis typically above fair value) recorded in net income and with unrealized gains and losses not recognized in any fashion. This type of reclassification increased banks’ net income, owners’ equity, and regulatory capital.
Third, banks could reclassify AFS assets to HTM assets or (if they met the definition) to loans and receivables. This type of reclassification increased banks’ net income if they had recorded OTT impairments on the securities after July 1, 2008 (but not otherwise) and increased their owners’ equity and regulatory capital.

Also on October 13, 2008, the IASB amended IFRS 7 to require disclosures indicating the effects on current period financial statements of the reclassifications in the current period and cumulatively to date. If provided completely, these disclosures would provide essentially full transparency over banks’ reclassifications.

Prior research documents that reclassifications of financial assets under the amendment of IAS 39 had substantial effects on net income and regulatory capital for many banks. For example, Fiechter (2011) reports that over one-third of his sample of European banks reclassified securities and that on average these banks increased their 2008 return on equity by 2.7% (from negative 1.4% to positive 1.3%) and their year-end 2008 Tier 1 and total risk-based capital ratios by 0.55% and 0.5%, respectively. Prior research also documents that banks did not reliably provide the complete set of disclosures of the financial statement effects of reclassifications required by IFRS 7. For example, Bischof, Brüeggemann, and Daske (2014) find that only 34% of their sample of reclassifying banks provided complete disclosure in 2008.

Bischof et al. (2014) examine whether reclassifications of financial assets under the amendment of IAS 39 benefited banks by reducing their costs of complying with regulatory capital requirements or hurt them by increasing their opacity and thus cost of capital. Bischof et al. provide two results consistent with subsets of banks obtaining benefits from reclassifications. Specifically, they find positive abnormal share returns on October 13, 2008 for the subset of

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48 IAS 39 allowed reclassifications of AFS assets to HTM assets prior to the October 2008 amendment, just not retroactively.
banks with high estimated reclassification likelihood (estimating this likelihood using banks’ subsequently reported actual reclassifications, i.e., with hindsight) and need for regulatory capital. They find abnormal share returns on reclassification announcement dates that increase with the effects of banks’ reclassifications on their regulatory capital only for banks with low estimated reclassification likelihood. Bischof et al. also provide one result consistent with subsets of banks being hurt by reclassifications. Specifically, they find increases in equity bid-ask spreads, i.e., increased opacity, for reclassifying banks that do not make all of the disclosures of reclassifications required by the amendment to IFRS 7.49

Compared to the imposition and first amendment of dynamic provisioning for loan losses in Spain discussed in Section 6.1, the amendment of IAS 39 constitutes a messily endogenous shock to banks’ regulatory capital and thus loan supply. Banks’ mounting losses on financial assets prior to October 13, 2008 and the specter of widespread additional losses yielding insolvency across the banking system in the near term led to the extreme political pressure that drove the IASB to amend IAS 39 as described above. The implications of this amendment and banks’ subsequent reclassifications are difficult to distinguish from numerous confounding events occurring during the financial market free fall in 2008Q4, such as the guarantees of $2.5 trillion of new bank debt by France, Germany, the United Kingdom, and other European countries reported in the Financial Times on October 13, 2008. Most importantly, banks could choose whether or not and how to reclassify financial assets depending on their current

49 Georgescu (2014) attempts to further identify the regulatory benefits and opacity costs of the amendment of IAS 39 further by examining the distinct reactions of CDS market and equity market participants to the October 13, 2008 announcement of the amendment. Although these two types of market participants may exhibit different sensitivities to the benefits and costs of the amendment, Georgescu obtains largely “inconclusive” findings. Her inclusive results may result from additional issues, such as risk shifting, that are raised by the comparison of CDS and equity; e.g., the incremental income resulting from newly allowed reclassifications of assets may have enabled banks to pay additional dividends.
regulatory capital status and private information about the likelihood and extent of future write-downs.

This endogeneity makes it difficult to address the research design issues discussed in the introduction. Due to the existence of considerable cross-country variation in prudential filters for unrealized gains and losses on AFS assets as well as capital requirements,\textsuperscript{50} however, the amendment of IAS 39 provides opportunities for interesting future research on the individual and collective effects of financial accounting and regulatory capital requirements. This variation enables banks to be sorted into groups whose regulatory capital status is differentially affected by the amendment of IAS 39 and by different types of reclassifications. In particular, banks in countries with less inclusive prudential filters for unrealized losses on AFS assets should be more affected by reclassifications from AFS assets to HTM assets or loans and receivables but less affected by reclassifications from trading assets to AFS assets. Researchers could examine whether banks more and less affected by the amendment of IAS 39, which depends on their pre-amendment classifications of financial assets, differentially altered their investment holdings as a consequence of the amendment. For example, did the amendment of IAS 39 disproportionately help significantly affected banks maintain their holdings of downgraded structured securities and sovereign bonds during the crisis? If so, did these holdings experience subsequent losses or otherwise lead to problems for these banks?

While each of the three settings examined in Sections 6.A-6.C exhibits its own distinctive collection of characteristics, many of these characteristics can be found in other settings. For example, dynamic provisioning for loan losses in Spain is analogous to other settings where regulators require or allow banks to record incremental provisions in good times that are

\textsuperscript{50} Bischof et al. (2014, Appendix I) list the prudential filters for unrealized gains separately from unrealized losses on AFS assets and the total regulatory capital requirements in each of the 39 countries in their sample.
eliminated in bad times, such as regulatory general provisions for loan losses in Germany. We encourage researchers to identify and examine such analogous settings.

7. Some Considerations for Accounting Standards Setters and Financial System Policymakers

We conclude with three suggestions for ways that financial and regulatory reporting can promote stability that accounting standards setters, bank regulators, and other financial system policymakers should consider.51 These suggestions pose practical difficulties that we briefly discuss. Bank regulators and possibly other financial system policymakers, due to their more extensive and timelier information about the banking setting, generally are in a better position than accounting standard setters to overcome these difficulties.

First, stability is threatened when positively correlated risk exposures accumulate across banks, particularly when these positive correlations are not well understood by the banks involved, their regulators, or the financial markets. One reason why these correlations may not be well understood is that existing financial reporting requirements typically require a bank to disclose a risk exposure only when it is reasonably possible that the exposure has significant effects on its total assets or net income, whereas the significance of a bank-level risk exposure for stability depends on its contribution to the magnitude and correlations of the holdings of all banks. Reiterating a recommendation by Leuz (2009), we encourage accounting standard setters (bank regulators) to endeavor to make financial (regulatory) reporting rules “countercyclically transparent” by requiring individual banks to provide expanded disclosure of a given risk exposure as that type of exposure accumulates systemwide or in a few large banks that serve as key counterparties. Such disclosures are particularly to be useful when a new class of risk

51 This section is not intended to be comprehensive. In particular, we do not repeat the many suggestions that have been made for expanded disclosures by banks and other financial institutions about their risks (e.g., Ryan 2012); in our view, such expanded disclosures likely would, if thoughtfully designed and faithfully implemented, enhance stability.
exposure (e.g., subprime mortgage-related assets) grows rapidly, yielding poorly understood system-wide risk exposures.

Difficult practical issues must be overcome to develop (and when no longer useful eliminate) countercyclically transparent disclosure requirements on an ongoing and timely basis. Early warning systems must be devised that reliably identify accumulations of risk exposures systemwide, triggering disclosure, before the aggregate exposures pose serious threats to stability. This is particularly challenging for new classes of risk exposures, which bank regulators or some other party will need to continuously monitor and incorporate into financial or regulatory reporting in a timely fashion. It is also challenging for risk-concentrated and cycle-contingent exposures that have little immediate effects on banks’ assets and income but that can blow up under sufficiently adverse circumstances.

Second, stability is threatened when banks hold exposures that are, or may become, illiquid and thus difficult to value. Recognizing this, in FAS 157 and subsequent amendments of that standard (ASC 820), the FASB requires extensive disclosures for fair value measurements based on unobservable level 3 inputs for current recognized assets and liabilities. While useful, these disclosures have more limited scope than they might in at least two ways: (1) some of banks’ recognized exposures that are measured at fair value using observable level 2 (and possibly even level 1) inputs in normal economic conditions are more prone than other such positions to become level 3 fair valuations in stress scenarios; and (2) some of banks’ currently unrecognized exposures (e.g., loan commitments as well as credit and liquidity support provided to securitization entities) will become recognized assets and liabilities and require the bank to provide liquidity in stress scenarios. We suggest that accounting standard setters (bank
regulators) consider requiring similarly expanded disclosures for exposures that are expected to become illiquid or recognized in stress scenarios in financial (regulatory) reports.

This suggestion requires some party, probably bank regulators, to conduct stress tests that ideally are based on banks’ aggregate exposures. Conducting such stress tests requires individual banks to report their exposures in standardized and detailed fashions to the party conducting the tests. The literature shows that disclosure of banks’ stress test results to the market has pros and cons (e.g., Goldstein and Sapra 2014) that may also apply to our suggested disclosures.

Third, LOLRs’ provision of liquidity on pledged illiquid (level 3) assets makes it easier for banks to keep those and other assets on-balance sheet, likely delaying the banks’ recording of losses on assets or deleveraging, forms of regulatory forbearance. While such forbearance surely is intended, it poses risks to stability that bank regulators and other financial system policymakers should attempt to mitigate to the extent possible. Bank regulatory approaches to mitigating these risks include requiring banks: (1) to maintain adequate capital given the current and potential future illiquidity of the pledged assets; and (2) to dispose of the pledged assets gradually following the provision of liquidity, thereby gradually recording losses and deleveraging. Financial or regulatory reporting approaches to mitigate these risks include requiring counter-cyclical transparency for the banks receiving liquidity as entities and, particularly, regarding their holdings of pledged problem assets.


ENHANCED DISCLOSURE TASK FORCE. *Enhancing the Risk Disclosures of Banks*, 2012.

ENHANCED DISCLOSURE TASK FORCE. *Enhancing the Risk Disclosures of Banks* (Second Report), 2013.


Appendix

A Model Setting

1. We consider the situation of a firm with unique access to a project that requires an initial investment of 1 and that must be funded with outside resources. The quality of the project is defined by a parameter $\theta \in [0, 1]$ that is common knowledge.

2. The project generates intermediate information regarding its eventual success. Conditional on this information, it may, in some circumstances, be optimal to terminate the project and realize the liquidation value. However, for the residual claimant on the project’s cash flows, it may nonetheless be in the firm’s interest to continue the project.

3. We consider two situations:

   (a) The first is where the firm “marks to market” the project at the interim stage; in our stylized model, that means he reveals the interim information to the investor. The investor then decides whether to withdraw the funding or not; withdrawal of the funding results in liquidation of the project and accelerates the payment due to the investor.

   (b) The alternative scenario is where the investor receives no information on the interim state of the project. The project is always continued through to maturity, even when it is suboptimal (i.e., value-destroying) to do so.

   (c) Note that we do not allow for the firm to send false signals. Implicitly, the signals may be audited/verified at zero cost.

4. At maturity, the project returns either $R$ or 0. The project type is $\theta \in [0, 1]$. The parameter $\theta$ is common knowledge to the firm and the investor.

5. At the interim time-point, the project may be in one of two states:

   \[
   \begin{cases}
   \text{The “good” state, } & \text{with probability } \theta \\
   \text{The “poor” state, } & \text{with probability } 1 - \theta.
   \end{cases}
   \]

   Note that the probability of being in a good state increases with $\theta$, giving $\theta$ the natural interpretation of being project “quality.”

6. Conditional on being in the good state,

   (a) If the project is continued, it pays

   \[
   \begin{cases}
   R, & \text{with probability } q_H \\
   0, & \text{with probability } 1 - q_H.
   \end{cases}
   \]
(b) If the project is liquidated, it yields a liquidation value of $H$.

7. Similarly, conditional on being in the poor state,

(a) If the project is continued, it pays

\[
\begin{cases}
R, & \text{with probability } q_L \\
0, & \text{with probability } 1 - q_L.
\end{cases}
\]

(b) If the project is liquidated, it yields a liquidation value of $L$.

8. In the sequel, for simplicity, we refer to the states by their liquidation values, i.e., state $H$ denotes the good state and state $L$ the poor state.

9. We assume that the liquidation value in state $H$ is higher than that in state $L$ (more precisely, that $H > 1 > L$); and that it is optimal from a project-value standpoint to continue if $H$ occurs and to withdraw from the project (i.e., liquidate) if $L$ occurs. In notational terms:

\[ q_H R > H > 1 > L > q_L R. \]  

To make the algebra simpler, we make one other assumption. Define $\bar{\theta}$ to be such that

\[
\bar{\theta} = \frac{1 - L}{H - L}.
\]

Note that for all $\theta > \bar{\theta}$, we have $\theta H + (1 - \theta)L < 1$, so it is efficient to invest in the project even if the project is shut down at the interim time point. We assume that the extra dollar returns to continuing are, on average, at least as large as the returns to terminating the project for all such $\theta$: that is, for all $\theta \geq \bar{\theta}$, we assume

\[
(\theta q_H + (1 - \theta)q_L)R - (\theta H + (1 - \theta)L) \geq (\theta H + (1 - \theta)L) - 1
\]

(2)

Note the special implication of (2) that for $\theta = 1$, we have

\[ q_H R - H \geq H - 1 \]

10. The investor’s promised payment at project maturity is denoted $F$. $F$ is determined endogenously. We assume without loss of generality that $F \leq R$. From limited liability, this means (assuming the project is not terminated at the interim state) that at maturity, the investor receives
\[
\begin{cases}
F, & \text{if the final project value is } R \\
0, & \text{otherwise}
\end{cases}
\]

11. So allowing the project to continue at the interim state results in an expected payoff to the investor of

\[
\begin{cases}
q_H F, & \text{from state } H \\
q_L F, & \text{from state } L
\end{cases}
\]

### B Base Case

The funding set for the marking to market (MTM) case, as derived in Acharya, Mukherjee, and Sundaram (2015), (AMS henceforth) is given by

\[
F_{MTM} = \left[ 1 - \frac{q_H R - L}{q_H R - L}, 1 \right]
\]

Under the full information scenario, all the funded projects are continued in the good state (H) and liquidated in the bad (L).

On the other hand, for the no-information (NI) case, the funding set is given by

\[
F_{NI} = \left[ 1 - \frac{q_L R}{(q_H - q_L)R}, 1 \right]
\]

where the projects funded are continued till maturity\(^\dagger\).

The following lemma compares the net present values of the projects funded under marking to market and the no information regimes.

**Lemma B.1.** The projects funded under the MTM regime have net present value (NPV) \(\geq 0\). For the no-information revelation case, only projects with strictly positive NPV get financed.

**Proof.** The NPV of a project with quality parameter \(\theta\) under either regime is given by

\[
V(\theta) = \theta q_H R + (1 - \theta)L - 1 = \theta (q_H R - L) - (1 - L)
\]

which is monotonically increasing in \(\theta\) given the assumption (1). Hence, suffices to show the NPVs for the cutoff quality parameter satisfies the above restrictions.

\(^\dagger\)The assumptions in their paper always imply that continuation is more valuable in intermediate liquidations. The lower bound, however, falls in the region where continuation is the only feasible option which satisfies the individual rationality constraint
For the MTM case, the cutoff value is given by (3). It is straightforward to see that
\[ V\left( \frac{1 - L}{q_H R - L} \right) = 0 \]
Thus all the projects funded under MTM regime have NPV \( \geq 0 \).

Similar calculation for the no-information regime obtains
\[ V\left( \frac{1 - q_L R}{(q_H - q_L)R} \right) = (q_H R - L) \frac{1 - q_L R}{(q_H - q_L)R} - (1 - L) > 0 \]
This directly follows from \( \frac{1 - q_L R}{(q_H - q_L)R} > \frac{1 - L}{q_H R - L} \) and the NPV is monotone increasing in \( \theta \).

**Proposition B.2.** The equilibrium debt \( F \) is lower under marking-to-market as compared to the no-information regime.

**Proof.** AMS (2015) derives the equilibrium debt level for marking-to-market as
\[
F^* = \begin{cases} 
\frac{1}{q_H} [1 - (1 - \theta) L], & \theta \in \left[ \hat{\theta}_1, \frac{1 - L}{H - L} \right] \\
\frac{1}{q_H} H, & \theta \in \left( \frac{1 - L}{H - L}, 1 \right]
\end{cases}
\]  
while that for the no-information regime being
\[
F^{**} = \begin{cases} 
\frac{1}{\theta q_H + (1 - \theta) q_L}, & \theta \in \left[ \hat{\theta}_2, \frac{1 - L}{H - L} \right] \\
\frac{1}{\theta q_H + (1 - \theta) L}, & \theta \in \left( \frac{1 - L}{H - L}, 1 \right]
\end{cases}
\]  
To show that \( F^* \leq F^{**} \) we consider two cases separately.

**Case I:** \( \theta < \frac{1 - L}{H - L} \)

We have,
\[
F^* \leq F^{**} \iff \frac{1 - (1 - \theta) L}{\theta q_H} \leq \frac{1}{\theta q_H + (1 - \theta) q_L} \\
\iff \frac{1}{\theta q_H + (1 - \theta) L} \leq \frac{L}{q_L}
\]
where the second line follows from simple algebra. Now consider the inequality \( \frac{1}{\theta q_H + (1 - \theta) q_L} \leq \frac{L}{q_L} \)
\( R \). Simple rearrangement of the above expression yields
\[
\frac{1}{\theta q_H + (1-\theta)q_L} \leq R \iff 1 \leq (\theta q_H + (1-\theta)q_L)R \\
\iff \frac{1-q_LR}{(q_H - q_L)R} \leq \theta.
\]
Recognize that the second line implies that \( \theta \) should be greater than the lower bound of the funding set for no-information. Also from assumption (1), we have \( R < \frac{L}{q_L} \). Combining delivers the required result for this case.

**Case II : \( \theta \geq \frac{1-L}{H-L} \)**
For this region of \( \theta \), we have the restriction
\[
F^* < F^{**} \iff \frac{H}{q_H} < \frac{\theta H + (1-\theta)L}{\theta q_H + (1-\theta)q_L} \iff \frac{H}{q_H} < \frac{L}{q_L}
\]
where the second inequality obtains through simple rearrangement. Note that this is true by assumption (1). This completes our proof.

### C Equilibrium with Bailout

In this section, we consider the equilibrium where the regulator bails out the investor in the event of failure with certain exogenously specified probability \( b \). In the next two subsections, we consider separately, the implications of such an event under the two accounting regimes. Specifically, we investigate the ex-ante effects on the financing set and whether bailout induces inefficient projects to be funded.

**C.1 No Information Case with Bailout**

We continue to assume the same structure with no interim information revelation (suspension of marking to market), with the additional assumption that the regulator bails out the investor with a probability \( b \) (assume exogenously specified) if the project fails. Thus, conditional on the project failing, the investor receives the face value of debt, \( F \), with probability \( b \).

The following proposition characterizes the equilibrium and provides expressions for the face value of debt and the corresponding funding set.

**Proposition C.1.** The set of projects funded under no interim information revelation and exogenous bailout probability \( b \) is
\[
F_{NI,BAIL}(b) = \left[ \hat{\theta}_{NI}(b), 1 \right]
\]
where the cutoff quality parameter is given by

$$
\hat{\theta}_{NI}(b) = \begin{cases} 
1 - \left[ q_L + (1 - q_L)b \right] R, & \text{if } b < 1 - q_L R \\
\frac{R - q_L R}{(1 - b)(q_H - q_L)R}, & \text{if } \theta \geq \frac{1 - q_L R}{R - q_L R} \\
0, & \text{if } \frac{1 - q_L R}{R - q_L R} - q_L R < 1 - q_L R 
\end{cases}
$$

(7)

\textbf{Proof.} Under no information regime, the investor can liquidate unconditionally at the interim date or continue till maturity. First consider the case when $\theta \leq \frac{1 - L}{H - L}$. This implies that intermediate liquidation violates the participation constraint of the investor.

Denote $\tilde{q}_H = q_H + (1 - q_H)b$ and $\tilde{q}_L = q_L + (1 - q_L)b$.

The investor funds the project if and only if her individual rationality constraint is satisfied

$$
\theta \left[ q_H + (1 - q_H)b \right] F + (1 - \theta) \left[ q_L + (1 - q_L)b \right] F - 1 \geq 0.
$$

In equilibrium, this constraint binds with equality and the face value of debt given by

$$
F^*(\theta; b) = \frac{1}{\theta q_H + (1 - \theta) q_L}.
$$

On the other hand, IC constraint of the firm restricts the debt to be less than the total possible payoff $R$. This imposes a lower cutoff bound on the set of projects which can be funded in equilibrium:

$$
F^*(\theta; b) \leq R.
$$

$$
\iff \theta \left[ q_H + (1 - q_H)b \right] F + (1 - \theta) \left[ q_L + (1 - q_L)b \right] F - 1 \geq R
$$

$$
\iff \theta(b) \geq \frac{1 - \left[ q_L + (1 - q_L)b \right] R}{(1 - b)(q_H - q_L)R}.
$$

(8)

Thus the total funding set, given a bailout probability $b$ is given by

$$
\mathcal{F}_{NI,BAIL}(b) = \left[ \hat{\theta}_{NI}(b), 1 \right]
$$

(9)

where $\hat{\theta}_{NI}(b) = \frac{1 - \left[ q_L + (1 - q_L)b \right] R}{(1 - b)(q_H - q_L)R}$.

The requirement that the cutoff value $\hat{\theta}_{NI}(b) \geq 0$ implies an upper threshold for $b$, say $\tilde{b}$, beyond which the funding set is simply $[0, 1]$ with all project indiscriminately funded.
This upper threshold can be derived by setting \( \tilde{\theta}_{NI}(b) = 0 \) which yields

\[
\tilde{b} = \frac{1 - q_L R}{R - q_L R}.
\]

Thus,

\[
\tilde{\theta}_{NI}(b) = \begin{cases} 
\frac{1 - [q_L + (1 - q_L)b] R}{(1 - b)(q_H - q_L) R}, & \text{if } b < \frac{1 - q_L R}{R - q_L R} \\
0, & \text{if } b \geq \frac{1 - q_L R}{R - q_L R}
\end{cases}
\]

(10)

Since adding insurance relaxes the financing constraints, it should expand the funding set ex-ante. The following lemma formalizes this.

**Lemma C.2.** *Ex-post bailout possibility relaxes the financing of project ex-ante.*

**Proof.** Denote the threshold project quality given no interim information revelation and bailout by

\[
\tilde{\theta}_{NI}(b) = \frac{1 - [q_L + (1 - q_L)b] R}{(1 - b)(q_H - q_L) R}
\]

where \( b = 0 \) simply reduces this threshold value to the no-information base case (without bailout).

Now,

\[
\tilde{\theta}_{NI}(b) \leq \tilde{\theta}_{NI}(0) \equiv \frac{1 - q_L R}{(q_H - q_L) R}
\]

\[
\iff \left[ \frac{1 - [q_L + (1 - q_L)b] R}{(1 - b)(q_H - q_L) R} \right] \leq \frac{1 - q_L R}{(q_H - q_L) R}
\]

\[
\iff 1 - [q_L + (1 - q_L)b] R \leq (1 - b)(1 - q_L R)
\]

\[
\iff R \geq 1
\]

which is true by assumption. \( \square \)

**C.1.1 An Algorithm to solve for the Debt Level**

In this subsection, we outline the algorithm to solve for the equilibrium debt level. We can write the individual rationality constraint for the above problem as

\[
\left[ \theta \tilde{q}_H + (1 - \theta) \tilde{q}_L \right] F \geq 1
\]
subject to the incentive compatibility (ensures that continuation dominate intermediate liquidation)

\[
[\theta \tilde{q}_H + (1 - \theta) \tilde{q}_L] F \geq \theta \min(H, F) + (1 - \theta)L
\]

Now for all \( \theta \) such that \( \theta H + (1 - \theta)L \leq 1 \), \( F^*(\theta; b) = \frac{1}{\theta \tilde{q}_H + (1 - \theta) \tilde{q}_L} \) satisfies both the IR and IC conditions.

Now consider the case when \( \theta H + (1 - \theta)L \geq 1 \). Without bailout, the only feasible value of debt which solves the above set of IC and IR constraints is derived in AMS(2015) as

\[
F^*(\theta; b) = \frac{\theta H + (1 - \theta)L}{\theta \tilde{q}_H + (1 - \theta) \tilde{q}_L}.
\]

However, this is not the only feasible solution with bailout. As an illustrative example, consider the case of full insurance (\( b = 1 \)). In this case, any risk-neutral investor would optimally set \( F = 1 \). However, extension of the above formula obtains

\[
\frac{\theta H + (1 - \theta)L}{\theta \tilde{q}_H + (1 - \theta) \tilde{q}_L} \geq 1.
\]

Note that this problem arises only for \( \theta > \frac{1 - L}{H - L} \). For any smaller \( \theta \), the incentive compatibility is always non-binding in equilibrium and the optimal debt level is indeed the one given in the previous paragraph.

Thus only for the range \( \theta \in [\frac{1 - L}{H - L}, 1] \), the equilibrium debt level is given by the solution of the following LP problem:

\[
\begin{align*}
\text{min} & \quad F \\
\text{s.t.} & \quad F \geq \frac{1}{\theta \tilde{q}_H + (1 - \theta) \tilde{q}_L} & \text{(I.R.)} \\
& \quad F \geq \frac{\theta \min(H, F) + (1 - \theta)L}{\theta \tilde{q}_H + (1 - \theta) \tilde{q}_L} & \text{(I.C.)}
\end{align*}
\]

This general solution encompasses all the specific solutions we have encountered before. For example, for \( \theta \leq \frac{1 - L}{H - L} \), we have \( \theta \min(H, F) + (1 - \theta)L \leq \theta H + (1 - \theta)L \leq 1 \). Thus the solution of the above optimization problem is \( F = \frac{1}{\theta \tilde{q}_H + (1 - \theta) \tilde{q}_L} \) which is indeed the one derived above.

C.1.2 Comparison with MTM

With a positive bailout probability \( b \), the funding set expands under the no-information regime. But how does this compare to the MTM regime (without bailout)? Intuitively, increasing bailout probability leads to a corresponding increase in the funding set until a threshold level is reached when it crosses the funding set \( \mathcal{F}_{MTM} \). The following proposition quantifies this.

**Lemma C.3.** There is a cutoff bailout probability \( b^* \in (0, 1) \) such that for all \( b > b^* \),
\( \mathcal{F}_{NI,\text{BAIL}}(b) > \mathcal{F}_{MTM} \) and vice versa.

**Proof.** The cutoff probability is easily obtained by comparing the threshold funding values under MTM and no-information (with bailout) regimes.

\[
\tilde{\theta}_{NI}(b) \leq \tilde{\theta}_{MTM} \iff \left[ 1 - \left[ q_L + (1-q_L)b \right] R \right] \leq \frac{1-L}{q_H R - L}
\]

\[
\iff (q_H R - L)(1-q_L R) - (q_H R - L)(R-q_L R)b \leq (1-L)(q_H R - q_L R) - (1-L)(q_H R - q_L R)b
\]

\[
\iff b \geq \frac{(q_H R - L)(1-q_L R) - (1-L)(q_H R - q_L R)}{(q_H R - L)(R-q_L R) - (1-L)(q_H R - q_L R)}
\]

Thus the cutoff value is given by

\[
b^* = \frac{(q_H R - 1)(L-q_L R)}{(q_H R - 1)(R-q_L R) + (1-L)(R-q_H R)}
\]

Lemma (B.1) proves that the lower bound of the quality parameter \( \tilde{\theta} \) which ensures that the NPV of the project is non-negative is, in fact, equal to the threshold value of the funding set under marking-to-market regime. That is \( \tilde{\theta} = \tilde{\theta}_{MTM} \). Any lower value of \( \theta \) makes the project a negative NPV and inefficient undertaking. Thus, when the bailout insurance is high enough, \( b > b^* \), the investors are willing to fund negative NPV projects. The following proposition summarizes this argument by laying down the range of negative NPV projects funded for various values of the exogenous bailout parameter \( b \).

**Proposition C.4.** The set of negative NPV projects funded by the investors under no interim information regime with exogenous bailout probability \( b \) is

\[
\begin{cases} 
\phi, & \text{if } b \in [0,b^*] \\
\left[ 1 - \left[ q_L + (1-q_L)b \right] R \right] \left( 1 - \frac{L}{q_H R - L} \right), & \text{if } b \in (b^*, \bar{b}) \\
0, & \text{if } b \in [\bar{b},1]
\end{cases}
\]

**C.2 MTM with Bailout**

In this section we again consider the one project setting under marking to market regime, but add the bailout possibility. Reiterating, conditional on the project failure, the investors gets bailed out by the regulator with an exogenously specified probability \( b \).
We start our analysis with a simple lemma, the application of which will become apparent in the following analysis.

**Lemma C.5.** There is a unique threshold probability $b^*$ such that the following is true

$$
\begin{align*}
\frac{H}{q_H + (1 - q_H)b} \geq \frac{L}{q_L + (1 - q_L)b} & \quad \forall \ b \geq b^* \\
\frac{H}{q_H + (1 - q_H)b} < \frac{L}{q_L + (1 - q_L)b} & \quad \forall \ b < b^*.
\end{align*}
$$

**Proof.** Consider the function $f(b) = \frac{H}{q_H + (1 - q_H)b} - \frac{L}{q_L + (1 - q_L)b}$. Note that $f(1) = H - L > 0$ and $f(0) = \frac{H}{q_H} - \frac{L}{q_L} < 0$ where the second inequality comes from the assumption (1). Then by intermediate value theorem, there exists a unique point $b^*$ at which the function crosses the stationary point.

A simple comparison of the LHS and the RHS of the above equation determines the value of the $b^*$.

$$b^* = \frac{q_H L - q_L H}{(1 - q_L)H - (1 - q_H)L}$$

It is very simple to show why this term is positive. From assumption (1),

$$q_H L > q_H(q_L R) = q_L(q_H R) = q_L H.$$  

$q_H > q_L \implies (1 - q_L)H > (1 - q_L) > (1 - q_H) > (1 - q_H)H.$

Since we are primarily concerned with the lower bounds of the funding set, we restrict attention, as before, to the case where the project quality satisfies the upper cutoff $\theta \leq \frac{1 - L}{H + L}$.

The inclusion of the bailout possibility renders the analysis more complicated as compared to the benchmark marking-to-market case considered in AMS(2015). Under non-zero bailout, continuation may dominate intermediate liquidation in the low states. In the baseline analysis, assumption (1) precluded this possibility and the projects were always liquidated in the interim low state. We extend the analysis in the following proposition which calculates the lower bounds of the funding set under marking-to-market with bailout regime.

**Proposition C.6.** The set of projects funded under marking to market and exogenous bailout probability $b$ is

$$\mathcal{F}_{MTM,BAIL}(b) = \left[ \hat{\theta}_{MTM}(b), \ 1 \right]$$
where the lower cutoff point is given by

\[
\hat{\theta}_{MTM}(b) = \begin{cases} 
\frac{1 - L}{\hat{q}_H R - L}, & \text{if } b \in \left[0, \frac{L - q_L R}{R - q_L R}\right] \\
\frac{1 - [q_L + (1 - q_L)b]R}{(1-b)(q_H - q_L)R}, & \text{if } b \in \left(\frac{L - q_L R}{R - q_L R}, \frac{1 - q_L R}{R - q_L R}\right) \\
0, & \text{if } b \geq \frac{1 - q_L R}{R - q_L R}
\end{cases}
\]  

(13)

Proof. Denote \(\hat{q}_H = q_H + (1 - q_H)b\) and \(\hat{q}_L = q_L + (1 - q_L)b\).

Let us first look at the project from the investor’s viewpoint. The following individual rationality constraint needs to be satisfied for the financing to be possible

\[
\theta \max \left( \min(F, H), \hat{q}_H F \right) + (1 - \theta) \max \left( L, \hat{q}_L F \right) \geq 1
\]

(14)

where the first (second) term indicates the potential payoff to the investor in the high (low) state. In the high state, the investor would want to liquidate the project in the interim high state if the payoff from continuation \(\hat{q}_H F\) is smaller than that from liquidation \(\min(H, F)\). The same reasoning applies for the low state. Now, it is clear from lemma (C.5) that liquidation might not dominate always in the low state.

Under marking to market regime, the investor will continue in the low interim state if and only if

\[
\hat{q}_L R \geq \hat{q}_L F \geq L \iff [q_L + (1 - q_L)b]R \geq L
\]

By assumption (1), this inequality is true for \(b = 1\) while it is violated for \(b = 0\). Thus there is a unique bailout probability \(b_2\) for which this expression binds. Simply comparing the LHS and the RHS of the above expression provides the value for this threshold

\[
b_2 = \frac{L - q_L R}{(1-q_L)R}.
\]

(15)

Thus for all \(b < b_2\), \(L > [q_L + (1 - q_L)b]R\) and the investors prefer liquidation in the interim low state.

How does this cutoff compare to \(b^{**}\)? The following simple lemma quantifies this.

Lemma C.7. For the cutoffs \(b^{**}\) and \(b_2\) defined above, we have \(b_2 < b^{**}\)
Proof. First notice that
\[ \tilde{q}_HR = \left[ q_H + (1 - q_H)b \right] R \geq q_H R \geq H \quad \forall b \in [0, 1]. \]

Thus for all \( b \in [0, b_2] \), we obtain \( \frac{L}{q_L} \geq R \geq \frac{H}{q_H} \) which is also true for all \( b \in [0, b^{**}] \).

This implies that \( [0, b_2] \subseteq [0, b^{**}] \). Now consider the set \([b_2, b^{**}]\). For all \( b \in [b_2, b^{**}] \) we have the following relationship \( R \geq \frac{L}{\tilde{q}_L} \geq \frac{H}{\tilde{q}_H} \). It is very easy to find \( b \) for which this relationship holds. Thus the interval \([b_2, b^{**}]\) is nonempty.

Combining, we have our desired result.

To construct the proof of the main proposition, first consider the case when \( b \leq b_2 \). The investor liquidates the project at the interim date if the state is revealed to be \( L \). If the face value of debt \( F \) is such that \( \tilde{q}_H F \leq H \), the investor also liquidates in state \( H \). But given the restriction on the project quality
\[ \theta \leq \frac{1 - L}{H - L}, \]

the financing constraint is violated. Thus we need \( F \) to be high enough to induce the investor to continue in the high state. For such an \( F \), we can modify the individual rationality constraint to
\[ \theta \tilde{q}_H F + (1 - \theta)L \geq 1 \]

Thus in equilibrium, the face value of debt is given by
\[ F^*(\theta; b) = \max \left[ \frac{1 - (1 - \theta)L}{\theta \tilde{q}_H}, \frac{H}{\tilde{q}_H} \right] \]

Consider the two quantities inside the max operator. It can be shown easily that
\[ \frac{1 - (1 - \theta)L}{\theta \tilde{q}_H} \geq \frac{H}{\tilde{q}_H} \quad \forall \theta \leq \frac{1 - L}{H - L} \]

Thus, for our domain of consideration, the equilibrium debt level is given by
\[ F^*(\theta; b) = \frac{1 - (1 - \theta)L}{\theta \tilde{q}_H} \]

Now this debt level needs to satisfy the restriction that it cannot exceed the total payoff in any state; and also the one outlined in the case we are considering. This can be succinctly specified as
\[ F^*(\theta; b) \leq \min(R, \frac{L}{q_L}) \]
Thus, for all bailout probabilities \( b \in [0, b_2] \), the lower bound of the funding set is defined by the inequality

\[
F^*(\theta; b) \leq R \\
\iff \frac{1 - (1 - \theta)L}{\theta(q_H + (1 - q_H)b)} \leq R \\
\iff \theta \geq \frac{1 - L}{(q_H + (1 - q_H)b)R - L} \\
\Rightarrow \hat{\theta}_{MTM}(b) = \frac{1 - L}{(q_H + (1 - q_H)b)R - L}
\]

This proves one part of our proposition.

Now focus on the bailout probability \( b \in (b_2, b^**). \) First notice that with \( b > b_2, \bar{q}_L, R \leq L \) and the idea of continuation in the low state is possible now unlike earlier. There are two feasible options to consider: first, \( R \geq F \geq L \bar{q}_L \geq H \bar{q}_H \) in which case the investor continues the project in both states at the interim date and the equilibrium with marking-to-market becomes indistinguishable from no-information; and second, \( \geq L \bar{q}_L \geq F \geq H \bar{q}_H \), where the investor optimally liquidates conditional on the low signal and continues to invest under the high signal (the classic marking-to-market equilibrium).

**Case I :** \( R \geq F \geq L \bar{q}_L \geq H \bar{q}_H \)

As stated above, in this case, the investor continues to invest in both states of the world at the interim date. Thus the individual rationality constraint can be written simply as

\[
\theta \bar{q}_H F + (1 - \theta) \bar{q}_L \geq 1.
\]

Combining this with the inequality \( F \geq L \bar{q}_L \), yields the equilibrium face value of debt as

\[
F^*(\theta; b) = \max \left[ \frac{1}{\theta \bar{q}_H + (1 - \theta) \bar{q}_L}, \frac{L}{\bar{q}_L} \right].
\]

\[
= \begin{cases} 
\frac{1}{\theta \bar{q}_H + (1 - \theta) \bar{q}_L}, & \text{if } \theta \leq \frac{(1 - L) \bar{q}_L}{L(\bar{q}_H - \bar{q}_L)} \\
\frac{L}{\bar{q}_L}, & \text{otherwise}
\end{cases}
\]

As argued before, the candidate equilibrium must satisfy the restriction \( F^*(\theta; b) \leq R \). This
puts a lower bound on the funding set which in the present context is given as
\[
F^* (\theta; b) \leq R \iff \frac{1}{\theta \bar{q}_H + (1 - \theta) \bar{q}_L} \leq R \\
\iff \theta \geq \frac{1 - \bar{q}_L R}{(\bar{q}_H - \bar{q}_L) R}.
\]

**Case II :** \( \frac{L}{\bar{q}_L} \geq F \geq \frac{H}{\bar{q}_H} \)

Conditional on the intermediate high signal, the investor optimally continues to invest in the project, while he liquidates for the interim low signal. The individual rationality constraint in this case becomes
\[
\theta \bar{q}_H F + (1 - \theta) L \geq 1.
\]
The optimal F must satisfy the following inequalities simultaneously:
\[
F \geq \frac{1 - (1 - \theta) L}{\theta \bar{q}_H}; \quad F \geq \frac{H}{\bar{q}_H}; \quad F \leq \frac{L}{\bar{q}_L}.
\]
Thus in equilibrium, funding set and the debt level is
\[
F^* (\theta; b) = \begin{cases} 
\frac{1 - (1 - \theta) L}{\theta \bar{q}_H}, & \text{if } \frac{(1 - L) \bar{q}_L}{L(\bar{q}_H - \bar{q}_L)} \leq \theta \leq \frac{1 - L}{H - L} \\
\frac{H}{\bar{q}_H}, & \text{if } \frac{1 - L}{H - L} \leq \theta \leq 1.
\end{cases}
\]
Comparing with the previous case, one obtains
\[
F^* (\theta; b) = \begin{cases} 
\frac{1}{\theta \bar{q}_H + (1 - \theta) \bar{q}_L}, & \text{if } \frac{1 - \bar{q}_L R}{(\bar{q}_H - \bar{q}_L) R} \leq \theta \leq \frac{(1 - L) \bar{q}_L}{L(\bar{q}_H - \bar{q}_L)} \\
\frac{1 - (1 - \theta) L}{\theta \bar{q}_H} \quad \text{or} \quad \frac{L}{\bar{q}_L}, & \text{if } \frac{(1 - L) \bar{q}_L}{L(\bar{q}_H - \bar{q}_L)} \leq \theta \leq \frac{1 - L}{H - L} \\
\frac{H}{\bar{q}_H} \quad \text{or} \quad \frac{L}{\bar{q}_L}, & \text{if } \frac{1 - L}{H - L} \leq \theta \leq 1.
\end{cases}
\]
Two observations are in order. First, the lower bound of the funding set is the same as that for the no-information equilibrium. Secondly, the optimal level of debt is incentive compatible and maximizes the payoff to the firm. For example, consider the second line of the optimal debt expression provided above. If the firm chooses \( F(\theta; b) = \frac{1 - (1 - \theta)}{\theta \bar{q}_H} \), the profit of the firm is \( \pi^{(I)}_F = \theta q_H (R - \frac{1 - (1 - \theta)}{\theta \bar{q}_H}) \) while for the second case, the profit is \( \pi^{(II)}_F = \left[ \theta \bar{q}_H + (1 - \theta) \bar{q}_L \right] (R - \frac{L}{\bar{q}_L}) \). The optimal level of debt is simply the one which
maximizes profit. The directions of these inequalities are very difficult to ascertain without making further assumptions.

Finally, consider the scenario \( b > b^* \). We separately analyze three sub-cases.

**Case I :** \( \frac{L}{q_L} \leq F \leq H \)

Note that for all \( b \in (b_2, b^*] \), this situation is not valid\(^2\). Since the debt level is less than the liquidation value, the investor will optimally liquidate at date 1 in the high state and not continue to for an expected payoff \( \tilde{q}_H F \). Under this (unlikely) scenario, the investor liquidates in the high state and continues in the low state at the interim date.

The individual rationality constraint becomes

\[
\theta F + (1 - \theta) \tilde{q}_L F \geq 1
\]

Thus in equilibrium, \( F^*(\theta; b) = \max \left[ \frac{1}{\theta + (1 - \theta) \tilde{q}_L}, \frac{L}{q_L} \right] \)

Since we are interested in the lower bound of the funding set, the relevant debt level is the first term of the max operator\(^3\).

As specified in the conditions in case I, the following restriction needs to be satisfied

\[
F^*(\theta; b) = \frac{1}{\theta + (1 - \theta) \tilde{q}_L} \leq H
\]

which gives us the following lower bound (we subscript this with the case number to enable comparisons later)

\[
\hat{\theta}_I(b) = \frac{1 - \tilde{q}_L \cdot H}{(1 - \tilde{q}_L) \cdot H}
\]

**Case II:** \( H \leq F \leq \frac{H}{\tilde{q}_H}; F \geq \frac{L}{q_L} \)

As in the previous case, the investor optimally liquidates in the high state and continues in the low state at the interim date. The individual rationality constraint yields

\[
\theta H + (1 - \theta) \tilde{q}_L F \geq 1
\]

\(^2\)Simply consider the fact that \( \frac{H}{\tilde{q}_H} \geq H \) and combine it with lemma (C.5).

\(^3\)Comparing the two terms will produce the following restriction : the debt value \( F \) will equal the first term until \( \theta \) reaches a certain threshold when it will switch to the second term. Simple algebra obtains

\[
F^*(\theta; b) = \begin{cases} 
\frac{1}{\theta + (1 - \theta) \tilde{q}_L}, & \text{if } \theta \leq \frac{(1 - L) \tilde{q}_L}{L(1 - \tilde{q}_L)} \\
\frac{L}{q_L}, & \text{otherwise}
\end{cases}
\]

Since we are more concerned with the funding set and not the debt level per se, we omit the exact specification from the main analysis to avoid clutter.
Thus, in equilibrium, the restriction that this level of $F$ needs to satisfy can be combined into the following inequality

$$\max \left[ H, \frac{L}{q_L} \frac{1 - \theta H}{(1 - \theta) q_L} \right] = F^*(\theta, b) \leq \frac{H}{q_H}$$

Following the reasoning in the previous case, the pertinent inequality we need to consider is

$$\frac{1 - \theta H}{(1 - \theta) q_L} \leq \frac{H}{q_H}$$

which leads us to the second lower bound for the funding set

$$\tilde{\theta}_{1I}(b) = \frac{q_H - q_L H}{(q_H - q_L)H}$$

**Case III :** $F \geq \frac{H}{q_H}; \quad F \geq \frac{L}{q_L}$

First note that this is the only situation which is feasible for all bailout probabilities $b \in (b_2, 1]$. Also note that this boils down to the no information equilibrium where the project is continued in both states at the interim date. Thus the lower bound is obtained from the previous section to be

$$\tilde{\theta}_{1I}(b) = \begin{cases} 
\frac{1 - [q_L + (1 - q_L)b]R}{(1 - b)(q_H - q_L)R}, & \text{if } b \in \left( L - q_L R, \frac{1 - q_L R}{R - q_L R} \right) \\
0, & \text{if } b \geq \frac{1 - q_L R}{R - q_L R}
\end{cases}$$

Simple algebraic comparison among the various lower bounds reveal that this is the most efficient case which leads to the widest funding set.

We have already compared the funding sets for no information equilibrium with bailout and marking to market without bailout. In this case, we simply compare the MTM with bailout with baseline MTM for the case when $b < b_2^4$. For this case, the lower bound of the funding set is

$$\tilde{\theta}_{MTM,BAIL}(b) = \frac{1 - L}{(q_H + (1 - q_H)b)R - L} \leq \frac{1 - L}{q_H R - L} = \tilde{\theta}_{MTM}$$

Unsurprisingly, with ex-ante possibility of bailout, the funding set expands. But remember that $\tilde{\theta}_{MTM}$ is the lowest project quality for which the net present value of the project is non-negative. This implies that the expanded set is composed entirely of negative NPV projects.

---

4This also makes sense because for this restriction of the bailout probability, there is continuation in the high state and liquidation in the low state at the interim date for both the base case and the bailout case.
D Numerical Example

It is illustrative to consider the following simple numerical exercise to gain an intuitive understanding of the relative costs and consequences of the bailout program. For the benchmark model, assume $R = 2.5, H = 1.5, L = 0.7, q_H = 0.8, q_L = 0.2$. Note that this parameter set satisfies the assumptions (1) and (2).

**Effect on Funding Set:** First consider the financing of the funding set. As the ex-post bailout probability increases, more projects are funded ex-ante. Figure (1) plots such an expansion as a function of the bailout probability. In this figure, the blue dotted lines denote the lower bound of the funding set for no-information case while the red dotted lines plots the corresponding value for marking-to-market regime. We also include two reference lines indicating the financing lower bound for no-information and MTM for the benchmark scenario without bailout.

![Figure 1: Effect of Bailout on Financing Constraints](image)

It is important to note that marking-to-market funds a wider set of projects as compared to the no-information regime. This is true for the benchmark case as well as for low bailout probabilities\(^5\). Thus, a switch from MTM to NI regime reduces allocative efficiency by increasing the financing constraint and reducing the set of funded projects. Only under high

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\(^5\)For the bailout probability $b \geq \frac{L - q_L R}{(1 - q_L) R}$, given by 0.15 in the numerical example above, the no-information and marking to market funds the same set of projects. For large enough $b \geq \frac{1 - q_L R}{(1 - q_L) R}$ (0.25 in this case), all projects are funded and the funding set collapses to $[0, 1]$. 

bailout insurance, do the regimes converge.

Equilibrium Debt Level: The following figure (2) captures the impact of bailout on the equilibrium value of debt for two level of project quality \( \theta = \frac{1-q_H}{(q_H-q_L)R} \) and \( \theta = \frac{1-L}{H-L} \).

The solid line represents the variation of debt level for the no-information equilibrium while the dashed line captures the same for marking-to-market regime. For \( b < b_2 \), under the marking-to-market regime, the investor continues the project in the high state while liquidates in the low state. The figure reveals an interesting pattern where the equilibrium debt level spikes up at \( b > b_2 \). This happens because, for any \( b \) higher than this cutoff value, continuation becomes a possibility for both levels of the interim signal. Note that, the expected cash flow to the firm is higher when the project is continued till maturity irrespective of the level of the interim signal. Under marking to market regime, the minimum level of income required to pledge to the investor to incentivise him to continue under both states at the interim date is given by \( \max(\frac{H}{q_H+1-q_H R}, \frac{L}{q_L+1-q_L R}) \). Any debt lower than this would lead to inefficient liquidations in one of the states. Thus this spike captures the extra rent.
transferred by the firms to the investors to align their incentives and stop suboptimal state contingent liquidations.

Remember that under the no-information regime, state contingent liquidation is not possible. Secondly, given assumption (1), it is optimal for the investor to continue the project under high interim signal. The combination of these two effects mean that the minimum debt level required to align incentives is $\theta H + (1 - \theta)L$. It is simple enough to show that this value is smaller than that derived for the MTM case.

Intuitively, think of the investor’s ability to liquidate the project conditional on the interim signal as an extra option on the project value. At $b = b_2$, the firm can stop the investor from exercising the option by transferring extra rent. The spike in the value captures this effect. Compare this spike to the increase in the price of a call-option around at-the-money point. Higher face value of debt for MTM as compared to the NI case for $b > b_2$, in fact, captures the value of this optionality. In order to prevent state-contingent inefficient liquidations, the firms transfer higher rents to the investors to satisfy their incentive compatibility.

Cost of the Bailout Program and Benefits: This section concerns the relative costs and benefits of the bailout program. Assume that the quality parameter is drawn from the finite support $[0, 1]$ according to the continuous density function $g(\theta)$. For a given project quality $\theta$, the failure probability is given by

$$P_{fail}(\theta) = \theta(1 - q_H) + (1 - \theta)(1 - q_L)\mathbb{1}_{LC}$$

where $\mathbb{1}_{LC}$ denotes the event that the project is continued in the low state at the interim date. Of course, this only makes sense for the marking to market regime where the investor can take an interim continue or liquidate decision. Conditional on failure, the bailout program is institutionalized with a probability $b$. In the event of bailout, the regulator pays the investor the face value of the debt $F(\theta; b)$. Thus the expected cost of the bailout program is given by

$$C(b) = \int_{\hat{\theta}(b)}^{1} b P_{fail}(\theta) F(\theta; b) g(\theta) d\theta$$

(16)

For simplicity of exposition, we will assume the distribution of quality to be uniform. The complexity of the equilibrium debt levels renders analytical solutions impossible and we resort to numerical techniques. Figure (3) reports the expected cost of the bailout program, the expected profit of the firms conditional on a bailout probability and their difference as a measure of welfare.

For low bailout probabilities, marking-to-market is superior to no-information regime. Inefficient continuation of less efficient projects increases the probability and the cost of the bailout program. On the other hand, for MTM, the projects are liquidated in the low interim state and the probability of bailout is restricted to the event of failure conditional on a high
interim signal. This leads to lower bailout costs and higher profits (as the bailout insurance reduces the face value of debt). However, as the bailout probability increases, firms exercise the option to switch to essentially no-information equilibrium (unconditional continuation at the interim date) albeit at a higher cost$. Specifically, this switching happens for $b > b_2$ as is evident from the figure. Both the equilibrium debt level (refer to figure (2) above) and the cost shift up.

How does the cost of the bailout program compare to the benefits? By benefits, we mean the loosening of the financing constraint (as evidenced from the expanded funding set) and lower equilibrium face value of debt (the insurance provided by the program). We start by calculating the expected cash flow of the above continuum of firms under the bailout program and subtract from it the expected cash flow under the benchmark no-bailout case. This difference captures the extra payoff to the firms under bailout protection that they would not have otherwise. We consider this as a measure of benefit. Note that in Panel B of figure (3), we plot the raw cash-flows of the firms without subtracting the benchmark cash-flows.

The success of the bailout program can be gauged from the difference of the benefits and the cost of the program. In Panel C we plot this figure as a function of the bailout probability $b$. Note that institutionalizing a bailout program under MTM is never optimal. This is because all the extra projects funded under the bailout program are all inefficient (negative NPV) projects. On the other hand, as analyzed before and reported in table (1), for small levels of $b$, NI expands only in the range of positive NPV projects. Clearly, in this region, bailout insurance is Pareto improving and is also captured by the positive region in panel C. However, for higher bailout probabilities, NI also expands into the range of inefficient projects and the costs outweigh the benefits of the program.

**D.1 Comparative Statics**

How do project payoff $R$, the minimum pledge level $L$ and the probability of success conditional on low signal $q_L$ impact the financing constraint? These three parameters affect the bailout cutoffs and the funding sets more than the other two, namely $H$ and $q_H$. First consider the effect of project payoff $R$ on the funding set. Figure (4) documents this effect. As the project payoff $R$ increases, so does the amount of maximum pledgeable income. This relaxes the financing constraint and lowers the funding cutoffs for both accounting regimes. This effect is captured by the reduction in values of the lower-bound as we move from Panel A to Panel C of the figure.

Next consider the effect of the increasing the minimum pledge level $L$. For no-information regime, this does not play any role as state-contingent liquidation is not allowed. However, for marking to market, this reduces the equilibrium debt level as investors get more by liquidating at the interim low state. Thus the funding lower bound for MTM case should

$^6$As mentioned earlier the higher cost derives from the larger face debt which the firms must pay the investors to incentivise them to continue at the interim date.
decrease with an increase in $L$. Figure (5) shows that this is indeed the case.

Finally, increasing $q_L$, impacts both MTM and NI funding bounds. Higher $q_L$ improves the expected cash flows for the investor and in equilibrium this reduces the financing constraint on the firm. Figure (6) captures this effect.


<table>
<thead>
<tr>
<th>Without Bailout</th>
<th>With Bailout</th>
</tr>
</thead>
<tbody>
<tr>
<td>$b \leq b^*$</td>
<td>$b^* &lt; b \leq \frac{L - q_L R}{R - q_L R}$</td>
</tr>
<tr>
<td></td>
<td>$\frac{L - q_L R}{R - q_L R} \leq b \leq \frac{1 - q_L R}{R - q_L R}$</td>
</tr>
<tr>
<td></td>
<td>$b &gt; \frac{1 - q_L R}{R - q_L R}$</td>
</tr>
</tbody>
</table>

Panel A: Lower Bound of the Funding Set

<table>
<thead>
<tr>
<th>Marking to Market</th>
<th>$\frac{1 - L}{q_H R - L}$</th>
<th>$\frac{1 - L}{q_H R - L}$</th>
<th>$\frac{1 - L}{q_H R - L}$</th>
<th>$\frac{1 - \tilde{q}_L R}{(q_H - \tilde{q}_L) R}$</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Information</td>
<td>$\frac{1 - q_L R}{(q_H - q_L) R}$</td>
<td>$\frac{1 - q_L R}{(q_H - q_L) R}$</td>
<td>$\frac{1 - q_L R}{(q_H - q_L) R}$</td>
<td>$\frac{1 - q_L R}{(q_H - q_L) R}$</td>
<td>0</td>
</tr>
</tbody>
</table>

Panel B: Set of Positive NPV Projects funded

<table>
<thead>
<tr>
<th>Marking to Market</th>
<th>$\left[ \frac{1 - L}{q_H R - L}, 1 \right]$</th>
<th>$\left[ \frac{1 - L}{q_H R - L}, 1 \right]$</th>
<th>$\left[ \frac{1 - L}{q_H R - L}, 1 \right]$</th>
<th>$\left[ \frac{1 - L}{q_H R - L}, 1 \right]$</th>
<th>$\left[ \frac{1 - L}{q_H R - L}, 1 \right]$</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Information</td>
<td>$\left[ \frac{1 - q_L R}{(q_H - q_L) R}, 1 \right]$</td>
<td>$\left[ \frac{1 - q_L R}{(q_H - q_L) R}, 1 \right]$</td>
<td>$\left[ \frac{1 - q_L R}{(q_H - q_L) R}, 1 \right]$</td>
<td>$\left[ \frac{1 - q_L R}{(q_H - q_L) R}, 1 \right]$</td>
<td>$\left[ \frac{1 - q_L R}{(q_H - q_L) R}, 1 \right]$</td>
</tr>
</tbody>
</table>

Panel C: Set of Negative NPV Projects funded

<table>
<thead>
<tr>
<th>Marking to Market</th>
<th>$\phi \cdot \left[ \frac{1 - L}{q_H R - L}, \frac{1 - L}{q_H R - L} \right]$</th>
<th>$\left[ \frac{1 - L}{q_H R - L}, \frac{1 - L}{q_H R - L} \right]$</th>
<th>$\left[ \frac{1 - q_L R}{(q_H - q_L) R}, \frac{1 - q_L R}{(q_H - q_L) R}, 1 \right]$</th>
<th>$\left[ \frac{1 - q_L R}{(q_H - q_L) R}, \frac{1 - q_L R}{(q_H - q_L) R}, 1 \right]$</th>
<th>$\left[ \frac{1 - L}{q_H R - L}, 0, \frac{1 - L}{q_H R - L} \right]$</th>
</tr>
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<tbody>
<tr>
<td>No Information</td>
<td>$\phi \cdot \left[ \frac{1 - q_L R}{(q_H - q_L) R}, \frac{1 - q_L R}{(q_H - q_L) R}, 1 \right]$</td>
<td>$\phi \cdot \left[ \frac{1 - q_L R}{(q_H - q_L) R}, \frac{1 - q_L R}{(q_H - q_L) R}, 1 \right]$</td>
<td>$\left[ \frac{1 - q_L R}{(q_H - q_L) R}, \frac{1 - q_L R}{(q_H - q_L) R}, 1 \right]$</td>
<td>$\left[ \frac{1 - q_L R}{(q_H - q_L) R}, \frac{1 - q_L R}{(q_H - q_L) R}, 1 \right]$</td>
<td>$\left[ \frac{1 - L}{q_H R - L}, 0, \frac{1 - L}{q_H R - L} \right]$</td>
</tr>
</tbody>
</table>
Figure 3: Comparing Accounting Regimes and Bailout Impact: Parameters: $R = 2.5, H = 1.5, L = 0.7, q_H = 0.8, q_L = 0.2$
Figure 4: **Comparative Statics:** $H = 1.5, L = 0.7, q_H = 0.8, q_L = 0.2$. The blue solid line represents the lower bound of the funding set for no-information equilibrium, the black dashed line represents the marking-to-market equilibrium and the red line corresponds to the lower bound of efficient projects. Below this line all the funded projects are inefficient.
Figure 5: **Comparative Statics:** $R = 2.5, H = 1.5, q_H = 0.8, q_L = 0.2$. The blue solid line represents the lower bound of the funding set for no-information equilibrium, the black dashed line represents the marking-to-market equilibrium and the red line corresponds to the lower bound of efficient projects. Below this line all the funded projects are inefficient.
Figure 6: **Comparative Statics:** $R = 2.5, H = 1.5, L = 0.8, q_H = 0.8$. The blue solid line represents the lower bound of the funding set for no-information equilibrium, the black dashed line represents the marking-to-market equilibrium and the red line corresponds to the lower bound of efficient projects. Below this line all the funded projects are inefficient.
References