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Capital and Liquidity Requirements: A Review of the Issues and Literature

Stijn Claessens†

In this Article I review the literature on the conceptual and analytical arguments for and against capital adequacy and liquidity requirements for banks, in light of historical and recent experiences and evidence. Much research argues for higher capital adequacy requirements given their beneficial effects in terms of better incentives, greater buffers, and improved interventions in weak banks. The analytical case for liquidity requirements is less well established, and current academic thinking is little reflected in regulations being adopted or underway. While the financial services industries object to these requirements, most analyses show the direct costs to be relatively low. Overall, there is general agreement that the social benefits of higher capital (and perhaps liquidity) requirements likely exceed the private costs given the many externalities and market failures in banking. It is clear though that stricter and better-designed requirements need to be supported by a range of regulations and other actions to have a chance to make the global financial system safer and more efficient.

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† Assistant Director, Research Department, International Monetary Fund. This paper was prepared for the Yale Law School Center for the Study of Corporate Law and Sullivan & Cromwell Conference on *Challenges in Global Financial Services*, which took place in September 20, 2013 in New Haven, Connecticut. I would like to thank the conference participants, Charles Hauch, and the editors of the Yale Journal on Regulation for helpful comments. The views expressed here are those of the authors and should not be attributed to the IMF, or its Executive Directors or Management.

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Introduction

The recent financial crisis in advanced countries has led to much financial reform, varying from globally coordinated new rules, such as Basel III, to various national and regional initiatives, such as the Dodd-Frank Act in the United States and Capital Requirements Directives IV in the European Union. Much of the reforms, put in place or underway, have focused on adapting the rules governing capital and liquidity adequacy of commercial banks. Debates about the proper levels and forms of such requirements have been intense, with stark differences of opinion between policy makers, academics, and of course not surprisingly those in the financial services industries. To help clarify the issues, this paper reviews and summarizes the main findings of the academic literature on capital and liquidity requirements. While the literature is extensive, there are, perhaps surprisingly, still gaps, with especially few formal analyses of the impact of regulatory constraints on bank behavior in a dynamic framework, and little analyses of liquidity requirements.

In general the arguments for government mandated capital and liquidity requirements, as distinct from what market forces would ask for in the first place, are twofold. The essential motivation is that, in the presence of market failures and externalities, private levels of capital are set too low relative to the socially optimal level. And, closely related, the presence of a public safety net, including deposit insurance, justifies the state to set greater buffers at the individual level to protect its interests. Analytically these arguments provide much support for higher requirements. Specific gains are likely to arise from better incentives, greater buffers, and better protection of other stakeholders in case of financial distress, including less cost accruing to the public safety net from bailouts. Gains from requirements are even more important at the level of the overall banking system given the strong externalities and market failures within the sector, such as those arising from interconnectedness, credit crunches, herding, fire-sales and adverse asset price spirals. However, the case for higher requirements is not universally accepted, and some analysis argues that capital (and liquidity) requirements can act perversely, leading to more (tail) risk-taking. Another risk with (fast) introduction of capital requirements is that in the short term banks either contract assets or increase risk-weight arbitrage, but do not raise new equity. And there are of course costs associated with higher requirements.

While a review of the historical and recent experiences shows that high capital and liquidity ratios support safer banking, the effects of (higher) requirements on actual bank behavior are less well-known. Examining the effects of regulation has been empirically challenging partly because “actual” capital and liquidity positions are endogenous: requirements get introduced in ways that reflect the actual and expected capitalization, liquidity and profits of banks, and the conditions and market pressures under which they operate. While the literature, for the most part focused on the impact on banks in advanced economies of the introduction of Basel I, has identified a positive association between rising capital ratios and tighter capital requirements, this cannot be regarded as a causal relationship. Studies have also found, not surprisingly, that banks respond in what at the time is the least costly way to meet the new requirements. Deleveraging, rather than raising new capital, is a common pattern following adverse shocks to capital positions (and also appears to have been the response of many banks to the recent increase in requirements). As such, the analytical and empirical results of requirements are perhaps more ambiguous than expected. To the extent that there is evidence, it suggests, again not surprisingly, that requirements affect actual capitalization more for thinly-capitalized banks.

While some issues may remain debated, there are nevertheless likely gains to be made from a substantial increase in capital adequacy requirements from levels prevailing before the recent financial crisis in many advanced countries, and perhaps also from some restrictions on liquidity exposures. The obvious objections from the industry, and some others, are that higher requirements raise the costs of financial intermediation with negative impacts on the real economy—through reduced availability of external financing. While surely not universally accepted, most analysis suggests the costs of (higher) requirements to be small enough to justify at least some increase. A more important issue may be the migration of financial activities to institutions outside the regulated and monitored sphere, which may be associated with (some) systemic risks. Regardless, the literature has made clear that even when well designed and properly enforced, capital adequacy and liquidity requirements need to be supported by a range of other regulations and actions to have a chance to make the global financial system safer and more efficient.

It is important to note upfront that while this review is meant to cover most aspects of capital and liquidity requirements, it does not address many related issues important for the functioning of banks. I do not review, for example, bank corporate governance and its important relationship with requirements. And I do not review in much detail the moral hazard implications of a public safety net and the issue of too big to fail banks. I do not discuss the relationships between liquidity requirements and the provision of liquidity by the central bank, in the forms of lender of last resort and other facilities, which played important roles during the recent financial crisis. Relatedly, I do not review the potential role of the central bank as a market maker of last resort,

i.e., supporting the liquidity and value of securities during periods of financial stress to reduce potential fire sales. Neither do I analyze the many cross-border issues in allocating and sharing capital and liquidity, and assuring resolution can be done efficiently. These and other issues would require more space than available.

In terms of outline, the paper proceeds as follows. It first reviews the arguments typically made in favor of capital and liquidity requirements that are government-designed, imposed and enforced. It shows that such rules can be justified for three reasons, related to the needs for: better incentives for prudent risk taking; greater buffers to support ongoing banking operations when banks or banking systems are hit by adverse shocks; and a guide to interventions when banks run into financial distress. Despite these arguments, the literature has also recognized that there are many conceptual and practical issues with any such rules, which are therefore discussed in the next section. What the requirements might actually look like, including the current Basel rules as well as some recent proposals by academics and others, is reviewed in the next section. The following section reviews actual experiences with capital requirements and actual capital in assuring a stable banking system. A discussion of capital and liquidity requirements is not complete without reviewing other aspects of the ongoing financial reform agenda that can complement requirements. The last section concludes by highlighting the many other steps deemed necessary to create a safe and efficient global financial system and reviewing where we are today on some of these other features.

I. The Arguments for Mandatory Capital and Liquidity Requirements

The main motivation for government mandated (and enforced) capital and liquidity requirements is that the private solutions to the agency and information issues arising in financial institutions—here largely meant to refer to commercial banks—are not necessarily socially optimal. The general arguments are threefold.

Firstly, as for other corporations and economic transactions, given various market and contracting failures, the Coase Theorem may not apply.¹ Clearly defined and government enforced property (creditor and shareholders) rights are then important for financial intermediation, just as for general private sector development and general economic functioning. The relevance of property rights has been extensively argued and empirically shown in the law and finance literature. The arguments for some beneficial, government mandated rules take on more importance since market failures and externalities are arguably greater in banking than in other forms of private businesses. Ample

1. The Coase Theorem states that with externalities and transaction costs, market outcomes will not be efficient even with well-defined property rights. Ronald H. Coase, *The Problem of Social Cost*, 3 J.L. & ECON. 1 (1960).

analytical and empirical literature highlights how in banking, compared to non-financial corporations, opaqueness is greater, the ability to increase and shift risks quickly is larger, the specific forms in which banks raise funds (notably many small deposits) make market discipline less effective, and other factors lead to greater agency issues.² As markets alone cannot overcome these issues, there is an argument for some government designed and imposed requirements.

The second argument, more unique to banking and in many ways most important, is that even when capital or liquidity positions are determined optimally for each bank individually, optimality for the banking system as a whole and for the economy can call for certain government mandated rules. This deviation largely arises from the “fallacy of composition,” the standard argument related to differences between micro- and macro-economic perspectives.³ This problem takes on more importance in banking: individual requirements neglect the presence of direct and indirect interconnections, correlations among asset prices, and commonality in behavior and transactions, which are all high in banking systems and can make the aggregate risk profile vary from the collection of individual ones.

The third important argument related to the “specialness” of banking is that banks provide unique services to the real economy. As a consequence, modern banking depends much on the backing of the state through a large implicit and explicit public safety net, including deposit insurance. The implicit subsidy provided to the large, systemic banks (systemically important financial institutions, or SIFIs) alone, for example, can be very significant.⁴ And, when

2. For a survey on the special corporate governance issues for financial institutions, see Jakob de Haan & Razvan Vlahub, *Corporate Governance of Banks: A Survey* (De Nederlandsche Bank Working Paper No. 386, 2013), http://www.dnb.nl/en/binaries/Working%20Paper%20386_tcm47-294339.pdf.

3. See generally MARKUS BRUNNERMEIER ET AL., THE FUNDAMENTAL PRINCIPLES OF FINANCIAL REGULATION (2009) (providing a discussion of a macroprudential versus a microprudential perspective on financial stability and regulation); Gianni De Nicolò, Giovanni Favara & Lev Ratnovski, *Externalities and Macroprudential Policy* (Int'l Monetary Fund Staff Discussion Note, 1205 2005), <http://www.imf.org/external/pubs/ft/sdn/2012/sdn1205.pdf>. One obvious example of the various fallacies of composition is that Bank A can have liquidity insurance from Bank B, and Bank B from Bank A, allowing both to satisfy a liquidity requirement, yet in aggregate, liquidity risk still remains.

4. The subsidy is estimated to have been about 60 basis points before the crisis and 80 basis points by year-end 2009. See, e.g., Kenichi Ueda & Beatrice Weder di Mauro, *Quantifying Structural Subsidy Values for Systemically Important Financial Institutions* (Int'l Monetary Fund Working Paper No. 12/128, 2012), <http://www.imf.org/external/pubs/ft/wp/2012/wp12128.pdf>. While estimates of the exact size of this funding advantage are subject to a number of assumptions and vary by market conditions, results are similar across a number of methodologies. It translates for many of the SIFIs with balance sheets exceeding \$1 trillion into \$4 billion or more of an annual subsidy, with the current market capitalization of some banks appearing to largely derive from this subsidy. While reforms—such as the Dodd-Frank Act in the United States and better resolution frameworks in many countries—since the financial crisis may have reduced the TBTF funding advantage, they likely have not eliminated it. See, e.g., Joseph A. Warburton, Deniz Anginer & Viral V. Acharya, *The End of Market Discipline? Investor Expectations of Implicit State Guarantees* (unpublished manuscript) (2013), <http://ssrn.com/abstract=1961656>. While some of the subsidy can be recaptured by charging higher deposit insurance premiums and other fees related to liabilities, these do not eliminate the TBTF

the banking system as a whole is under stress, the safety net can easily extend to all banks, making smaller banks benefit as well from some subsidy. As an important (implicit) stakeholder, the government therefore has to safeguard its own interests, including by forcing banks to satisfy certain capital and liquidity rules.

From these general categories of arguments for some forms of government interventions, the next section provides some specific conceptual arguments for balance sheet based requirements, first for capital adequacy requirements, and then for liquidity requirements.⁵ I distinguish between three analytical categories (we follow Hellwig⁶ in this categorization), which nevertheless overlap to a significant extent. I review the conceptual arguments against such requirements in the next section. The actual requirements, experiences with them, and the empirical evidence are reviewed in Parts III and IV.

A. Capital as Incentive

The first and most important set of specific arguments for capital requirements are incentive related and can be summarized as the need for some “skin in game.” As with other corporations, equity holders (and management) have incentives to take excessive risks. It is also clear that market solutions do not suffice to overcome these agency issues. Depositors do not have the proper incentives or necessary skills to monitor a bank. Rating agencies can lack information or be conflicted. Subordinated debt has proven to be a weak disciplining tool. While not the only way—changes to corporate governance, including remuneration, can also help—because more of the bank owners’ money is at risk, capital requirements can reduce the incentives of bank owners (and managers) to engage in excessive risk taking and risk-shifting.⁷ Capital requirements can thereby put debt-holders, including depositors, at lower risk of not being paid in full. In that way, government mandated requirements can help align the interests of various stakeholders of an individual bank and make sure that more are properly represented. This motivation is even more relevant in the context of modern banking, where the state is a large (implicit) stakeholder, as it de-facto subsidizes the debt of many banks by stepping in at

problem. See also Philip Strahan, *Too Big To Fail: Causes, Consequences, and Policy Responses*, 5 ANN. REV. FIN. ECON. 43 (2013).

5. For an extensive, early analytical treatment of the prudential regulation of banks, see MATHIAS DEWATRIPOINT & JEAN TIROLE, *THE PRUDENTIAL REGULATION OF BANKS* (1994).

6. Martin Hellwig, *Capital Regulation after the Crisis: Business as Usual?* (Max Planck Institut. for Research on Collective Goods, Working Paper No. 2010/31, 2010). https://www.coll.mpg.de/pdf_dat/2010_31online.pdf.

7. While there is relatively limited in-depth empirical research on corporate governance for financial institutions, it is clear that in a number of areas their corporate governance can be improved. For reviews, see Luc Laeven, & Fabián Valencia, *Systemic Banking Crises Database: An Update* (Int’l Monetary Fund Working Paper No. 12/163, 2012); and de Haan & Vlahub, *supra* note 1.

times of (systemic) stress. The state thus has an argument to equate private and social rates of return by asking for more capital than what private interests would choose.

Importantly, when considering the banking system as a whole, private market solutions, including on capital, can have severe limits. As one concrete example, proper monitoring of management and owners by equity or debt holders requires some concentration in claim holdings. Yet this can increase the (implicit) insurance these holders receive from the state—as it increases the risk of related default. With this insurance, actual monitoring may not be enhanced. Another systemic argument relates to competition: without the presence of (internationally agreed upon) capital requirements, private markets (banks or countries) could compete too much on capital standards, leading to too low levels (“a race to the bottom” in national adequacy requirements). More generally, a systemic perspective likely suggests that some capital requirements higher than and/or changed from the market solutions can be socially beneficial, for example, by limiting overall credit growth or discouraging the lending to certain activities that impose externalities, especially “systemic” ones.

B. Capital as a Buffer

A second class of arguments refers to the need for buffers to maintain the bank as a “going concern.” As a buffer, capital will help to protect debt-holders, including (small) depositors and their “agent,” the deposit insurance agency, from the consequences of financial distress. By having more capital, it is easier for a bank to absorb losses when hit by an adverse shock, avoid the risk of default, and be able to “go on.” This can be privately beneficial for all stakeholders combined, as it preserves the specialized knowledge and franchise value in the bank and avoids the direct and indirect costs of a potential bankruptcy. Yet, owners and managers may not fully internalize these potential deadweight costs, in part because of the presence of a public safety net, and choose too low a level of capital, thus justifying a government mandate. The argument for capital buffers is (again) even stronger for the banking system as a whole as the costs that arise from systemic financial stress or distress are likely greater than those of all banks individually combined. This is obvious given interconnections leading to possible chains of defaults, fire sales, or credit crunches, i.e., a drying up of overall external financing, leading to lower aggregate activity. Higher buffers at individual banks can reduce these overall financial and economic costs.

C. Capital for Intervention

A third set of arguments for capital requirements is to facilitate and ease interventions when a bank is a “gone concern.” The stringency of requirements

would vary depending on how easy it is to dispose of assets and unwind the bank, and limit costs. Capital (and liquidity) requirements can help regulators as they define shortfalls, indicating when to intervene. As such, having formal requirements can be important from a legal perspective and be a form of discipline on the regulators to intervene timely. As for the going concern argument, the gone concern argument is even more important for the banking system as a whole. As banks are typically highly interconnected, the social benefit of having capital provide protection for the debt holders of individual banks and intervening timely, thereby preventing a cascade of bankruptcies, is higher than the individual private costs, making for another justification for formal capital requirements.

D. Liquidity as Incentives

The arguments for liquidity requirements are in many ways similar to those for capital requirements, except that they are more directly aimed at achieving certain types of behavior and outcomes (and thus are more intrusive to the bank). It is clear that both asset and liability structures are crucial for a bank's sound and efficient operations at reasonable ("prudent") levels of risk. This is due in part to the fact that forms of funding vary in their incentives to monitor a bank's risks. As noted, small depositors do not have all the incentives or ability to monitor bank risks well and surely cannot influence it (although they can shift banks). In principle, some forms of (short-term) debt could have good incentives to monitor. Whole-sale funding has been argued, however, to have few incentives to monitor risks as these creditors know they can withdraw before others do, including small (insured) depositors.⁸ Many forms of short-term and whole-sale financing, such as repos, also come with a greater claim over specific assets (due to so-called safe harbor provisions), making again for fewer incentives to monitor. Risky funding structures in turn can induce related risky investments (e.g., the SIVs/SPVs used before the financial crisis may have been more likely since they were funded with short-term funds) and increase asset encumbrance. By affecting incentives, liquidity requirements can reduce excessive risk taking. More generally, there could be arguments to encourage certain liability structures, notably unsecured, subordinated debt, that have better risk properties and monitoring incentives.

E. Liquidity as a Buffer and for Intervention

As in the case of capital requirements, liquidity requirements can help protect stakeholders and claimholders from bank illiquidity and related insolvency problems and make it more likely the bank can continue to operate

8. Rocco Huang & Lev Ratnovski, *The Dark Side of Bank Wholesale Funding*, 20 J. FIN. INTERMEDIATION 248 (2011).

as a going concern. Liquidity requirements can directly make or lead banks to avoid risky funding structures (e.g., wholesale funding), thereby reducing the risk of bank runs or other liquidity-related events due to concerns about rollover risks. By having banks “set aside” minimum cash balances or achieve better matching between asset and liabilities (in maturities or other exposures), requirements also provide for buffers, preventing runs from becoming solvency concerns. Liquidity requirements can improve the quality of assets directly (as more safe cash needs to be held). In this respect, Calomiris, Heider, and Hoerova argue that requiring a bank to hold large cash balances can serve a buffer (and an incentive) role somewhat similar to that of capital.⁹ Indeed, in earlier periods liquidity requirements were used more than capital requirements for micro-prudential reasons. More generally, as the recent financial crisis showed, liability structures, not just assets’ riskiness, can cause stress at the individual bank level. Lastly, liquidity requirements can help guide (or discipline) intervention, e.g., when a shortfall from a target triggers supervisory actions, and in that way helps reduce the risks of moral hazard of banks relying excessively on lender of last resort and other forms of the public safety net.

Many of these arguments for liquidity requirements apply even more at the level of the overall banking system.¹⁰ At a system level, risky funding structures can lead to systemic risks, as the perverse systemic effects of wholesale funding during the last crisis particularly showed. System-wide, if many financial institutions over-utilize short-term funding, runs, liquidity crunches, vicious asset spirals, and related credit contractions can occur. Requirements can thus help prevent the occurrence of such events. They can also make the system less interconnected. And liquidity requirements can be socially optimal when they indirectly reduce overall inefficient or risky investments (e.g., subprime lending) or unwarranted asset price booms that arise due to interactions among banks.

II. Issues with Capital and Liquidity Requirements

The analytical literature has not just stressed the benefits but also recognized that there are limitations, drawbacks, costs and risks associated with formal capital and liquidity requirements. As banks are forced by requirements to deviate from what market forces might lead them to, not only private costs can arise, but solutions to the contracting problems inherent in any corporation, including banks, may become socially suboptimal as well. The question is

9. Charles Calomiris, Florian Heider & Marie Hoerova, *A Theory of Bank Liquidity Requirements* (January 2013) (unpublished manuscript), http://www.bportugal.pt/en-US/EstudosEconomicos/Conferencias/Documents/2013FinancialIntermediation/paper5_e.pdf.

10. See BENGT HOLMSTRÖM & JEAN TIROLE, *INSIDE AND OUTSIDE LIQUIDITY* (2013) (providing an extensive treatment of liquidity requirements); Lev Ratnovski, *Box 3.2. What the Crisis Taught Us About Bank Funding*, in INT’L MONETARY FUND, *GLOBAL FINANCIAL STABILITY REPORT* 113 (2013) (reviewing work on the systemic aspects of liquidity choices).

whether these extra costs and the consequences of deviating from market-based choices for financial structures are socially optimal. Less analyzed is the fact that each of the three objectives can call for different designs of capital and liquidity requirements (e.g., capital as an incentive may mean a different requirement than capital as a buffer) and that the objectives can interact with each other.

A. Incentives

Again, discussing first the incentives issues, capital (and possibly also liquidity) requirements could have costs or lead to increased risks as they make the liability structures of banks differ from “normal” market outcomes, specifically from the optimal capital structure that maximizes bank value.¹¹ Calomiris,¹² in his review of Admati and Hellwig,¹³ also stresses this general issue.

For one, it has, analytically at least, been shown that as capital requirements increase and overall funding costs go up, the incentives for more risk-taking or risk shifting could increase rather than decrease. With higher funding costs, the average return to equity-holders declines. Since equity is a call option, the incentives to increase (tail) risks can therefore go up.¹⁴ Obviously, while not the expected or likely outcome, deviations from what markets may dictate in terms of optimal capital structures could lead to more risks.

Excessive risk taking by equity holders is a standard corporate governance problem, but a more important one in banking. For one, banking is a business where risks are paramount to manage, yet with small margins and high leverage, room for mistakes is limited. Yet, risks can often be ratcheted up easily, with potentially high short-term gains for owners and managers (and traders within these firms). More easily than for non-financial corporations, risks in banks can also be hidden, at least temporarily, from other stakeholders, notably depositors. In addition, to the extent banking relies on the public safety net, the moral hazard of taking on even more tail risks at the expense of the state as capital adequacy requirements increases is potentially large.

This affects incentives not only with respect to current balance sheets positions, but also with respect to future banks’ positions. Blum was one of the

11. For a review of capital structure theory in banking, see Anjan V. Thakor, *Bank Capital and Financial Stability: An Economic Tradeoff or a Faustian Bargain*, 6 ANN. REV. FIN. ECON. (forthcoming 2014).

12. Charles W. Calomiris, *Reforming Banks Without Destroying Their Productivity and Value*, 25 J. APPLIED CORP. FIN., no. 4, 2013, at 14.

13. ANAT ADMATI & MARTIN HELLWIG, *THE BANKERS’ NEW CLOTHES: WHAT’S WRONG WITH BANKING AND WHAT TO DO ABOUT IT* (2013).

14. For an early version of this argument, see Gerard Genotte & David Pyle, *Capital Controls and Bank Risk*, 15 J. BANKING & FIN. 805 (1991). See also Paul Calem & Rafeal Rob, *The Impact of Capital-Based Regulation on Bank Risk Taking*, 8 J. FIN. INTERMEDIATION 317 (1999).

first to model how the anticipation of (higher) capital adequacy requirements in the future may increase risk taking today.¹⁵ This is because banks manage their risks with both current capital position and franchise values in mind, each affecting the degree of risk taking differently. While analytical work is not conclusive, capital adequacy requirements can adversely affect the balance.¹⁶ Liquidity requirements are another example where distortions can arise. To the extent that short-term debt holders, including (large) depositors, discipline banks and force banks to be more diligent in their monitoring of borrowers and associated risks,¹⁷ risks could in principle increase when liquidity requirements discourage short-term debt “too much.”¹⁸

Requirements also raise direct costs, although the exact magnitude is debated (this will further be reviewed). Liquidity requirements can reduce the ability of banks to efficiently provide liquidity services (e.g., contingent commitments for loans and credit lines, backstops for corporations’ issuance of commercial paper, etc.). And since very low-risk, short-term debt instruments can provide liquidity benefits to the debt holders, liquidity requirements discouraging such funding can be costly for banks. If indeed costly, requirements can hinder the key functions of a bank, that is, risk pooling and maturity transformation, converting partly illiquid long-term assets into more liquid, short-term liabilities. More generally, requirements could lead the banking system to provide too little credit and liquidity to the overall economy and imposing overall economic costs.

Another fundamental criticism is that, even when fully effective in their objectives at the individual level, capital and liquidity requirements (alone) do

15. Jürg Blum, *Do Capital Adequacy Requirements Reduce Risks in Banking?*, 23 J. BANKING & FIN. 755 (1999).

16. In the model of Hellman, Murdoch and Stiglitz, for example, while capital-requirements can induce prudent behavior by putting bank equity at risk, they also harm banks’ franchise values, thus encouraging relatively risky gambling. See Thomas F. Hellmann, Kevin C. Murdoch & Joseph E. Stiglitz, *Liberalization, Moral Hazard in Banking, and Prudential Regulation: Are Capital Requirements Enough?*, 90 AM. ECON. REV. 147 (2000). Only with deposit-rate controls as an additional regulatory instrument, can incentives for prudent investment be restored efficiently. In some papers using general equilibrium set-ups, capital regulation potentially entails welfare costs related to these incentives and other costs. See, e.g., Douglas Gale & Onur Özgür, *Are Bank Capital Ratios Too High or Too Low? Risk Aversion, Incomplete Markets, and Optimal Capital Structure*, 3 J. EUR. ECON. ASS’N 690 (2005); Gianni De Nicolò and Marcella Lucchetta, *Financial Intermediation, Competition, and Risk: A General Equilibrium Exposition* (Int’l Monetary Fund Working Paper Number 09/105, 2009), <http://www.imf.org/external/pubs/ft/wp/2009/wp09105.pdf>; Douglas Gale, *Capital Regulation and Risk Sharing*, INT’L J. CENTRAL BANKING, Dec. 2010, at 187; Skander J. Van den Heuvel, *The Welfare Cost of Bank Capital Requirements*, 55 J. MONETARY ECON. 298 (2008).

17. Charles W. Calomiris & Charles M. Kahn, *The Role of Demandable Debt in Structuring Optimal Banking Arrangements*, 81 AM. ECON. REV. 497 (1991); Douglas W. Diamond & Raghuram G. Rajan, *Liquidity Risk, Liquidity Creation, and Financial Fragility: A Theory of Banking*, 109 J. POL. ECON. 287 (2001).

18. This is likely more of theoretical concern, however, since in practice, as noted, it does not appear that short-term debt per se assures sufficient monitoring. See also Rocco Huang & Lev Ratnovski, *The Dark Side of Bank Wholesale Funding*, 20 J. FIN. INTERMEDIATION 248 (2011) (providing a model with this property).

not assure proper incentives for an overall safe banking system.¹⁹ One obvious reason is the various fallacies of composition. Another example is that capital adequacy requirements can lead to fire-sales in downturns. As economic prospects worsen, banks may be inclined to shed assets to meet capital adequacy requirements. As they do so, asset prices can decline further, worsening capital positions and leading to further asset shedding and asset prices declines. Requirements are, however, largely not designed with a macro-prudential perspective in mind.

It may even be that requirements make the system as a whole more, instead of less, risky. Requirements can lead to more procyclicality, as has been argued in case of Basel II. One reason noted for Basel II's shortcomings was that it encouraged the use of VaR models, which are often used with similar inputs, including asset prices, making lending and other financial market activities more procyclical. As another example, requiring all banks to hold the same portfolio (e.g., a combination of government bonds and mortgages) exposes the whole banking system to the same risks and can actually increase overall vulnerabilities. More generally, even when rules encourage risk management and diversification at the individual firm level, they may reduce diversity and robustness at the system level as they lead to more common behavior. Too costly requirements may also lead financial intermediation to move outside the regulated banking system, e.g., to the shadow banking system or hedge funds, without necessarily an overall reduction in systemic risks. For example, incentives to manage risks in a bank could become worse when franchise values inducing some prudence are reduced; or, as activities migrate from the formal banking system, systemic risk may be less monitored.

Requirements also come with their own practical considerations, which can raise other costs and distortions. Capital adequacy requirements are mostly implemented in the form of a required ratio of equity to risk-weighted assets, complemented perhaps by a simple leverage, that is, a minimum ratio of equity to total assets, requirement. Using such weights provides for greater risk sensitivity in capital requirements, but of course raises the issues of the appropriate weights and the (incentive) effects these weights might have. Banks may be inclined to choose those assets with lower capital adequacy weights per quantity of risk, not necessarily those with the best risk-return properties. This could increase risks at the individual bank level. Fixed weights can also encourage investment in some types of assets at the system level (e.g., by focusing on its zero risk weight, rules can induce too much investment in sovereign assets, or, as it also has a low risk weights, too much in real estate).

Arbitrage can also happen between market risk and credit risks, for example, by choosing assets that have low on balance sheet credit risk weights, but higher actual market risks, or vice-versa. As an example, a portfolio of

19. See BRUNNERMEIER ET AL., *supra* note 4, for a general discussion of the macro-prudential vs. micro-prudential aspects of regulations.

traditional mortgages carried on a bank's balance sheet will have a certain risk weight and corresponding capital charge. A similar set of mortgages, but now securitized as an MBS and held in the bank's trading book, may carry a different capital charge, yet have more market risks. Choosing whether or not to securitize and how to hold the assets on the balance sheet can then in part be driven by regulatory arbitrage. And arbitrage can happen between the banking and trading books (as when more troubled, less liquid assets are put on the banking book, as they do not need to be marked to market or provisioned as frequently). Similarly, depending on their exact designs, liquidity requirements may skew the risk profiles of actual assets and liabilities chosen away from "optimal" (e.g., by holding more cash banks may end up with less mortgages; or liquidity requirements may lead banks to use more covered bonds to raise funds), which may raise new risks.²⁰

In practice, views on the incentive effects of requirements, their detailed prescriptions, and related costs differ, predictably so, between market participants and regulators. It is argued by the financial services industry that market forces will adequately set the level of capital in light of the bank's asset risk profile and its quality of management. This in turn, they say, negates some or all of the need for requirements. Even when they do not necessarily object to the overall capital or liquidity levels prescribed, they argue against many of the details—for example, the specific risk-weights in the rules. Institutions tend to say they can manage asset quality and liquidity risks better, and therefore prefer internal risk based approaches. Some actually argue that prescriptions increase rather than decrease risk by skewing incentives.

At the same time, it is clear from many experiences, including at even very sophisticated and otherwise well-managed banks, that the (often largely) model-based, internal approaches to risk management can also have serious flaws in their design, application, and operation. This too can be a problem at the system level if many banks use similar approaches. As such, limitations set by requirements can in principle be helpful. Of course, as with any other rule, in their design and application, requirements are subject to conceptual flaws, design flaws, and regulatory arbitrage and capture, making them likely less useful in practice than theory might suggest.²¹ In practical terms, and depending on, among other things, the degree of information asymmetries between bank managers and supervisors (e.g., whether supervisors can observe the true riskiness of a bank), these problems can negate some of the benefits of

20. See Gerard Caprio, Jr., William Brough Prof. of Econ. Williams College, *Financial Regulation After the Crisis: How Did We Get Here, and How Do We Get Out?*, Remarks prepared for the 2013 Asia Economic Policy Conference at the Federal Reserve Bank of San Francisco, (transcript available at <http://ssrn.com/abstract=2350564>) (discussing risk weights, focusing especially on the distortions arising from Basel II).

21. There are many challenges with liquidity requirements. For example, what constitute liquid assets? What are short-term, yet stable funding sources? How does one compare maturity transformation across banks when one is short in the near term and the other is (more or less) short but in the longer term?

formal requirements. The fact that banks have been found to set aside very different levels of capital for the same assets is indicative of some of the problems.²²

B. Buffers

There are also similar conceptual and practical issues with the capital or liquidity requirements as to their role as buffers. The main challenge is that the perspective of the market may differ from the objective of the regulator. For one, the market may set a higher minimum than the level required by any regulations. This is likely so in “normal times” and even more so in times of (systemic) stress when bank capital overall is, or is perceived to be, already low. Because of uncertainty about asset valuations, possibly revealed by the bank (or the financial system more generally) facing some stress, markets would likely call for greater buffers, but raising new equity can be costly. Capital (and liquidity) requirements may not be effective in these circumstances.

If effective, i.e., if they do indeed force banks to adjust their capital adequacy upwards, constant requirements can induce greater procyclicality. This is notable as requirements would limit a banking system’s ability to lend in a downturn in the likely presence of constraints on the ability to issue new equity; banks would then try to meet the capital adequacy requirements by shedding assets rather than by raising new equity. Conversely, since capital is likely to be overstated in booms, fixed requirements can lead to more lending. As such, requirements, including the use of VaR-models, can lead to more procyclicality (e.g., using a model, Repullo and Suarez²³ show that while Basel II made banks safer than Basel I, it led to more procyclicality). While counter-cyclical requirements could alleviate this problem,²⁴ they are not easy to design. Requirements can perhaps be raised during booms to build up buffers, but allowing buffers to be run down without undermining confidence (e.g., by signaling forbearance) is difficult. Put another way, it is unlikely that the market will value favorably a decision by regulators to allow buffers to be run down during times of stress unless buffers are quite high to begin with.

22. See Basel Comm. on Banking Supervision [BCBS], *Regulatory Consistency Assessment Programme (RCAP): Analysis of Risk-Weighted Assets for Market Risk*, BANK FOR INT’L SETTLEMENTS (2013), <http://www.bis.org/publ/bcbs256.pdf>. The study asked 15 large banks in nine countries to calculate the total capital required to support the same hypothetical trading portfolio. The results ranged from €13 million to €35 million, and the variation within individual asset classes—such as credit risk or interest rate portfolios—in several cases was more than eight times. Again, whether the differences are too large is hard to judge (some differences could be good since too much similarity in risk assessments could increase overall risks as it reduces diversity).

23. Rafael Repullo & Javier Suarez, *The Procyclical Effects of Bank Capital Regulation*, 26 REV. FIN. STUD. 452 (2013).

24. Rafael Repullo, *Cyclical Adjustment Of Capital Requirements A Simple Framework*, 22 J. FIN. INTERMEDIATION 608 (2013).

Second, and relatedly, a regulated buffer is not a usable buffer if what happens in case of a shortfall is not well defined. Is the buffer an absolute minimum below which the bank is not allowed to go? If breached, is the bank then “closed” or its license suspended immediately? In that case, there is no real buffer. Or is hitting the requirement a trigger or threshold for other, more graduated forms of government interventions, with the buffer being allowed to erode to some degree, yet without endangering the bank (or banking system)? Liquidity requirements face similar questions: what do we do when a bank hits the limit? Having a requirement to hold at least x days of liquidity does little when the bank has reached that point, unless there is a clear rule if and how liquidity can be run down further. In the words of Charles Goodhart, in such cases “required liquidity is not true, usable liquidity.”²⁵

Like the incentive roles of requirements, the micro-prudential buffer perspective can vary from the macro-prudential one. For example, requirements for individual financial institutions do not necessarily assure system-wide stability when many banks are hit by an adverse shock. Having to meet capital requirements, some may prefer to sell (some classes of) assets rather than raise new equity. In such a case, the presence of relatively high capital requirements can imply patterns of (greater) deleveraging and negative asset price spirals, and raise rather than lower overall systemic risks.

C. Intervention

There can also be issues with requirements from an intervention point of view. The key problem, already alluded to, is the need for sufficient “room” to intervene before financial distress or the risk of bankruptcy becomes too high, a run occurs or capital is fully depleted. In practice this is often not the case as buffers are too little and interventions too late. As such, the capital or liquidity buffer “saves a mere two days.” At the same time, interventions can send adverse signals about the bank and the rest of system, especially when other elements of the resolution framework are not well set in place. For example, intervening in a few banks, while not clarifying the status of other banks, can send a perverse signal. As such, requirements of formal intervention triggers alone do not suffice. And, again, there is the need to safeguard against manipulation, as incentives for owners and managers to hide losses and gamble for resurrection will arise when they edge close to the insolvency point, as

25. As Goodhart puts it succinctly “The most salient metaphor and fable in prudential regulation is of the weary traveller who arrives at the railway station late at night, and, to his delight, sees a taxi there who could take him to his distant destination. He hails the taxi, but the taxi driver replies that he cannot take him, since local bylaws require that there must always be one taxi standing ready at the station. Required liquidity is not true, usable liquidity. Nor might I add, is required minimum capital fully usable capital from the point of view of a bank.” Charles Goodhart, *Liquidity Risk Management*, 11 BANQUE DE FR. FIN. STABILITY REV. 39, 41 (2008).

examples from U.S. Savings and Loans crisis in the 1990s and the Spanish case of Bankia have shown.²⁶

This does not mean that requirements cannot help increase the likelihood of regulatory interventions and reduce overall deadweight costs, but their effectiveness is likely greater in the presence of and in combination with other tools. For example, requirements in combination with other rules can set formal thresholds and triggers for supervisors to intervene. This can work especially well for smaller, non-systemic banks (as has been done in the United States through the Federal Deposit Insurance Corporation Improvement Act which codified prompt corrective action, or PCA). When conversions to new equity are in part also based on market signals such as declines in stock prices²⁷ or increases in interest rates on repriced subordinated debt,²⁸ capital and liquidity thresholds can perhaps also be useful disciplinary devices for supervisors in larger, more systemic banks.

D. Interactions and Tradeoffs

While little analyzed, for each of these three objectives, requirements likely differ in their optimal designs and may face possible conflicts and tradeoffs between the three roles. Hellwig²⁹ provides the following examples. To serve as an incentive tool would call for capital to rise incrementally as risks from additional asset acquisitions increase. In its role as a buffer, however, capital would need to be calibrated with respect to “tail” risk, the chance of a large shock to all assets combined, old and new. And, in its role as a basis for intervention prior to insolvency would presumably call for a calibration with respect to the ease with which assets can be disposed without incurring a fire sale. These three calibrations can, and are likely to, differ. For example, capital adequacy requirements to deal with additional asset risk would be calibrated with respect to the covariance of return on new assets with those on existing assets, whereas for tail risk only extreme risk on the overall asset portfolio would matter.

There are not only differences in these three dimensions, but also interactions between capital and liquidity requirements. For example, requiring

26. See generally EDWARD J. KANE, *THE S&L INSURANCE MESS: HOW DID IT HAPPEN?* (1999); *A Rude Awakening: Sorting Out Bankia is Just a Start*, *THE ECONOMIST*, May 12, 2012.

27. Oliver Hart & Luigi Zingales, *A New Capital Regulation for Large Financial Institutions*, 13 *AM. L. & ECON. REV.* 453 (2011).

28. See generally GEORGE J. BENSTON, ROBERT A. EISENBEIS, PAUL M. HORVITZ, EDWARD J. KANE & GEORGE G. KAUFMAN, *PERSPECTIVES ON SAFE AND SOUND BANKING: PAST, PRESENT, AND FUTURE* (1986); *CRASHES AND PANICS: LESSONS FROM HISTORY* (Eugene N. White ed., 1991); Shadow Fin. Regulatory Comm., *Shadow Statement No. 168: Requiring Large Banks to Issue Subordinated Debt*, AMERICAN ENTERPRISE INSTITUTE (Feb. 26, 2001), <http://www.aei.org/article/economics/financial-services/requiring-large-banks-to-issue-subordinated-debt/>.

29. Hellwig, *supra* note 7.

a bank to hold many more, high-quality assets is sure to make it safer and in less need of capital, as historical data for the United States and other countries suggest (for the U.S. banking system on aggregate, liquidity ratios were between 15% and 25% in the 60s and 70s when capital ratios were below 8%). More generally, many of these tradeoffs have so far not been considered in the existing research.

III. What Might Capital and Liquidity Requirements Look Like?

Having reviewed the analytical and empirical benefits and costs of formal capital and liquidity requirements, I next review past and current approaches. On capital requirements, most important is obviously the sequence of international capital accords: Basel I, II, and now III. The current Basel III rules are: a 4.5% basic requirement and a 2.5% conservation buffer requirement for all banks; a 2.5% countercyclical buffer depending on the boom phase of the financial cycle; and for some banks (designated as systemically important), an up to 2.5% systemic surcharge.³⁰ Altogether, the highest minimum requirement in the form of common equity (Tier 1) would be 12%. In addition to this, there would be 1.5% alternative Tier 1 equity and 2% Tier 2 (hybrid) forms of capital. All these ratios apply to the risk-weighted assets, where the weights are chosen by banks with some minimums set by regulation, with the average risk weight for a typical bank expected to be about 0.50.³¹ Besides raising the level of capital requirements, and presumably the quality of risk weighting, Basel III requires better forms of capital, especially more core equity, rather than the hybrid forms of equity that were frequently used before the financial crisis. Many countries are in the process of adopting Basel III,³² albeit with adaptations to fit their local circumstances and concerns.³³

30. See Basel Comm. On Banking Supervision, *Basel III: A Global Regulatory Framework for More Resilient Banks and Banking Systems*, BANK FOR INT'L SETTLEMENTS (2010), <http://www.bis.org/publ/bcbs189.pdf>.

31. Under Basel I, there were just five asset classes for risk purposes and weights were set by regulation, e.g., zero on sovereign bonds and 100% on corporate loans. Under Basel II there was more differentiation, with risk exposures no longer captured at a broad asset class level nor weights confined to five buckets. Under the standardized approach of Basel II, weights importantly depend on external ratings. Under the Internal Risk Based (IRB) approach banks have much more freedom to set weights, with large variations between banks on how similar credits were weighted. For a further discussion of risk weights, see Vanessa Le Leslé & Sofiya Avramova, *Revisiting Risk-Weighted Assets: "Why Do RWAs Differ Across Countries and What Can Be Done About It?"* (Int'l Monetary Fund Working Paper. No. 12/90, 2012), <http://www.imf.org/external/pubs/ft/wp/2012/wp1290.pdf>.

32. BANK OF INT'L SETTLEMENTS, *supra* note 32.

33. *Current Data Collection Exercises: Basel III Monitoring*, BANK OF INT'L SETTLEMENTS, <http://www.bis.org/bcbs/qis/index.htm> (last visited Sept. 3, 2014) Reports therein state that as of August 2013 of the twenty-seven BCBS member jurisdictions, eleven issued final Basel III capital rules that are legally in force. Fourteen members have issued final rules but not yet brought them into force (Argentina, Brazil, Korea, Russia, United States and the nine EU member states that are BCBS members). The two remaining countries (Indonesia and Turkey) have issued draft rules. A further twenty-six non-BCBS member countries surveyed have implemented Basel III or are in the process of implementation.

Concerning liquidity, although there have been debates going back as far as the 1980s, including in the Basel Committee on Banking Supervision (BCBS), no international standard existed until the liquidity coverage ratio (LCR) was announced earlier this year by the BCBS. The LCR requires banks to have enough liquidity, defined as having certain assets (High Quality Liquid Assets, HQLA) on their balance sheets and access to some facilities (including some forms of central bank liquidity) to cover thirty days of outflows. The Net Stable Funding Ratio (NSFR), still under discussion, aims for better structural asset and liability maturity matches. Countries are in the process of implementing such liquidity requirements, but when they do so, adaptations of the LCR (and NSFR) to local circumstances are likely.

All requirements have phased time-tables (up to 2019). While some banks meet the final capital adequacy requirements already, many do not, as shown in the latest Quantitative Impact Study (QIS).³⁴ Compliance is better with liquidity requirements, which are arguably more lenient than initially expected. The QIS shows banks in the BCBS member jurisdictions already having over 90 percent LCR on average as of the end of 2011, compared to the 100 percent requirement to be achieved by 2019. With the 2013 revision to the LCR rule, the average LCR likely exceeds 100 percent. On the expected NSFR, the QIS suggested (as of June 2012) that the average bank analyzed had already reached the required 100 percent.³⁵

As the discussion above has highlighted, the conceptual underpinnings of standards in general and the various rules adopted specifically are not so clear. Early on (when Basel-I was negotiated), it was not even clear whether the capital requirement would be a target or a minimum.³⁶ Now capital adequacy requirements are considered to be a minimum. Some of this lack of analytical support is to be expected since these requirements are largely “negotiated” between various countries and reflective of local and global interests, including those from the financial services industries, rather than designed from first principles. The detail of the final standards (more than 600 pages in the case of Basel III, compared to thirty pages for Basel I) reflects as well some of this need to accommodate various views, with the exact risk weights likely being compromises.³⁷

34. Basel Comm. On Banking Supervision, *Joint Quantitative Impact Study*, BANK OF INT’L SETTLEMENTS (2013), <http://www.bis.org/bcbs/qis/index.htm>.

35. See also Basel Comm. on Banking Supervision, *Basel III Monitoring Report*, BANK OF INT’L SETTLEMENTS, (2013) <http://www.bis.org/publ/bcbs262.pdf>.

36. See generally CHARLES GOODHART, *THE BASEL COMMITTEE ON BANKING SUPERVISION: A HISTORY OF THE EARLY YEARS, 1974-1997* (2011) (reviewing the workings of the BCBS up to 1997, when the discussion on Basel II began). With respect to the question of the level of capital “[BCBS Chair] Cooke raised the question whether the number was to be ‘a *minimum*, or target or standard.’” *Id.* at 177.

37. For a criticism of the increased complexity, see generally Andrew G. Haldane, Exec. Dir., Fin. Stability, Bank of Eng., *The Dog and the Frisbee*, Speech at the Federal Reserve Bank of Kansas

Academics are accordingly critical of current approaches. One of the most extensive critiques is offered in a recent book by Admati and Hellwig.³⁸ Their main thesis is that higher capital requirements have very limited costs and the net gains from a 20% to 30% increase to the requirements would be sizeable. While many others seem to agree that higher capital adequacy requirements would be beneficial and are desirable, they see more costs and so do not advocate levels as high as those favored by Admati and Hellwig. Generally, my reading is that observers accept capital levels on the order of 15%-20% of risk weighted assets as both feasible and sufficient.³⁹

There are fewer proposals from academics for liquidity requirements. Some propose to adjust banks' capital depending on the riskiness of funding structures. One proposal by Markus Brunnermeier et al⁴⁰ suggests, among other things, a new accounting rule called "mark-to-funding." Under this rule, assets that are funded short-term would receive a higher capital charge for their inherently larger liquidity risk. For example, a long-term asset funded with a short-term liability would have to be valued reflecting the prices at which it could be sold when that specific liability came due, rather than the more favorable price received if it were held longer.

Policy makers have made related suggestions for liquidity rules. Federal Reserve Governor Daniel K. Tarullo has suggested adjusting capital requirements, especially for large, systemic banks, for the degree to which the bank was relying on wholesale funding.⁴¹ He singles out funding in forms he calls "securities financing transactions," including repo, reverse repo, securities lending and borrowing, and securities margin lending, which all proved risky for the financial system as a whole during the crisis. Raising capital requirements as a function of the reliance on these and other forms of wholesale financing, especially for large systemic banks, would be a macro-prudential way to force banks to internalize some of the systemic costs of this form of intermediation.⁴²

City's 366th Economic Policy Symposium: The Changing Policy Landscape (Aug. 31, 2012) (transcript available at <http://www.bis.org/review/r120905a.pdf>).

38. ADMATI & HELLWIG, *supra* note 14, at Ch. 1.

39. For a review, see Douglas J. Elliot, *Quantifying the Effects on Lending of Increased Capital Requirements* (Pew Financial Reform Project, Briefing Paper #7, 2009), http://www.pewtrusts.org/uploadedFiles/wwwpewtrustsorg/Reports/Economic_Mobility/Elliott-Capital-final.pdf.

40. BRUNNERMEIER ET AL., *supra* note 4, at 41-46.

41. Daniel K. Tarullo, Member, Bd. of Governors of the Fed. Reserve Sys., Evaluating Progress in Regulatory Reforms to Promote Financial Stability, Remarks at the Peterson Institute for International Economics 12-14 (May 3, 2013) (transcript available at <http://www.federalreserve.gov/newsevents/speech/tarullo20130503a.pdf>).

42. Another model that Governor Tarullo suggests is security-specific over-collateralization rates to limit the procyclicality in securities financing. *Id.* at 12-13; *see also* Jeremy C. Stein, Governor, Fed. Reserve Bd., The Fire-Sales Problem and Securities Financing Transactions, Remarks at the Federal Reserve Bank of New York Workshop on Fire Sales as a Driver of Systemic Risk in Triparty Repo and other Secured Funding Markets (Oct. 4, 2013) (transcript available at www.federalreserve.gov/newsevents/speech/stein20131107a.htm).

Hyun Song Shin,⁴³ Enrico Perotti and Javier Suarez,⁴⁴ and a number of others⁴⁵ have proposed a Pigouvian tax on wholesale funding, especially when in foreign exchange. Such a tax could be designed as an optimal disincentive to deter this socially risky behavior. The tax proposal can be seen as part of a broader discussion about whether price-based tools (besides a direct tax, a capital adequacy requirement also acts as a price tool) or quantity requirements (e.g., hard limits on certain exposures, such as limits on asset or liability composition or liquidity requirements) are best suited to achieve certain public policy objectives. Given the uncertain benefits—in part due to the presence of externalities and the (informational) uncertainty related to the cost functions of banks—the tradeoffs between tax and quantity regulations and the consequent optimal mix are not clear.⁴⁶

Accepting the de facto presence of some capital adequacy requirements, yet realizing the many design and tradeoff issues in the various roles capital is supposed to perform, academics and policy makers have highlighted a number of useful, important, and complementary design aspects. Goodhart suggests that there could be an explicit low capital ratio as well as a high capital ratio (he mentions levels of roughly 3% and 12% of assets).⁴⁷ The high ratio would serve as the required ratio, while the low ratio would serve as the final trigger for intervention. This dual trigger approach tries to balance the roles of capital as a buffer and capital as an alarm for intervention.

Others have proposed ideas along these lines, with capital complemented by classes of debt that are more graduated in their seniority. Many observers have proposed various forms of explicit contingent capital (CoCos),⁴⁸ classes of debt that are converted into equity depending on certain triggers (which could be regulatory or market-based or a combination of the two). To avoid death spirals—where equity price decline triggers conversions, which end up diluting equity claims and further reducing prices—such conversion would have to happen early on, i.e., at relatively high prices.⁴⁹ Only then could they serve to protect the bank's going concern value. Conversely, conversion would happen

43. Hyun Song Shin, Non-Core Liabilities Tax as a Tool for Prudential Regulation (Feb. 19, 2010) (unpublished manuscript), <http://www.princeton.edu/~hsshin/www/NonCoreLiabilitiesTax.pdf>.

44. Enrico Perotti & Javier Suarez, *A Pigovian Approach to Liquidity Regulation*, 7 INT'L J. OF CENT. BANKING 3 (2011).

45. INT'L MONETARY FUND, FINANCIAL SECTOR TAXATION: THE IMF'S REPORT TO THE G-20 AND BACKGROUND MATERIAL 2, 54 (Stijn Claessens, Michael Keen & Ceyla Pazarbasioglu eds., 2010), <http://www.imf.org/external/np/seminars/eng/2010/paris/pdf/090110.pdf>.

46. For an analytical treatment, see Michael Keen, *The Taxation and Regulation of Banks* (Int'l Monetary Fund Working Paper No. 11/206, 2011), <http://www.imf.org/external/pubs/ft/wp/2011/wp11206.pdf>.

47. Charles Goodhart, *Ratio Controls Need Reconsideration*, 9 J. FIN. STABILITY 445 (2013).

48. For a review, see Ceyla Pazarbasioglu et al., *Contingent Capital: Economic Rational and Design Feature* (Int'l Monetary Fund Staff Discussion Note No. 11/01, 2011), <http://www.imf.org/external/pubs/ft/sdn/2011/sdn1101.pdf>.

49. Charles W. Calomiris & Richard J. Herring, *How to Design a Contingent Convertible Debt Requirement that Solves Our Too-Big-To-Fail Problem*, 25 J. APPLIED CORP. FIN., no. 2, at 39 (2011).

gradually, for example as payments on some classes of newly issued bonds fall due when at the same time the equity price of the bank is dangerously low.⁵⁰ And, more recently, proposals have been made and some are being implemented for classes of claims that would be “bailed-in”—that is, converted to equity automatically in case of financial distress.⁵¹

Many have also argued for more emphasis on general principles and less on specific requirements. Some, like Charles Goodhart,⁵² have argued that the supervisor using his or her discretion, should be able to adjust Pillar 2 of the Basel Accord, thus adjusting an individual bank’s required capital. Andrew Haldane and Vasileios Madouros also argue for more simplicity, with again the supervisor using its discretion to adjust requirements.⁵³ They and others take the view favoring less emphasis on specific requirements and more on general principles in part because of the many estimation issues: basically, the risk measurement underlying Basel II and III relies on many assumptions for which empirical or analytical support is too limited to serve as a useful enough guide. Furthermore, regulations of this kind may be chasing a moving target, given that firms have ample incentives and ability to innovate and introduce financial products that escape or at least reduce the effectiveness of regulations.

IV. Experiences and Evidence with Actual Requirements

How do we evaluate these various requirements and proposals in light of their analytical advantages and disadvantages? Historical and cross-country evidence can shed some light on this. I therefore review first how actual levels of capital and liquidity have varied over time and across countries, and how this relates to bank and banking system performance. I then review the literature on the actual effects of requirements, even though there are relatively few formal in-depth, detailed analyses of the effects of requirements. I lastly discuss the costs of requirements.

A. Actual Capital and Liquidity

Historically, it is clear that banks had higher capital before the expansion of the public safety net, most notably before the introduction of deposit insurance (Figure 1). Banks also had more deposits (Figure 2) and held much

50. For such a proposal, see Jeremy Bulow & Paul Klemperer, *Market-Based Bank Capital Regulation* (unpublished manuscript) (Aug. 2013), <http://siepr.stanford.edu/?q=/system/files/shared/pubs/papers/MBBCRFinal08.22.13.pdf>.

51. For a review, see Jianping Zhou et al., *From Bail-Out to Bail-In: Mandatory Debt Restructuring of Systemic Financial Institutions* (Int’l Monetary Fund Staff Discussion Note No. 12/03, 2012), <http://www.imf.org/external/pubs/ft/sdn/2012/sdn1203.pdf>.

52. Goodhart, *supra* note 26, at 41.

53. Haldane & Madouros, *supra* note 38.

higher liquid assets until recent decades, up to 30% of total assets.⁵⁴ There also seems to be a tradeoff between higher capital and higher liquidity (Figure 3). A simple reading of the historical, time-series evidence suggests that banks maintaining higher capital and liquidity levels is not inherently detrimental, as it has occurred at times with high economic growth. In the United States and the United Kingdom, for example, there have been many periods when actual bank capital ratios were five or more times higher than they are today, while growth was high as well. Nor for that matter is there much evidence that such levels increased financial intermediation costs since spreads were no different then. Similarly, the available cross-country evidence does not suggest obvious tradeoffs between capital and growth.

Obviously, in analyzing the times series evidence, there are many endogeneity issues, as when fast (slow) growing economies have better (worse) capitalized or liquid banks as profitability and funding conditions are good (bad). And a higher presence of capital and liquidity in itself does not answer the socially optimal level of capital or liquidity. For example, if capital were only there to be a buffer against rare systemic shocks and not for intervention, a lower level of capital with the provision of a public safety net in times when shocks do occur could be a more efficient model. That way, individual banks economize on socially inefficient capital or liquidity (which is kept for very rare events) and provide more credit at lower costs. However, as noted, overall economic growth was not low with high capital and liquidity, and the main problem is that individual banks may undercapitalize or have low liquidity and engage in excessive risk taking in the presence of a public safety net.

In terms of actual experiences on the various reasons for capital, there is more evidence that a low level of capital can lead to excessive risk taking by individual banks or banking systems, but not much solid evidence that higher capital per se reduce risk-taking. The excessive risk taking, some of it in the form of a gamble for resurrection ("go for broke"), was clearly seen before the Savings and Loans crisis in the United States.⁵⁵ It may even mean a "go for profit," where firms deliberately incur liabilities that they intend to default on at the expense of the state.⁵⁶ At the same time, there is much evidence that adverse shocks to capital lead to less lending, and presumably less risk taking, among the majority of banks. Bernanke,⁵⁷ Kashyap and Stein,⁵⁸ Peek and

54. Charles Goodhart writes: "in the 1950s liquid assets were typically 30 percent of British clearing banks' total assets, and these largely consisted of Treasury Bills and short dated government debt. Currently, such cash holdings are about ½ percent and traditional liquid assets about 1 percent of total liabilities." Goodhart, *supra* note 26, at 39.

55. EDWARD J. KANE, *THE S&L INSURANCE MESS: HOW DID IT HAPPEN?* (1989).

56. George A. Akerlof & Paul M. Romer, *Looting: The Economic Underworld of Bankruptcy For Profit*, 2 BROOKINGS PAPERS ON ECON. ACTIVITY, no. 2, at 1-60, 70-74 (1993).

57. Ben S. Bernanke & Cara S. Lown, *The Credit Crunch*, 1991 BROOKINGS PAPERS ON ECON. ACTIVITY, no. 2, at 205.

58. Jeremy C. Stein & Anil K. Kashyap, *What Do a Million Observations on Banks Say About the Transmission of Monetary Policy?*, 90 AM. ECON. REV. 407 (2000).

Rosengren⁵⁹ and Van Der Heuvel⁶⁰ all document that negative shocks to bank capital have large adverse effects on lending and that bank capital matters for the conduct of monetary policy. And ample evidence shows that a low level of capital not only deters credit expansion, but also has adverse effects on economic growth at the country, sector and firm level. As such, the perverse effects of low capitalization on risk taking are not universal.

The benefits of higher capital are less clear, in part as some of the counterfactuals (individual bank default or financial crises that are avoided) are harder to prove. The lack of clear evidence may also be due to reporting problems. There was for example a significant reported capital buildup among banks in advanced countries before the recent financial crisis. Berger et al.⁶¹ documented this for U.S. banks. In hindsight, it is not just clear that these capital adequacy positions were overstated, but it is also possible that there may have been perverse effects leading banks to over-report capital and profitability. Banks may for example have engaged in increased risk taking by investing in those assets with low risk weights, yet in illiquid markets which made it easier to value these claims relatively high. And regulatory forbearance may also have played a role, as the difference between market and accounting values suggests (Figure 4).

Experiences bear out some of the problems with measured capital as an indication of the presence of buffers. While evidence supports the view that lower leverage (the simple equity to asset ratio) reduces the risks of defaults, capital adequacy levels alone are not a good prediction of the lack of systemic distress, at least not at the forecast horizons where remedial actions can usefully be taken. Many of the banks that received public support in the recent financial crisis reported capital levels above that of banks that were not receive such support (Figure 5a).⁶² Also, major banks that failed reported higher returns (ROA) than those that did not fail (Figure 5b). This was largely due to the risk weighting since simple leverage (unweighted capital to asset) and liquidity ratios were often better predictors of financial distress, with a critically-low leverage ratio being a good predictor of failure.⁶³ To the extent capital

59. Joe Peek & Eric S. Rosengren, *Collateral Damage: Effects of the Japanese Real Estate Collapse on Credit Availability and Real Activity in the United States*, 90 AM. ECON. REV. 30 (2000); Joe Peek & Eric S. Rosengren, *The International Transmission of Financial Shocks: The Case of Japan*, 87 AM. ECON. REV. 495 (1997).

60. Van den Heuvel, *supra* note 17.

61. Allen Berger et al., *How Do Large Banking Organizations Manage Their Capital Ratios?*, 34 J. FIN. SERV.'S RES. 123 (2008).

62. See INT'L MONETARY FUND, GLOBAL FINANCIAL STABILITY REPORT, Ch. 3 (2009).

63. See Lev Ratnovski & Rocco Huang, *Why are Canadian Banks More Resilient?* (Int'l Monetary Fund Working Paper No. 09/152, 2009), <http://www.imf.org/external/pubs/ft/wp/2009/wp09152.pdf>. Also, Asli Demirguc-Kunt, Enrica Detragiache, and Ouarda Merrouche find that during the recent crisis relationships between stock returns and capital are stronger when capital is measured by the leverage ratio rather than the risk-adjusted capital ratio, and that higher quality forms of capital, such as Tier 1 capital and tangible common equity, were more relevant for stock returns. Asli Demirguc-Kunt, Enrica Detragiache & Ouarda Merrouche,

adequacy is an important predictor of financial distress, the relationship only appears at very low levels (below or above 4%).

In terms of its role for a gone concern, it is clear that bank losses can be large both individually and at the system level. At the bank level, the deposit insurance scheme in the United States (the FDIC) regularly incurs costs (albeit recovered by premiums), even though it largely addresses small weak banks. This suggests that buffers are too low and/or that the agency intervenes, on average, too late. This is worrisome since one reason for capital requirements is exactly to protect the taxpayer (in the presence of a public safety net, including deposit insurance). At the system level, evidence from advanced countries suggests that actual losses (measured as non-performing loans, NPLs) can be high, up to 19% of assets (Ratnovski,⁶⁴ Figure 6). To cover such losses with capital could mean a capital requirement of some 9%, as the average bank holds assets with a risk-weighting of about 50%.⁶⁵ While this is just one benchmark, it suggests that capital requirements should be higher than currently required to cover those systemic crises that seem to occur with some frequency.⁶⁶

Overall, experiences are that real buffers are limited, that interventions are generally too late—especially, but not only for systemic banks—and that losses (paid for by other claim-holders and the state) can be considerable. The problem in part arises because banks under stress will tend to overstate their regulatory capital, as in the recent crisis (of course, there is also regulatory forbearance, which may or may not be optimal from an overall economic point of view).⁶⁷ Banks also weaken their forms of capital when under stress. Bankia in Spain is clearly such a case, where new preferred equity was issued at a point when the bank was likely already close to insolvent (Figure 7). This helps explain the (few) empirical studies finding a relationship between level of bank capital ex ante and bank vulnerability ex-post and makes capital less useful for early remedial actions.

Bank Capital: Lessons from the Financial Crisis (Int'l Monetary Fund Working Paper No. 10/286, 2010), <http://www.imf.org/external/pubs/ft/wp/2010/wp10286.pdf>.

64. Lev Ratnovski, *How Much Capital Should Banks Have?*, VOX (July 28, 2013), www.voxeu.org/article/how-much-capital-should-banks-have.

65. Le Leslé & Avramova, *supra* note 32.

66. See Basel Comm. on Banking Supervision, *An Assessment of the Long-Term Economic Impact of Stronger Capital and Liquidity Requirements*, BANK FOR INT'L SETTLEMENTS, <http://www.bis.org/publ/bcbs173.pdf>.

67. As an example, Harry Huizinga and Luc Laeven find that the market discounts on banks' real estate loans starting in 2008 explains much of low stock prices of banks (real estate is about half of a typical bank's assets. Harry Huizinga & Luc Laeven, *Bank Valuation and Accounting Discretion During a Financial Crisis*, 106 J. FIN. ECON. 614 (2012). While this may not surprise, it was also found that banks with large MBS exposure report lower loan-loss provisioning in 2008. This suggests that weaker banks tweaked their regulatory capital, in part by classifying their MBS in such a way as to take advantage of valuation differences.

B. Requirements

In terms of evidence of the role of requirements, as opposed to actual capital or liquidity positions, solid evidence is limited. Many analyses struggle with the problem of attribution: with requirements being put in place in response to or at least considering the actual positions of banks, it is hard to detect clear causal effects. And variations in bank capitalization levels could be driven by other factors, such as the business cycle or market discipline. Banks can also adjust to new capital ratios in many different ways, with the impact on bank behavior, and risk in particular, ambiguous. In broad terms and ignoring simple misreporting, banks can increase capital, contract lending, change the risk profile of assets, or engage in regulatory arbitrage. These adjustments depend on the least cost alternative, with opportunity costs likely to be bank specific.

With these important caveats in mind, most studies document a rise in observed capital ratios following increases in capital requirements. However, endogeneity and omitted variable concerns imply that these results, especially when using time series data, should not be interpreted as causal evidence. For instance, the Basel I accord was introduced in 1991 in the U.S., but around the same time the country underwent a recession. Rising capital ratios following the accord could then be the consequence of a recovering economy. A better way is to look at differential effects among banks depending on their level of capitalization. Examples of such studies are Keeley,⁶⁸ Shrieves and Dahl,⁶⁹ Jacques and Nigro,⁷⁰ Aggarwal and Jacques,⁷¹ Hancock and Wilcox,⁷² Ediz et al.,⁷³ and Rime.⁷⁴ They arrive at broadly similar conclusions, namely, that banks with low capital ratios exhibit faster adjustment than better capitalized banks following changes in regulation. Also, some empirical evidence from the United Kingdom by Alfon et al.⁷⁵ and Francis and Osborne⁷⁶ suggests that

68. Michael C. Keeley, *Bank Capital Regulation in the 1980s: Effective or Ineffective?*, FED. RESERVE BANK OF SAN FRANCISCO ECON. REV., Winter 1988, at 3.

69. Drew Dahl & Ronald E. Shrieves, *The Relationship Between Risk and Capital in Commercial Banks*, 16 J. BANKING & FIN. 439 (1992); Drew Dahl & Ronald E. Shrieves, *The Impact of Regulation on Bank Equity Infusions*, 14 J. BANKING & FIN., 1209 (1990).

70. Kevin Jacques & Peter Nigro, *Risk-Based Capital, Portfolio Risk and Bank Capital: A Simultaneous Equations Approach*, 49 J. ECON. & BUS. 533 (1997).

71. Raj Aggarwal & Kevin T. Jacques, *Assessing the Impact Prompt Corrective Action on Bank Capital and Risk*, 4 ECON. POL'Y REV., Oct. 1998, at 23.

72. Diana Hancock & James A. Wilcox, *Bank Capital, Non-Bank Finance, and Real Estate Activity*, 8 J. HOUSING RES. 75 (1997).

73. Tolga Ediz, Ian Michael & William Perraudin, *Bank Capital Dynamics and Regulatory Policy* (unpublished manuscript) (1998).

74. Bertrand Rime, *Capital Requirements and Bank Behaviour: Empirical Evidence for Switzerland*, 25 J. BANKING & FIN. 789 (2001).

75. Isaac Alfon, Isabel Argimón, & Patricia Bascuñana-Ambrós, *How Individual Capital Requirements Affect Capital Ratios in United Kingdom Banks and Building Societies* (Bank of Spain Working Paper No. 515, 2005)

capital requirements do affect actual capital levels, at least for those banks for whom the capital constraints are (close to) binding. It may also be that equity issues to capital requirements are associated with lower discount as there is less of an adverse signal.⁷⁷

Studies on whether banks raise equity or adjust assets in response to requirements have found that banks do both. Dahl and Shrieves⁷⁸ find that the degree of undercapitalization is a powerful predictor of equity issuance, regardless of market conditions. Aggarwal and Jacques⁷⁹ and Ediz et al.⁸⁰ conclude that regulation has a bigger impact on banks' long term targets of Tier 1 capital than that of overall capital. Ediz et al. find that banks adjust Tier 2 capital before adjusting Tier 1 capital.⁸¹ Ito and Sasaki, concerned with Japan, also find that subordinated debt issuance responds strongly to stock market fluctuations.⁸²

Other papers find that banks also adjust the asset side of their balance sheets, either by contracting lending,⁸³ altering the risk composition of assets,⁸⁴ or engaging in regulatory arbitrage. In the latter case, securitization and special purpose vehicles are prominent examples.⁸⁵ In a recent study from the United Kingdom, Aiyar et al., shows that about a half of banks' short-term response to an increase in capital requirements occurs through a contraction of balance sheets.⁸⁶ No convincing support is found as to whether banks increase risk-

<http://www.bde.es/f/webbde/SES/Secciones/Publicaciones/PublicacionesSeriadas/DocumentosTrabajo/05/Fic/dt0515e.pdf>

76. William Francis & Matthew Osborne, *Bank Regulation, Capital and Credit Supply: Measuring the Impact of Prudential Standards* (Fin. Services Authority Occasional Paper Series No. 36, 2009), <http://www.fsa.gov.uk/pubs/occpapers/op36.pdf>.

77. Marcia M. Cornett & Hassan Tehranian, *An Examination of Voluntary Versus Involuntary Security Issuances by Commercial Banks*, 35 J. FIN. ECON. 99 (1994).

78. Drew Dahl & Ronald Shrieves, *The Impact of Regulation on Bank Equity Infusions*, 14 J. BANKING & FIN. 1209 (1990).

79. Aggarwal & Jacques, *supra* note 72.

80. Ediz, Michael & Perraudin, *supra* note 74.

81. *Id.*

82. Takatoshi Ito & Yuri Nagataki Sasaki, *Impacts of the Basle Capital Standard on Japanese Banks' Behaviour* (Nat'l Bureau of Econ. Research, Working Paper No. 6730, 1998), http://www.nber.org/papers/w6730.pdf?new_window=1.

83. E.g., Diana Hancock & James A. Wilcox, *Bank Capital and the Credit Crunch: The Roles of Risk-Weighted and Unweighted Capital Regulation*, 22 J. AM. REAL ESTATE & URBAN ECON. ASS'N 59 (1994); Allen N. Berger & Gregory F. Udell, *Did Risk-Based Capital Allocate Bank Credit and Cause a "Credit Crunch" in the United States?*, 26 J. MONEY, CREDIT & BANKING 58 (1994).

84. E.g., Drew Dahl & Ronald Shrieves, *The Relationship Between Risk and Capital in Commercial Banks*, 16 J. BANKING & FIN. 439 (1992); Kevin Jacques & Peter Nigro, *Risk-Based Capital, Portfolio Risk and Bank Capital: A Simultaneous Equations Approach*, 49 J. OF ECON. & BUS. 533 (1997); Aggarwal & Jacques, *supra* note 72; Rime, *supra* note 75.

85. Patricia Jackson, *Capital Requirements and Bank Behavior: The Impact of the Basel Accord* (Basel Comm. on Banking Supervision, Working Paper No. 1, 1999), http://www.bis.org/publ/bcbs_wp1.pdf.

86. Shekhar Aiyar, Charles W. Calomiris & Tomasz Wieladek, *Does Macro-Pru leak?* (Nat'l Bureau of Econ. Research, Working Paper No. 17822, 2012), http://www.nber.org/papers/w17822.pdf?new_window=1. They also report though evidence of significant leakages, with up to 1/3 of the initial impulse of capital requirements being offset through

taking, by choosing to lend to the riskiest borrowers within a risk weight category, mainly since studies do not find significant differential behavior among highly- and poorly-capitalized banks.⁸⁷

Cross-country work finds some role for capital requirements, but other factors are found to play important roles as well. Brewer, Kaufman, and Wall, using data for 78 large private banks in 12 industrial countries between 1992 and 2005, show that banks maintain higher capital ratios in not only in home countries that have more stringent capital requirements, but also in countries in which the bank sector is relatively smaller, where prompt corrective action is practiced more actively and corporate governance structures are more effective.⁸⁸ In contrast, Heider and Gropp do not find that regulatory factors help explain the variation in capital structures of large U.S. and European banks during the period from 1991 to 2004.⁸⁹ Rather, They find that mispriced deposit insurance and capital regulations were of second-order importance in determining the capital structure relative to standard cross-sectional determinants of non-financial firms' leverage and unobserved time-invariant bank fixed-effects.

Analysis also finds that formal capital requirements do not necessarily mean less risks overall. Using data for more than 3,000 banks in 86 countries, Demircuc-Kunt and Detragiache find that neither an overall index of compliance with the Basel Core Principles nor the individual components of the index are robustly associated with bank risk (measured by Z-score, a proxy for default risk, typically measured as the ratio of the capital of the bank to the standard deviation of its profits, with a lower ratio indicating a riskier bank).⁹⁰ Evidence suggests rather that, besides actual capital and liquidity position, it is the overall regulatory environment and some specific rules (those encouraging for example market discipline, including by having a small safety net) that help reduce overall systemic risk taking.⁹¹

lending by non-affected banks (that is, foreign branches operating in the UK). In a follow-up paper, also controlling for within bank groups regulatory arbitrage and competition, the same authors refine the number to about 43%.

87. Frederick T. Furlong, *Changes in Bank Risk Taking*, FED. RESERVE BANK OF SAN FRANCISCO ECON. REV., Spring 1988, at 45; George Sheldon, *Capital Adequacy Rules and the Risk-Seeking Behavior of Banks: A Firm-Level Analysis*, 132 SWISS J. ECON. & STAT. 709 (1996).

88. Elijah Brewer III et al., *Bank Capital Ratios Across Countries: Why Do They Vary?*, 34 J. FIN. SERVICES RES. 177 (2008).

89. Reint Gropp & Florian Heider, *The Determinants of Bank Capital Structure*, 14 REV. FIN. 587 (2010).

90. Asli Demircuc-Kunt & Enrica Detragiache, Enrica, 2011. *Basel Core Principles and Bank Soundness: Does Compliance Matter?*, 7 J. FIN. STABILITY 179 (2011).

91. See Asli Demircuc-Kunt et al., *Banking on the Principles: Compliance with Basel Core Principles and Bank Soundness*, 7 J. FIN. INTERMEDIATION 511 (2008); see also JAMES BARTH ET AL., GUARDIANS OF FINANCE: MAKING REGULATORS WORK FOR US (2012) (offering specific analysis of the beneficial (or not) role of supervisors); Martin Čihák et al., *Bank Regulation and Supervision Around the World: A Crisis Update* (World Bank Pol'y Research Working Paper 6286, 2012) (providing an in-depth comparison of regulation and supervision in countries that were directly hit by the recent financial crisis and those that were not).

C. Cost of Requirements

As most observers and much research argue that the benefits of higher requirements seem considerable, the important question becomes “what are the economic costs of higher requirements?” In Modigliani and Miller’s perfect financial markets world, there would not be any impact, as asset and activity choices are not affected by liability structures, and banks would continue to operate as is (but just allocate their net earnings differently between equity and debt claims). But there are many real world deviations: the tax benefits of debt financing, agency and information asymmetry issues, imperfect corporate governance and contracting arrangements, the costs of raising equity (quickly), etc.

The perspective of the industry is, of course, largely predictable: it generally objects to higher requirements. But the reasoning is not always clear. One line of argument is straightforward: the higher costs of equity and reduced tax benefits from debt will lead to higher intermediation costs, which in turn lower lending, with adverse consequences on economic growth. But the industry surely overstates the case, as a report by the Institute of International Finance argues that the impact could total 3.2 percent of GDP over five years for the United States, Euro Area, Japan, United Kingdom and Switzerland.⁹² This study has been heavily criticized as being an overly pessimistic assessment. But the financial services industry too also employs some “fallacies.” It also appears that the objections of the industry reflect more the managerial interests than bank shareholders’ views and certainly not overall stakeholders’ views.

Conclusive empirical evidence of costs of formal requirements is scarce, in large part due to similar endogeneity and omitted variable concerns that plague studies on the effects of requirements. As such, time series based evidence is not as useful. In terms of performance, if anything higher capital tends to go together with higher return on assets for the banking system on aggregate (Figure 8). Again, this is likely influenced by, besides reporting biases, the state of the economy. Furthermore, the actual costs of equity and various debt financing instruments are heavily influenced by, besides tax shield, the distortions of deposit insurance and other aspects of the public safety net.

A more useful way to address the cost question is through simulations. Two ways have been used to calculate the effect of higher capital on the bank’s cost of funding. One very simple way used by Elliott is to keep the costs of banks’ debt and equity exogenous.⁹³ Assume for example that the required

92. INST. OF INT’L FIN., *THE CUMULATIVE IMPACT ON THE GLOBAL ECONOMY OF CHANGES IN THE FINANCIAL REGULATORY FRAMEWORK* (2011).

93. Douglas J. Elliott, *Quantifying the Effects on Lending of Increased Capital Requirements* (Sept. 21, 2009) (unpublished manuscript, Brookings Institution),

return on bank equity is 15% and the average cost of bank debt is 4% (3% net of tax shield), which means a relatively large wedge between debt and equity costs.⁹⁴ Then an increase in banks' risk-weighted capital ratio of 1 percentage point, equivalent to a shift of 0.5% of funding from debt to equity (given an average risk weight of 0.5), would increase the average cost of capital by 6 basis points. This type of analysis produces the highest possible costs. While BCBS shows even higher costs from the Basel III level of requirements, it still concludes that costs are limited and benefits outweigh them.⁹⁵

As Admati and Hellwig also argue, much of this ignores the Modigliani-Miller (M&M) proposition that the banks' overall cost of funding should not increase with higher equity (as equity and debt become safer and cheaper), except for the tax shield effect.⁹⁶ Another form of analysis then finds—under some assumptions—that an increase in the banks' risk-weighted capital ratio by 1 percentage point would increase the weighted average cost of capital by just 1 basis point. Under some additional departures from M&M, the cost can be somewhat higher: Kashyap et al., for example, suggest some 2.25 basis points for a 1 percentage point increase.⁹⁷ Again, costs remain quite limited.

Reviewing a number of approaches, Santos and Elliott find that a 1 percentage point increase in capital ratios would imply additional costs for an average bank of between 1 and 6 basis points (the range varies with assumptions about capital structure irrelevancy, the cost of equity versus debt, and the tax shield).⁹⁸ These are small amounts: if capital ratios were to rise due to requirements by a full 6 percentage points, the costs would be 36 basis points at most. And this would only be an additional cost if this truly is an additional capital need *above* what markets would require in the first place. Estimates for the costs of currently envisioned liquidity requirements provided by Santos and Elliott are between 14 and 21 basis points.⁹⁹ Overall, while numbers vary

http://www.brookings.edu/~media/research/files/papers/2009/9/24%20capital%20elliott/0924_capital_elliott.pdf.

94. The historical average nominal cost of debt (interest expenses over all liabilities) for the sample of 6,600 banks in 13 OECD countries over the 15-year period from 1993 to 2007 used by Basel Comm. on Banking Supervision, *supra* note 67, is some 4 percentage points. As banks likely substitute more expensive forms of debt for equity, the marginal debt cost saved is likely higher, reducing the costs of switching from debt to equity.

95. Basel Comm. on Banking Supervision, *supra* note 67. The BCBS study finds that each 1 percentage point increase in the capital ratio raises loan spreads by 13 basis points. Liquidity standards raise spreads by about 25 basis points when risk-weighted assets (RWA) are left unchanged, and by 14 basis points or less after taking account of the fall in RWA and the corresponding lower regulatory capital needs.

96. ADMATI & HELLWIG, *supra* note 12. Ch. 7.

97. Anil K. Kashyap et al., An Analysis of the Impact of "Substantially Heightened" Capital Requirements on Large Financial Institutions (unpublished manuscript) (May 2010), http://www.people.hbs.edu/shanson/Clearinghouse-paper-final_20100521.pdf.

98. André Oliveira Santos & Douglas Elliott, *Estimating the Costs of Financial Regulation*, International Monetary Fund (Int'l Monetary Fund Staff Discussion Note No. 12/11, 2012), <http://www.imf.org/external/pubs/ft/sdn/2012/sdn1211.pdf>.

99. *Id.* at 16, tbl. 3.

between types of banks and countries (U.S. banks for example are more affected), the total estimated cumulative costs of currently envisioned capital and liquidity requirements, as well as some other new rules (such as those for derivatives), do not appear to exceed 50 basis points.¹⁰⁰

These admittedly simple calculations generally show small cost effects. And, even with these small costs, there would still be several margins along which banks could adjust. For one, increases could be met by a reduction in costs or changes in mix of activities or funding, some of which may be useful in their own right (e.g., as they represented too much risk). With some reasonable assumptions about adjustment, Santos and Elliott show that their overall costs come down to a maximum of 28 basis points.¹⁰¹ Or, if it results in an increase in the net interest margin, it could fall on either lending or deposit rates, or on the costs of other financial services. And, even if it were to fall fully on lending rates, the economic costs, while hard to assess, are likely to be small.¹⁰² In a context where the interest rate moves in similar such amounts without major macroeconomic consequences, it is hard to argue that this range of costs is very detrimental. A bigger issue may be “dis-intermediation,” where activities migrate to less regulated parts of the financial services industries. Only to the extent this raises new sources of systemic risk, however, should this be a source of concern.

Most of this analysis is based though on the steady state. The transition effects of higher requirements, however, might be more important, as there are fewer ways for banks to adjust. At the same time, they are also harder to judge, in part because banks adjust is not clear, but also because the costs of raising capital or liquidity quickly are not well known. A comprehensive study suggests a modest impact on aggregate output in the transition towards higher standards.¹⁰³ Taking the median across all results, increases in domestic lending spreads were estimated to be of about 15 basis points, and declines in lending volumes 1.4%. In turn, this has small effects on growth. Median estimates are that a 1 percentage point increase in the target ratio of tangible common equity to risk-weighted assets leads to a decline in the level of GDP by a maximum of about 0.19% from the baseline path after four and a half years (equivalent to a reduction in the annual growth rate of 0.04 percentage points over this

100. *Id.* at 21, tbl. 6.

101. *Id.*

102. Assessing the long-run steady state impact, BCBS, *supra* note 67, assumes that the higher requirements increase the cost of bank credit without additional non-price restrictions (e.g., no credit rationing). The higher cost lowers investment and consumption, in turn influencing the steady-state level of output. In the median estimate across countries a 1 percentage point increase in the capital ratio translates into a 0.09% decline in the level of output relative to the baseline and meeting the liquidity requirement in a 0.08% decline.

103. Macroeconomic Assessment Grp., *Assessing the Macroeconomic Impact of the Transition to Stronger Capital and Liquidity Requirements*, BANK FOR INT'L SETTLEMENTS (2010), <http://www.bis.org/publ/othp10.pdf>.

period).¹⁰⁴ These costs are small enough to justify tighter capital and liquidity requirements, at least along the lines of Basel III, and perhaps the related liquidity rules (LCR and NFSR).

Conclusion

Capital and liquidity requirements are very much the focus of current regulatory efforts to achieve safer and more efficient banking systems. While supportive of (higher) requirements, the current analytical literature has offered relatively little guidance on the exact design of requirements and rigorous empirical reviews of experiences with requirements have been relatively limited. While maybe more limited than desirable, most research argues for higher capital requirements as private costs seem to be low while the social benefits considerable. The analytical case for liquidity requirements is less clear and current academic thinking seems both less advanced and little reflected in current or proposed regulation. Even though the financial services industry objects to (new) requirements, its arguments on the impact on the real economy is not particularly strong.

There is also general agreement that higher and better designed requirements need to be supported by a range of actions and regulations to have a chance to make the global financial system safer and more efficient. To review in detail the various other measures being put in place and actions undertaken (or contemplated) is too broad an agenda.¹⁰⁵ One crucial element to highlight nevertheless is the overall approach taken to regulation and supervision. Some of the approach has to be less “formula or model” based, and aim for less detail and complexity in rules. Regulators and supervisors need to assess risks in a more intuitive manner. The history of crises shows that often what appear to be relatively useful financial innovations occurring within the set of existing rules can grow into systemic risks (subprime and some aspects of shadow banking system being the latest examples). To a greater extent than has been the case to date, “judgments” by regulators and supervisors will be needed as to what types of activities constitute potential for systemic risk.¹⁰⁶

While a proactive, less rules-based approach can hope to detect such risks, greater discretion will require some changes to the regulatory governance

104. It is important to note that these results apply to any increase in target capital ratios whether its source is higher regulatory minima, required buffers, changes in the definition of capital, the application of a leverage ratio, or some other change in standards.

105. For a progress report, see *Fourth Progress Report on the G-20 Data Gaps Initiative*, FIN. STABILITY BD. & INT’L MONETARY FUND (Sept. 2013), http://www.financialstabilityboard.org/publications/r_131014.pdf. For an overall assessment of financial reforms, see Stijn Claessens & Laura Kodres, 2013, *The Regulatory Responses to the Global Financial Crisis: Some Uncomfortable Questions*, Paper for the project: “Recalibrating Risk: Crises, Perceptions, and Regulatory Change,” presented, September 19-20, 2013, at Duke University, Mimeo, IMF, Washington, D.C. for an overall assessment of financial reforms.

106. See also Haldane & Madouros, *supra* note 38.

model and the internal workings of supervisory agencies. As is, agencies are, besides at times being too close to the industry, not always well “governed” (in terms of legal, operational and financial independence, degree of accountability, and level of transparency). Approaches somewhat similar to those in place today in most countries to assure the independence of monetary policy should also be applied to supervisory agencies.¹⁰⁷

A large agenda exist on reducing the too-big-to-fail (TBTF) problem. Besides increases in capital requirements, possible policy measures include limits on size and complexity and restrictions on the scope of permissible activities (as in the Volcker, Vickers and Liikanen rules and proposals).¹⁰⁸ While progress is being made on bank resolution, much more still needs to be done. This will require better frameworks, regulations and laws (e.g., for resolving holding companies, bailing-in of creditors, and determining the optimal design of other contingent contracts,¹⁰⁹ and possibly introducing equity “insurance” instruments.¹¹⁰ In terms of specific tools, improvements in practices are needed as well. If a bank is found to be short of capital, liquidity or other required targets, sanctions (e.g., limits on dividend payouts and bonuses, restrictions on activities, dismissal of management, etc.) will need to be strictly enforced (and in some countries such possible sanctions need to be tightened). For cross-border resolution (of large financial institutions), more progress on mechanisms for burden sharing will be needed.¹¹¹

Complementary work will be needed on enhancing accounting rules and disclosure to allow market discipline to work better. Better rules and harmonization of IFRS and US GAAP will be important, but here progress has been minimal to date.¹¹² A challenge here is designing fair value accounting rules, including mark-to-market, that provide the right information on underlying valuations, yet do not increase the risks of virtuous and vicious spirals. There also is some hope for greater synergies between market discipline and supervisory actions (market signals cannot just alert supervisors to

107. See Donato Masciandaro, Marc G. Quintyn & Michael W. Taylor, *Inside and Outside the Central Bank: Independence and Accountability in Financial Supervision: Trends and Determinants*, 24 EUR. J. POL. ECON. 833 (2008); Franka R. Liedorp et al., *Transparency of Banking Supervisors*, 61 IMF ECON. REV. 310 (2013).

108. José Viñals, Ceyla Pazarbasioglu, Jay Surti, Aditya Narain, Michaela Erbenova, & Julian Chow, *Creating a Safer Financial System: Will the Volcker, Vickers, and Liikanen Structural Measures Help?* (Int’l Monetary Fund Staff Discussion Note No. 13/4, 2013).

109. Jianping Zhou et al., *supra* note 52.

110. Anil K. Kashyap, Raghuram G. Rajan & Jeremy C. Stein, *Rethinking Capital Regulation*, in FED. RESERVE BANK OF KANSAS CITY, FEDERAL RESERVE BANK OF KANSAS CITY SYMPOSIUM ON MAINTAINING STABILITY IN A CHANGING FINANCIAL SYSTEM 431 (2008).

111. STIJN CLAESSENS, RICHARD J. HERRING & DIRK SCHOENMAKER, A SAFER WORLD FINANCIAL SYSTEM: IMPROVING THE RESOLUTION OF SYSTEMIC INSTITUTIONS, INT’L CTR. FOR MONETARY & BANKING STUDIES (ICMB) & CTR. FOR ECON. POLICY RESEARCH (CEPR) (2010).

112. See Nicolas Véron, *Keeping the Promise of Global Accounting Standards* (Bruegel Policy Brief No. 2011/05, 2011), <http://www.bruegel.org/publications/publication-detail/publication/575-keeping-the-promise-of-global-accounting-standards/>.

problems, but can also serve as formal triggers for supervisory actions). More disclosure on aggregate risk exposures in various dimensions is surely needed,¹¹³ including better available (cross-border banking) data.¹¹⁴ Another area is adjustment to remuneration procedures, although how to do this best is not clear.

A new area of policy making has become macro-prudential policies.¹¹⁵ So far, only some of these approaches have been formally defined, in terms of scope and calibration (mainly countercyclical and systemic capital surcharges, and then only to some degree). Many other tools, such as LTVs and levies, have been mentioned and studied as potentially useful, but in practice, policy making with these tools is still at an early stage. Overall while macro-prudential policies are promising and important in that they encourage a system-wide perspective, much remains to be determined, including their calibration to country characteristics and circumstances, their regulatory governance, and their relationships with stress tests as a macro-prudential tool.

Table 1: Summary of the micro-prudential and system effects of requirements, and possible other, complementary tools necessary

Objective	Micro-Prudential			System	
	Incentives	Buffer	Intervention	Cross-Sectional	Procyclicality
Capital (requirements)	?	✓✓	✓	✓	?
Liquidity (requirements)	✓	?	✓	?	✓
Other tools necessary	✓✓	✓	✓✓	✓✓	✓
Examples	Remuneration Scope of Activities	CoCos	Resolution, Bail-in, LoLR	Market infrastructure Limits (size)	Macro-prudential policies

113. See also FIN. STABILITY BOARD & INT'L MONETARY FUND, *supra* note 106.

114. Eugenio Cerutti, Stijn Claessens & Patrick McGuire, *Systemic Risks in Global Banking: What Available Data Can Tell Us and What More Data Are Needed?*, in SYSTEMIC RISK AND MACRO MODELING (Markus K. Brunnermeier & Arvind Krishnamurthy eds., forthcoming 2014).

115. Int'l Monetary Fund, *Key Aspects of Macroprudential Policy* (June 10, 2013), <http://www.imf.org/external/np/pp/eng/2013/061013b.pdf>.

Figure 1: U.S. Banks' Measured Capital Ratio

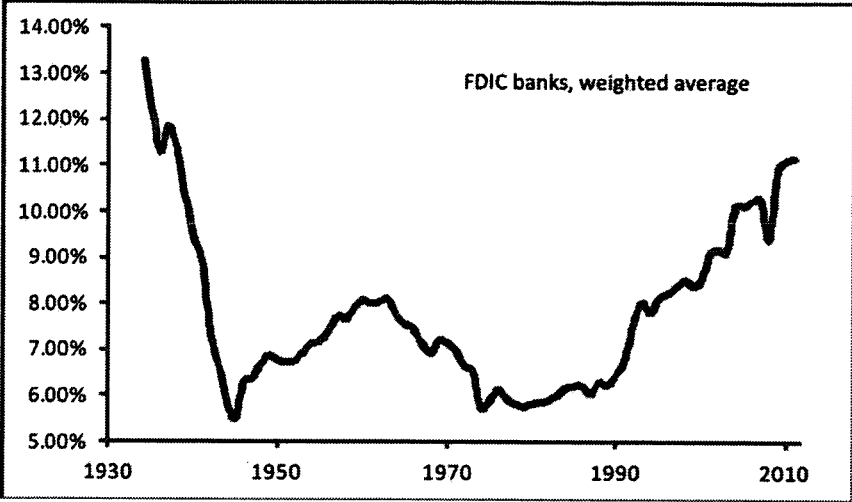


Figure 2: U.S. Banks' Deposits and Liabilities

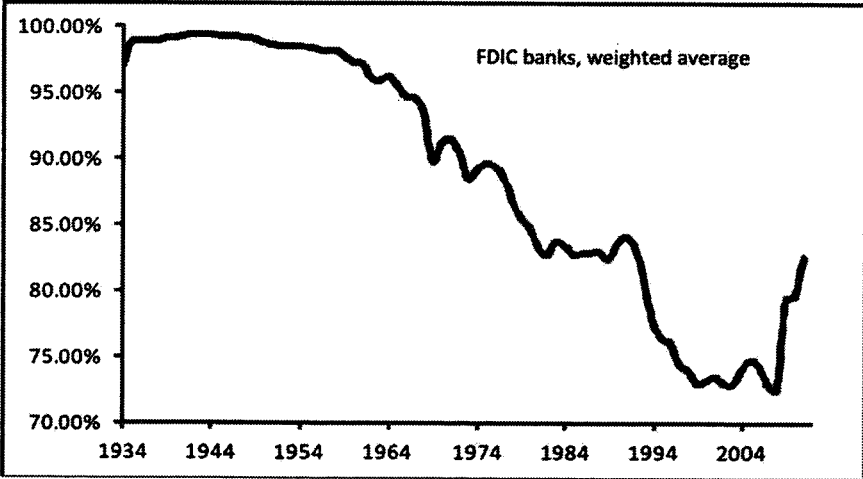


Figure 3: Capital vs. Liquid Assets: A Tradeoff?

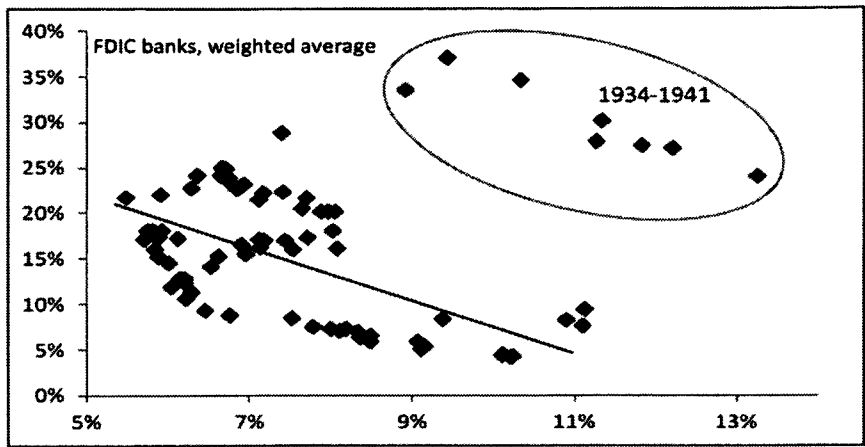
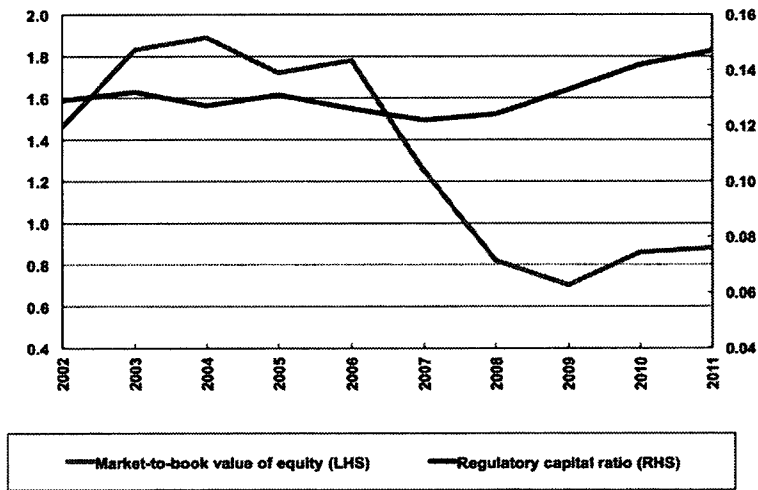


Figure 4: Regulatory Forebearance During the Crisis



Source: Call Reports of U.S. Bank Holding Companies, Median Values

Figures 5(a) and 5(b): Banks that Failed Reported Higher Capital Ratios and ROAs

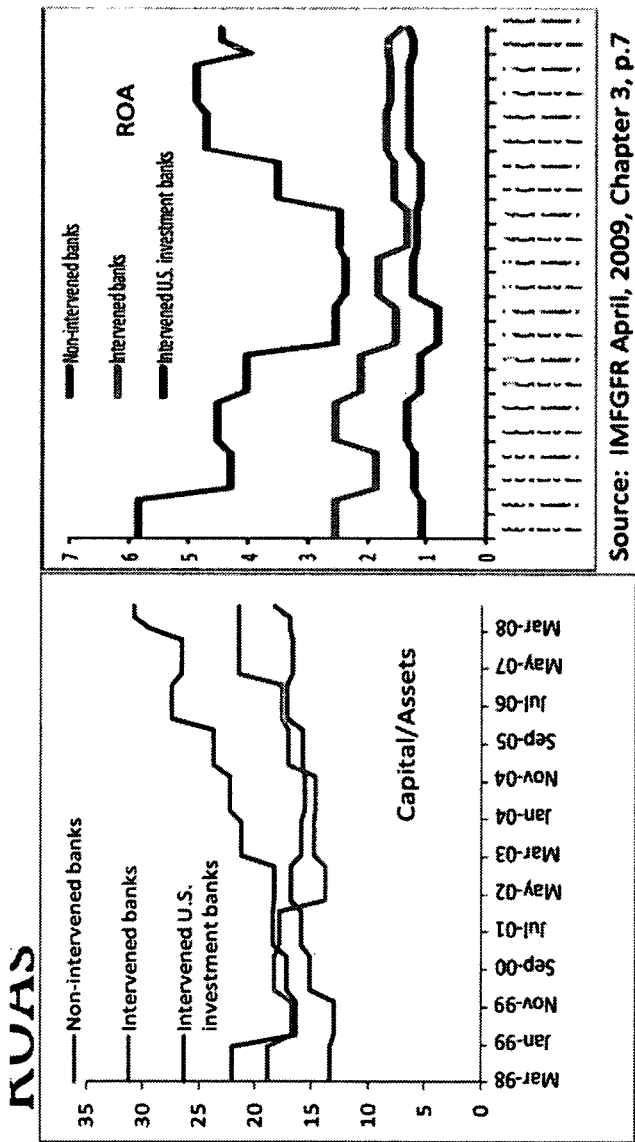
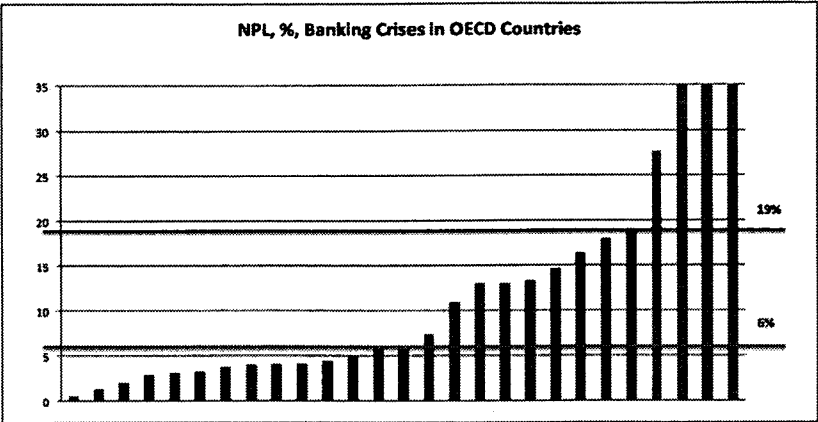
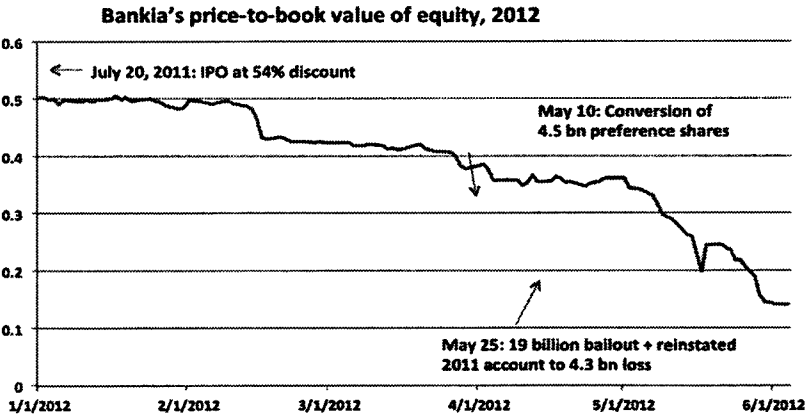


Figure 6: One Benchmark, Actual Losses (NPLs)



Source: Laeven and Valencia (2012)

Figure 7: The Fall of Bankia



Source: Bloomberg

Figure 8: The Tradeoff between Capital and RoA is not Clear

