



WP/14/169

IMF Working Paper

Reconsidering Bank Capital Regulation: A New Combination of Rules, Regulators, and Market Discipline

Connel Fullenkamp and Céline Rochon

IMF Working Paper

Institute for Capacity Development

Reconsidering Bank Capital Regulation:

A New Combination of Rules, Regulators, and Market Discipline

Prepared by Connel Fullenkamp and Céline Rochon¹

Authorized for distribution by Marc Quintyn

September 2014

This Working Paper should not be reported as representing the views of the IMF.

The views expressed in this Working Paper are those of the author(s) and do not necessarily represent those of the IMF or IMF policy. Working Papers describe research in progress by the author(s) and are published to elicit comments and to further debate.

Abstract

Despite revisions to bank capital standards, fundamental shortcomings remain: the rules for setting capital requirements need to be simpler, and resolution should be an essential part of the capital requirement framework. We propose a new system of capital regulation that addresses these needs by making changes to all three pillars of bank regulation: only common equity should be recognized as capital for regulatory purposes, and risk weighting of assets should be abandoned; capital requirements should be assigned on an institution-by-institution basis according to a regulatory (s,S) approach developed in the paper; a standard for prompt, corrective action is incorporated into the (s,S) approach.

JEL Classification Numbers: G18, G21, G28

Keywords: Regulation, Bank Capital.

Author's E-Mail Address: cfullenk@duke.edu; crochon@imf.org.

¹ The authors thank Ralph Chami, Burkhard Drees, Laura Kodres, Sunil Sharma and IMF staff from various departments for helpful comments on an earlier version.

CONTENTS

Abstract.....	1
I. Introduction	3
II. Issues with the Current Approach to Bank Capital Regulation	4
III. What Changes Should Be Made to Capital Regulation?	9
IV. A New Framework for Bank Capital Regulation	15
V. A Brief Defense of the New Framework	19
VI. Conclusion: Where Do We Go From Here?.....	26
Appendix: Choosing the Capital Boundaries.....	30
References.....	32

I. INTRODUCTION

The global financial crisis and subsequent recession revealed multiple problems with bank regulation. Some of the most critical problems that were discovered include the following. First, for a variety of reasons, banks demonstrated compliance with Basel capital standards yet accumulated excessive amounts of actual or effective leverage. For example, some institutions engaged in regulatory capital arbitrage on a massive scale, while others used over-the-counter derivatives to mask or distort their true leverage. Second, risks which were thought to have been adequately addressed actually inflicted crippling losses on many institutions. For example, liquidity risk emerged, quite unexpectedly, as one of the main drivers of financial contagion during this crisis. In addition, unexpected changes in correlations across different sources and types of risk meant that estimated loss distributions were far too optimistic, relative to actual experience. And finally, the bank regulation framework neither prevented the emergence of too-big-to-fail (TBTF) institutions nor provided sufficient guidance for their orderly resolution when they went into financial distress.

As might be expected, given the size of the crisis, the regulatory response has been massive. Thousands of pages of new bank regulations have been written since the start of the financial crisis, and they continue to appear on a daily basis. At the international level, the past several years have brought a large number of revisions and additions to the Basel capital standards, which are now referred to collectively as Basel 2.5 and Basel 3. New regulations continue to appear at the national level also. The Dodd-Frank Act added several thousand pages of new bank regulation to the existing body of U.S. banking regulations, for example. It is also likely that significant new rules are still to come, at both levels. For example, recommendations contained in the Vickers Report in the U.K., and the Liikanen Report in the E.U., which aim to alter the structure of banking operations, may yield concrete regulations in the near future.

These new rules have generally augmented rather than displaced the existing set of bank regulations, which implies a dramatic increase in the number of written rules governing the banking system. Moreover, these efforts have generally focused on revising Pillar 1—the set of rules that banks must follow. To be sure, changes have also been made to Pillars 2 and 3, Supervision and Market Discipline, respectively. But the number and significance of the changes to Pillar 1 shows a primary focus on rewriting the rules for banks and bankers.

This huge increase in regulation would be well worth the effort if it were an effective remedy for the several problems described above. But there are many reasons to question whether this rules-driven approach to revising bank capital regulation will be effective. In addition, making new rules is often the quickest and politically expedient response to crises, so that societies tend to draft new rules without giving alternative approaches sufficient consideration. We believe that there are benefits to continuing to have a broad discussion of how bank capital regulation could respond to the crisis, regardless of what direction has been chosen, and this paper is intended to encourage a continuing dialogue.

In this paper, we raise issues with the current direction of bank capital regulation, and use these concerns to suggest an alternative framework. In particular, we believe that the push toward imposing more rules on banks and bankers will be less effective than a strategy of imposing more responsibility on bank supervisors. In other words, we propose to emphasize Pillar 2 rather than Pillar 1 in future bank capital regulation, and we lay out a framework for a Pillar 2-centered approach. We argue, however, that this approach cannot succeed without a significant revision to Pillar 3, Market Discipline, which aims market scrutiny directly at bank regulators as well as at banks and bankers. We believe that our framework better addresses the underlying causes of the financial crisis, and stands a better chance of achieving the goals pursued by the current approach to bank capital regulation.

Our proposal highlights the basic choice we face in capital regulation at the present time: either we lean more heavily on rules, or on regulatory discretion. Market discipline remains an important tool to counterbalance banks' and regulators' actions, but one hard lesson from the most recent crisis is that we cannot yet base a financial regulatory system on market discipline—and perhaps we will never be able to do so. There is no perfect system, but we still need to have a discussion about whether a rules-based or supervision-based regulatory system better serves society at this time. Our paper is intended to (re-)open this debate.²

The following section of the paper raises issues and concerns with the current direction of bank capital regulation. The subsequent section suggests broad changes to bank capital regulation that address the concerns raised. Then the paper lays out a concrete framework for bank capital regulation, followed by a defense of this framework against important objections to it. In the final section, we conclude by summarizing several capital regulation issues that remain to be dealt with, and how our proposal could impact society's responses to them.

II. ISSUES WITH THE CURRENT APPROACH TO BANK CAPITAL REGULATION

We have several concerns regarding the effectiveness and the consequences of a rules-focused approach to further bank capital regulation. Some of these concerns have been raised recently among regulators and academics, while others, we believe, have not yet been sufficiently acknowledged.

Our first concern was articulated by Haldane (2012) among others: banking regulations, including capital regulations, have become too complex to be effective.³ For example, consider the new bank regulations that comprise Basel 3. Although the Basel Committee did simplify the definition of Tier 1 equity, their primary response has been to add multiple new mechanisms and to modify many existing mechanisms in order to address problems that were exposed during the crisis. A simple leverage ratio requirement, which will include off-

² Kowalik (2011) analyzes the pros and cons of rule-based versus discretion-based approaches as it applies to the implementation of the countercyclical capital requirements mandated by Dodd-Frank and Basel III.

³ Following a series of comparative tests, Seamans (2013) concludes that greater capital ratio complexity does not make the identification of future bank failures easier. Simpler rules are also advocated in Calomiris (2011), among others.

balance sheet exposures, is being phased in. Two separate capital buffers will be placed as additional layers of protection on top of the minimum capital ratios. One of these is a capital conservation buffer, which will increase the total common equity level and limit banks' discretionary payouts. The other buffer is a countercyclical buffer, which will help to limit credit growth that is deemed excessive.

In addition, the Basel committee modified its definition of capital to require that any instrument counted as capital for regulatory purposes must absorb losses at or before the point of bank insolvency.⁴ In other words, any instrument counted as Tier 1 or Tier 2 capital must either be common equity or contain provisions that require the writedown of principal value at or before the point at which the value of the institution's assets falls below the value of its liabilities.

Each of the mechanisms described above either comes with detailed instructions regarding how to implement it, or it will require national authorities to create these detailed instructions. For example, there are many possible ways to structure instruments that satisfy the loss-absorption requirements for capital, but regulators may want to impose specific rules on which structures they will permit banks to count as Tier 2 capital.

Increasing the complexity of existing regulation and adding multiple new mechanisms makes bank regulations more difficult to understand and enforce, and therefore easier to avoid or manipulate. Different regulations may contradict one another, making banks and regulators hesitant to take action. A greater concern is that gaming the capital regulations and engaging in practices such as regulatory capital arbitrage become easier for banks as the rules become more complicated and specific.

Complex rules effectively transfer a significant share of the power over enforcement to the banks themselves, which may encourage regulatory capital arbitrage. This occurs because banks must educate their examiners on the details of their compliance programs before the examiners can carry out their duties. For example, Tarullo (2008) pointed out this problem with the Basel 2 internal ratings based (IRB) capital standards for credit risk. These encourage banks to create complex credit risk models whose theoretical justification and practical operation must be explained to bank supervisors, who may only partially understand them. Indeed, we believe that under the current capital regulation framework, the burden of proof is on regulators to prove that a bank's capital requirements are too low. This creates a difficult situation for regulators, since the banks also control the information that regulators need to demonstrate the inadequacy of the banks' current requirements.

An increasing number of observers have thus called for a simplification of the rules. For example, Admati and Hellwig (2012) advocate that a simple leverage ratio, with a very high minimum value, should replace all current capital requirements. Similarly, Fisher (2013) advocates moving away from risk weighting of assets in the determination of capital adequacy.

⁴ Basel Committee on Banking Supervision (2011a), (2011b), (2011c).

Unfortunately, experience has demonstrated that simple rules do not survive long, once they are exposed to the market. If overly simple rules are adopted, they are also easy to game and lead to regulatory arbitrage or other unintended consequences⁵. For example, banks responded to the few, broad risk categories of Basel 1's credit risk standard by concentrating their balance sheets in higher risk, higher return assets such as sovereign debt, which carried low risk weightings. This response prompted the Basel Committee to draft more complicated credit risk rules, including the IRB standards.

In addition, if simple rules set standards that are too demanding (and they always seem to be too demanding for some institution's liking), then they prompt the regulated institutions to pressure regulators vigorously for exemptions and other relief. This was the case in the adoption of the simple leverage ratio standard in Basel 3, for example, which was revised in early 2014 in response to industry concern that off-balance-sheet exposures were being weighted in ways that resulted in excessive amounts of required capital.

Thus, we believe that it is not possible to create simple rules for capital regulation. Rules may be simple at the start, but are inevitably revised and made increasingly complex as a natural consequence of the political economy of regulation. We believe, moreover, that progression towards more complex rules occurs quickly, because of the increasing competition in the financial services industry. Competition drives banks to find and exploit weaknesses in the rules in order to increase their profits, which in turn prompts regulators to amend the rules.

A further consequence of the complexity of bank capital rules, we believe, is that they deter rather than facilitate market discipline. Private investors suffer from a more severe version of the asymmetric information problem affecting bank supervisors, which we discussed above. For example, the risk-weighted capital system is opaque to investors and other non-experts. They lack access to the detailed data on which these calculations are based, and they also lack knowledge of the models used to perform the capital requirement calculations. It is nearly impossible, for example, for a bank client, shareholder, or potential investor to calculate a bank's required capital under the Basel 2 IRB standards. The expert rating systems currently used by regulators, such as CAMELS, may not be very useful either. Even if investors were to learn a bank's CAMELS rating, they wouldn't know how to interpret the rating's meaning, especially with respect to capital adequacy. Even a simple leverage ratio standard may be opaque to investors, since off-balance-sheet exposures are difficult to observe and moreover may be subject to netting and other rules that make them extremely difficult for investors to calculate due to lack of data.

We believe that the appropriate standard of simplicity in bank capital regulation should be the facilitation of market discipline. Good capital requirements should be simple for private

⁵ Indeed, we believe that there is a U-shaped relationship between complexity of regulations and the amount of regulatory capital arbitrage they prompt. We think that very simple and very complex regulations lead to the highest amounts of regulatory arbitrage, while moderately complex regulations seem to reduce it.

investors to understand and use to verify compliance. If private investors cannot understand the meaning of capital requirements, nor measure an institution's compliance with their capital requirement based on publicly available information, then we believe that market discipline will be extremely limited in its effectiveness. Currently, private investors cannot independently assess the level of capital of a bank or compare it meaningfully and in a systematic way with other banks. Moreover, to the extent that capital regulations become more complex, such changes will make it even more difficult for investors to exert market discipline on banks or regulators.

A second set of concerns arises from the fact that the task of restructuring or resolving large and complex financial institutions that become weak remains separate from capital regulation. Bank capital regulation has focused primarily on prevention of bank failures and much less on dealing with them once they do occur. Although prevention of failures should always be the top priority of capital regulation, we believe that capital regulation would be improved by explicitly integrating restructuring and resolution into the pillars of bank capital regulation.

The experience of the financial crisis clearly demonstrates why bank resolution should be an essential part of the capital adequacy framework. Basel 1 and 2 set minimum standards expected to be exceeded by most banks. But without a credible restructuring and resolution framework embedded in the capital standards, regulators lacked direction precisely when they needed it most. Thus, when the worst case did materialize, regulators scrambled to devise responses. One controversial response was the recapitalization of banks that took place in many countries without forcing any creditors of the banks to suffer losses. This action constituted an effective bailout of equity holders, and subordinated debt holders as well. We believe that such responses are difficult to avoid when the failure of a large institution seems imminent and regulators lack a contingency plan.

We believe that the lack of a restructuring and resolution framework makes bank bailouts much more likely, which in turn dramatically weakens the banks' incentives to adhere to capital standards—or other safety and soundness regulations—in the first place. Indeed, financial institutions may have the incentive to put regulators in a position in which they will find it optimal to choose to make unrequited capital injections or other bailouts if a financial institution goes into distress, which implies that banks may take on larger risks *ex ante*.

Recently, regulators in several countries have begun to address the need for improved approaches to restructuring and resolution of large and complex banks. In response to the financial crisis, a set of principles for resolving large institutions has been promulgated.⁶ In addition, countries such as the US and the UK have extended the resolution authority of supervisors over bank holding companies, as well as clarified these supervisors' responsibilities when undertaking bank resolution.⁷ Although these steps represent significant

⁶ Financial Stability Board (2011).

⁷ United States Federal Deposit Insurance Corporation and Bank of England (2012).

improvements over the previous regulatory regime, they are aimed primarily at improving the execution of the resolution process once an institution becomes insolvent. We believe that waiting for an institution to reach insolvency before intervening significantly reduces the chance of a successful regulatory intervention. For example, temporizing on the part of supervisors contributed to the severity of the U.S. Savings and Loan crisis⁸

One of the sources of our concern is that in many systems, the resolution of the institution will be carried out by an authority that is separate from the bank supervisor. For example, the current EU plan for a banking union calls for national regulators to hand off the responsibility for resolving an institution to a resolution authority. If this handoff is not well coordinated and virtually seamless, however, it may lead to problems in execution that disrupt the markets and result in excessive losses to taxpayers. But this handoff will inevitably take place during a crisis period for the institution, when there is little time for reflection and significant pressure on regulators to act. We believe that this will increase the likelihood of problems during the regulatory handoff to a specialized resolution authority. The case of Northern Rock illustrates the consequences of coordination problems among regulators who share responsibility for winding down troubled institutions. Northern Rock ended up being nationalized and held as a publicly owned bank for several years, contrary to the goals of the U.K. bank regulators.

The process of bank resolution envisioned by current regulation also raises concerns because of its reliance on the preparation of contingency plans or “living wills” that outline how resolution should proceed. These plans represent the best guesses made by the banks’ managers regarding the transactions they will be willing and able to make if the institution goes into distress. These are not binding commitments, as contingency plans can potentially become outdated and virtually useless within days if a bank undertakes large changes to its portfolio. Market conditions may also change drastically, rendering positions suddenly illiquid and nearly impossible to unwind. Therefore, although the preparation of living wills is an informative and useful exercise, we believe it is insufficient preparation for a stress episode. In short, if an institution goes into stress and the assumptions of its living will are violated (which we believe they inevitably shall be), then there is no alternative plan (or planner) for the institution to fall back on.

A further concern about the current approach to resolution is that these interventions may come as a shock to the market. The FDIC and Bank of England (2012) argue that, given their expanded authority, the seizure and resolution of a financial institution should not cause market disruptions because day-to-day operations will be allowed to continue. But the FDIC’s own procedures for resolving small financial institutions—which typically also allow day-to-day operations to continue—suggest that this is not a credible assertion. When a small institution is seized and resolved, this takes place over the course of a weekend, when the bank would normally be closed. And no advanced notice is given to the bank or to the market. The timing and secrecy would presumably not be necessary if the resolution was not expected to cause disruptions to the local banking market. If these measures are deemed

⁸ See for example Kane (2003).

necessary when small institutions are resolved, then it seems that large institutions, whose financial weakness would be highly visible to the markets, would require much more aggressive steps on the part of regulators to prevent market disruption. It seems unlikely that a promise that day-to-day operations would be allowed to continue would be sufficient to prevent strong market reactions to actual or rumored seizure of a large bank.

Our final set of concerns regarding the current direction of bank capital regulation involves supervision. In particular, we believe that too little has been done to remedy the weaknesses in supervision that were exposed during the global financial crisis. Many observers have characterized the financial crisis as, above all else, a failure of supervision.⁹ The political economy of regulation is by now well known. Many have pointed out problems with regulatory capture that have affected supervision¹⁰ as well as excessive forbearance and temporizing on the part of regulators. Even when regulators are (relatively) free from capture or political constraints, they appear to be ill prepared to deal with a fast-evolving financial services industry. The image of the financial regulator who is one (or more) steps behind the private sector is so common as to have become a part of the conventional wisdom regarding regulation.

We believe that improving the performance of supervisors is essential to the success of any future capital regulation regime. An increased reliance on rules—especially simple ones—may appear to offer reduced reliance on supervisors and hence some insulation from the problems mentioned above. We believe, however, that a rules-focused approach to capital regulation also relies heavily on improved supervision in order to obtain its promised benefits. For example, closer monitoring will likely be necessary for effective enforcement of Pillar 1 based approaches, especially to ensure that restrictions on financial institution activities are observed. It is also possible that increased reliance on rules-based regulation may lead to more invasive intervention by supervisors, who may be called on frequently to issue rulings to permit or deny many day-to-day activities that fall within the gray areas of the rules. Both of these outcomes will increase the level of competence and expertise demanded of bank supervisors. We believe, therefore, that a rules-focused approach to capital regulation will be successful only to the extent that supervisors increase their capacity to analyze bank activities and make good decisions. Without this, supervision may fail yet again.

III. WHAT CHANGES SHOULD BE MADE TO CAPITAL REGULATION?

Given the concerns with the direction of capital regulation outlined above, a logical question to ask is whether there are concrete steps that can be taken to address these concerns in ways that will improve the performance of bank capital regulation. Although it is difficult to enumerate all the goals of bank regulation succinctly, improved performance of bank capital regulation would be associated with greater resilience of the financial system and a reduced impact of any financial instability on the payment system.

⁹ See for example U.S. Financial Crisis Inquiry Commission (2011), and IMF (2011b).

¹⁰ See for example Barofsky (2012).

We believe that the concerns expressed above can be addressed by several big-picture changes in regulatory strategy that we describe below. These broad changes in turn suggest a concrete framework for bank capital regulation, which we will describe in the following section of the paper. The strategies, and the components of the framework they suggest, are not necessarily new. But they do suggest new combinations of existing ideas and tools in bank regulation that we believe will result in a better regulatory system. Each of the broad changes we suggest is directed at one of the pillars of bank capital regulation. Therefore, we begin by discussing a broad change to Pillar 1, Rules.

The main change to Pillar 1 that we propose is to reduce the complexity of some of the key rules imposed on banks. The intention of doing so is to reduce the incentive to engage in regulatory capital arbitrage, and to redirect the banks' efforts to reduce their capital burdens into more productive activities, which will be explained below.

A sensible place to begin simplifying the rules on banks is with the definition of capital. One lesson from the crisis is that many of the instruments counted as capital for regulatory purposes did not absorb losses in practice, as capital ought to do. Consequently, they were not recognized by the market as capital. Subordinated debt is an example of such an instrument. Although it was intended to absorb losses after the depletion of a bank's equity, subordinated debt was not allowed to serve this purpose during the financial crisis. Instead, regulators injected equity into banks, obviating the need to impose losses on the subordinated debt. In other words, regulators bailed out subordinated debtholders.

In response to this experience, one of Basel 3's main proposals is to tweak the subordinated debt contract in the hopes of making the resulting contingent convertible debt perform more like equity. But this result may be very difficult to achieve, because of the inherent complexity of the contingent convertible debt contract. As we argue in another paper (Fullenkamp, Rochon, Sharma, 2014 forthcoming), contingent convertibles are vulnerable to several problems that can render them ineffective or even make them a threat to bank solvency. We believe that the best alternative, therefore, is to de-recognize subordinated debt as a Tier 2 equity instrument and eliminate Tier 2 completely from the capital standards.¹¹

In addition, the experience with instruments such as callable preferred shares also demonstrates that so-called hybrid Tier 1 equity cannot be relied on to absorb potential losses. Basel's elimination of most hybrid instruments and intangible assets from Tier 1 equity was therefore a welcome step that should be carried further: only common equity should be counted as capital for regulatory purposes.

Another main source of complexity in the rules faced by banks is the risk-weighting systems, which are a defining feature of the current approach to setting bank capital requirements. Although the financial markets are by now used to thinking of capital requirements expressed in terms of capital divided by risk-weighted assets, this way of measuring minimum capital is

¹¹This step was considered but rejected by the Basel Committee (see Basel (2010)).

now openly criticized in various fora.¹² Because of the inclusion of additional types of risks in the Basel standards, the multiplication of approaches that institutions may use to calculate the capital held against each risk, and the increased complexity and diversity of financial institutions' activities, we believe that large and complex financial institutions' capital adequacy simply cannot be meaningfully expressed as a ratio of capital to some measure of risk-weighted assets.

Although setting capital requirements according to risks taken by financial institutions should continue to be a basic principle of bank capital regulation, we believe that the risk weighting of assets has led to capital arbitrage problems and has deterred effective market discipline, as discussed in the previous section. We therefore believe that risk-weighting systems should be abandoned in favor of a different way of making the capital standards risk sensitive, which we will describe in the following section of the paper.

We propose three broad changes to Pillar 2, Supervision, that we believe will address the concerns raised in the previous section of the paper. First, it is essential to build the capacity of bank regulators to significantly higher levels, and bolster their political independence. This is an essential step in preventing large-scale failures of supervision. As Fullenkamp and Sharma (2012) point out, substantial reform of the way that financial regulators are trained, funded, and compensated is necessary to improve financial supervision and independence. Currently, however, governments spend relatively little on financial supervision, and funding is used to maintain political leverage over supervisors. We propose that the changes discussed in Fullenkamp and Sharma (2012), such as the establishment of global training academies for financial regulators, and new funding systems for regulatory agencies based on taxes or fees dedicated to this use, be adopted. Fortunately, new funding and compensation systems for financial regulators could be implemented very quickly, as the private sector has demonstrated in its adoption of clawbacks and other compensation mechanisms. A fee assessed on financial firms' assets at a rate of a few basis points would raise several times the amount of funds that are currently devoted to all financial regulation. Reforms that increase the depth and breadth of regulator training could be implemented within the same time frame allotted for Basel 3's new regulations to be phased in. Given sufficient cooperation between regulatory agencies, universities and international financial institutions such as the IMF, training academies of the kind envisioned by Fullenkamp and Sharma could be fully operational within two to three years.

The second broad change to supervision is to set concrete expectations regarding supervisors' activities, especially in terms of how and when they should respond to changes in bank capital. To the extent that decreasing the complexity of the rules on banks takes weight off of Pillar 1, placing explicit obligations on regulators shifts much of this displaced weight onto Pillar 2. We propose that this should be accomplished by including a prompt, corrective action (PCA) standard in Pillar 2, which requires supervisors to take specific actions when

¹² Acharya et al (2013) provides evidence that risk weights are not the right tools to use in assessing the level of bank capital requirement.

various conditions are met. In the capital framework developed in the next section, we will describe a set of actions that regulators will be required to take when bank capital falls below required levels.

The Basel 3 capital adequacy standards do include some PCA features, notably the capital conservation and countercyclical buffers. Basel 3's capital conservation buffer, for example, requires banks to retain a progressively greater share of their earnings as a bank's capital level drops further below the top value of the buffer range. This is intended to require a bank with insufficient capital to build it up through retained earnings. We believe that such an approach to capital regulation is beneficial, and should be extended into a full PCA program. A fully developed PCA program for banks would specify an extensive set of expectations for bank regulators (and banks) that would require interventions that begin once a bank is less than well capitalized and escalate, if necessary, up to and including regulator-led resolution of the institution.

One particular focus of the PCA regulations should be to take a more graduated approach to seizure of the institution, while at the same time requiring supervisors to maintain credible readiness to intervene in the operation of the bank. Such a graduated approach would build on existing PCA requirements such as restrictions on bank activities and requiring the managers of a bank to submit a turnaround plan for a bank. For example, PCA regulations should also require supervisors to replace the management of banks whose capitalization falls below some level that is low, but presumably would still allow sufficient time for a skilled team of managers to turn around a struggling bank. The PCA regulation should also require bank supervisors to remain engaged with a troubled bank all the way through the process of formulating and executing a resolution plan, should that become necessary. More details on this will be given in the following section.

We realize, however, that PCA remains controversial in the wake of the financial crisis. It has been observed (GAO 11-612) that in the U.S., which did have a PCA policy in place, large banks that did not undergo PCA did not do much worse during the crisis than institutions that did undergo PCA. How to interpret this evidence, however, is unclear, and the U.S. experience may simply be showing that existing PCA standards need revision. For example, the PCA standards may have mandated taking action too late, and the required actions may not have been specific enough. On the other hand, the U.S. FDIC has developed a successful program of intervention into failing small banks, which suggests that intervention into struggling banks is a skill that can be learned, practiced, and developed. The third change we propose to Pillar 2 is to transfer the mechanism for setting minimum capital levels from Pillar 1 to Pillar 2. In other words, we propose that capital standards would not be set by rules, but rather by supervisors on a bank-by-bank basis. Technically, a capital adequacy rule based on a capital-asset ratio is already an individualized standard. In addition, the current capital standards allow supervisors to impose higher capital standards on specific institutions. The change we propose would require supervisors to consider each bank separately and adjust its capital requirements to the bank's exposures. This maintains the risk-sensitivity of capital requirements while also requiring supervisors to respond to changes in individual banks' activities as well as to changes in the broader financial markets and overall economy, as we argue below.

We believe there are several reasons why capital requirements should be individually tailored to banks. First, if capital requirements are to be tied to recapitalization, the capital thresholds should correspond to each institution's actual need for recapitalization, which is directly dependent on the institution's capacity to absorb unexpected losses. This in turn depends on the institution's individual risk profile. For example, a measure of each bank's nonperforming loans is an indicator of future bank failure that should be considered in the setting up of individualized boundaries. Provisioning rules for bad loans, and funding sources, will also impact each bank's risk rating and capital requirements.

Capital requirements should also be set to account for the size and complexity of each individual institution, and their cross border linkages. Indeed, it is well recognized that institutions that could endanger the financial sector due to their sheer size, and that have the scope for cross border negative externalities to emerge from their activities, should hold additional capital. The increased capital provides an additional margin of safety, and prompts banks to internalize some of the costs they impose on the financial system. The Basel standards already require such global systemically important banks to meet certain loss absorbency requirements only with common equity. They also include a systemic risk capital surcharge on large banks, which is determined using a standardized approach based on bank characteristics. But we believe it would be more effective to tailor the capital requirements to each institution's contribution to systemic risk.

An additional justification for individualized capital requirements is that experience has shown that it is far too easy for financial institutions to game any one-size-fits-all requirements that are imposed on the entire industry. Incentives to conduct regulatory capital arbitrage can never be eliminated, but they can be reduced by tailoring capital requirements to each individual institution. This implies, in turn, that capital requirements should vary across time as well as across institutions.

With respect to Pillar 3, we believe that two substantive changes will help market discipline achieve more of its potential to support capital adequacy. The first change is to ensure that capital adequacy standards are simple and transparent enough so that market participants can verify compliance using publicly available information. This change can be partially accomplished by adopting the changes to Pillar 1 discussed above. In particular, simplifying the definition of capital to a number that is routinely reported on the bank's balance sheet enables market participants to measure banks' current levels of capital quickly and easily.

Each bank's capital requirement, similarly, should be expressed in terms of the level of capital rather than a capital-asset ratio. This change would dramatically improve outside investors' ability to monitor banks' capital adequacy, since they would not be required to understand or implement the risk weighting schemes currently being used to calculate required capital. In addition, bank depositors and other investors will be better able to assess changes in the riskiness of each institution. By monitoring a bank's required capital level over time, a depositor or investor will be able to infer whether a bank is becoming more or less risky. Admittedly, this information will probably be used only by a small proportion of

the banks' clients, but these clients will be the ones whose actions determine the funding costs of the bank.

The second major change to market discipline is to focus it on the regulators as well as on the banks. The broad changes to bank regulation discussed above would create minimum capital standards that are expressed in terms of levels of capital and that are set for each institution individually. In such a setting, we believe that banks will have an increased incentive to monitor each other, and to disclose information about their activities. If a bank finds its capital requirement too onerous, it would have the incentive to compare itself to other banks with lower capital requirements, and to make the argument to regulators that it deserves lower capital requirements as well. Instead of pursuing regulatory capital arbitrage if they wish to reduce their capital burdens, banks would have an incentive to put their efforts into demonstrating to regulators that they truly deserve to have their capital requirements reduced. These efforts would focus market discipline on regulators.

To make its argument for reduced capital requirements credible, the bank would have to present hard evidence. For example, it could disclose more detailed information about its activities and strategies. Or it could disclose new risk models or other analytical tools that it has developed. Banks will most likely present their cases for lower capital requirements to regulators first, but they will also take their complaints to the public as well, in the hopes of enlisting the help of investors and experts in pressing the banks' case with regulators.

Importantly, the burden of proof in this system is on the banks to prove that their capital requirements are too high. In the previous section, we discussed how under the current system, the presumption is that a bank's capital is adequate, if it follows the rules. This implies that the burden of proof is on the regulators to prove that a bank's capital is too low. Shifting the presumption from the banks back onto the regulators levels the playing field and gives banks an incentive to monitor the work of the regulators.

Investors will also exercise market discipline on the regulators. The discipline will be focused on making sure the regulators live up to their PCA obligations, as well as on the levels of capital they choose. The simplicity and transparency resulting from the simplifications to the definition of capital and the statement of capital adequacy standards would make it possible for investors and other members of the general public to judge whether a bank is meeting its capital requirements, and if its capital is significantly below required levels, whether regulators are taking the required actions to remedy the situation. This will enable investors to monitor regulators' actions and provide evidence they can use to point out regulators' shortcomings to the rest of the public, and to the regulators' bosses as well.

Sufficient monitoring and supervision of regulators has always been needed to ensure that regulations, including PCA standards, are enforced in a timely fashion. Creating a set of explicit expectations specifying the actions regulators must take, and increasing the transparency of capital regulation will facilitate this monitoring and make it more likely that these standards will be enforced. It has long been acknowledged that society needs to

regulate its financial regulators better¹³, and we believe that our proposal addresses this need through improved market discipline.

We believe that the changes we suggest will address the issues and concerns raised in the previous section. Our broad proposals simplify the rules that banks must follow, explicitly include restructuring and resolution in the capital adequacy regulation system, and improve the ability of supervisors to fulfill their role in the financial system. Our proposals go beyond these three tasks, however, because of the need to ensure that the new system of regulation would be robust and feasible. In particular, we attempted to design changes that would make the three pillars of regulation work together to improve the robustness of our envisioned system of regulation. The revisions to Pillar 1—especially the simplification of rules and the definition of capital—greatly enhance Pillar 3, by making market discipline easier to perform, and by giving greater incentives to pursue it. The improvement in Pillar 3, meanwhile, supports the proper use of Pillar 2 by focusing much of the market discipline on the regulators. That in turn will give them more incentive to live up to the goals laid out for them in Pillar 1.

In the next section, we describe a framework showing how a bank capital regulation system could be implemented if the changes proposed in this section are carried out.

IV. A NEW FRAMEWORK FOR BANK CAPITAL REGULATION

The proposed changes to capital regulation discussed in the previous section yield a set of specifications to use in designing a new framework for capital regulation. These specifications include the following features:

- Capital requirements set in terms of levels of common equity, on a bank-by-bank basis, by bank supervisors
- Prompt, corrective action (PCA) regime built into the capital requirements
- Disclosure requirements sufficient to facilitate bank compliance with capital requirements, public and private monitoring of bank compliance with capital requirements, and private monitoring of regulator compliance with PCA standards

There are many possible ways to design a system that meets these specifications. What follows is an attempt to design a simple system of capital regulation that meets the specifications given above. We also attempted to fill in some of the practical details that will help the reader envision how the process of capital regulation would proceed through time. We believe that this is important, given that we are proposing a system of dynamic capital requirements.

The heart of our proposed regime for capital regulation is a modified (s,S) approach. This simple mechanism has been used to model the inventory policy of manufacturing or retailing firms, as well as other activities involving the maintenance of a stock of some good or asset.

¹³ See for example Kane (2010).

In addition, the capital conservation buffer and procyclical buffer prescribed by Basel 3 are also variations on the (s, S) approach. The basic situation envisioned by this approach is that some agent finds it beneficial to maintain a stock X of some good or asset, where the flows into and out of this stock are random, and the maintenance and adjustment of this stock has a set of costs and benefits associated with it. This situation leads the agent to choose a lower bound for the stock, called s, and an upper bound for the stock, called S, and then the stock is allowed to fluctuate without interference until one of the boundaries is reached. In inventory management, for example, when the stock of a good held for sale reaches the lower bound s, the agent adds to the stock of the good in order to bring the level of this stock to S, the upper bound of the range. Generally speaking, breaching the lower bound s is thought to be very costly to the agent, while maintaining too much stock also has costs, but they are less severe.

Using an (s, S) approach as the basis of regulation is attractive because reaching, or breaching, one or more of the boundaries is a clear signal that some action is necessary. The possibility to require various specific actions in response to declines in bank capital below predetermined boundaries suggests that an (s, S) approach provides a simple means of embedding a resolution framework into the capital adequacy standards.

Therefore, we propose a regime for capital adequacy regulation based on the (s, S) approach. In other words, financial institutions will manage their capital stocks with the goal of maintaining capital between (or above) important boundaries, and this performance will be monitored by regulators. But our proposal makes several departures from the standard (s, S) approach. First, the (s, S) approach we propose has three boundaries rather than two, which we will call s_1 , s_2 , and s_3 . Let $s_1 < s_2 < s_3$ in the discussion that follows. Second, regulators rather than the financial institutions will choose the values for these boundaries. Finally, the boundaries define levels of capital at which the regulators, not the financial institutions, take action. Many of these actions are intended to prod (or require) the financial institution to increase its level of capital to an acceptable level. Other required actions, however, include the seizure and possible resolution of the institution by regulators. Thus, this “regulatory (s, S)” approach to bank capital regulation integrates bank recapitalization and resolution into capital regulation in a simple way, by embedding prompt, corrective action (PCA) requirements into the capital requirements.

The three boundaries for capital, s_1 , s_2 , and s_3 , should be chosen to correspond to economically meaningful assessments of the bank’s risk. As discussed in the previous section, these boundaries are expressed in terms of levels of common equity. These are most easily understood by beginning with the uppermost capital boundary, s_3 . The level s_3 is taken to be the minimum amount of capital at which a particular institution can be considered to be “well capitalized.” For any bank, being well capitalized means that it has a sufficient capital cushion to protect the institution from all but the most extreme unexpected losses that could be caused by its own particular portfolio of exposures. But for larger and more complex banks, being well capitalized also has a systemic dimension that places further conditions on the definition of this boundary. For example, a systemically important bank might only be considered well capitalized if the level of its capital is so great that it is thought to have a positive impact on systemic stability.

The level s_2 represents the minimum amount of capital at which an institution can be considered to be “adequately capitalized.” For every bank, adequate capitalization means that it has a sufficient level of capital to withstand the vast majority of unexpected losses caused by its own portfolio of exposures, but not enough capital to protect the institution from extreme unexpected losses that occur infrequently. For large and complex banks, adequate capitalization also implies that the institution has a neutral impact on overall financial stability.

The lowest capital threshold s_1 is taken to be the amount of capital below which the institution is considered “critically undercapitalized” and is not capable of withstanding the majority of unexpected losses.¹⁴ For large and complex institutions, being critically undercapitalized also means that the institution’s condition is thought to reduce the resiliency of the financial system.

These boundaries, in turn, correspond to the following mandatory actions on the part of regulators. If an institution’s capital is above s_3 , regulators do not have any obligations beyond normal monitoring. If capital falls below s_3 and is between s_2 and s_3 , regulators impose capital conservation measures similar to those in the Basel 3 standards, in which company payouts of earnings and compensation practices are increasingly restricted. These measures are intended to force institutions to raise their capital back to s_3 , but to do so through increases in retained earnings rather than through adjusting their balance sheets.

If capital falls below s_2 and is between s_1 and s_2 , this triggers an increase in the intensity of the prompt corrective action regime. As the bank’s capital level falls further below s_2 , regulators will be required to increasingly restrict the company’s activities in the various financial markets and to require the bank’s management to formulate and implement a recapitalization plan. These restrictions will generally have escalating impacts on the institution’s balance sheet and off-balance-sheet commitments. If capital falls below s_1 , however, operational control over the institution is seized by regulators and management is replaced by a team selected by the regulatory agency.

The FDIC experience in resolving smaller banks suggests that seizure need not lead to long periods of government control—but this will depend on regulators’ preparedness, and the quality of the recovery or resolution plans they are able to construct. Under our proposal, once control over a bank is seized by regulators, the goal of the managers who are put in place by the regulators would be to recapitalize the bank to a capital level of s_2 and return its control to privately selected managers, who would then be responsible for increasing the bank’s capital to the level s_3 (and above). But if recapitalization could not be done at a reasonable cost to taxpayers—for example, by an equity issuance or asset sale to private investors—then regulators would be charged with resolving the institution. Regulators would be empowered to use a wide variety of mechanisms to resolve the bank, but they would be

¹⁴It is important to recognize that an institution that is critically undercapitalized still has positive capital, so that s_1 is greater than zero.

required to follow the FSB (2011) resolution principles, which include imposing losses on shareholders and bondholders before taxpayers.

We now move on to describe how some of the key details of our alternative capital regulation framework would function. First, we consider the choice of the capital boundaries s_1 , s_2 , and s_3 . In order for a system of individualized capital requirements to maintain sensitivity to the risks taken on by banks, the capital boundaries should be reset periodically by bank supervisors. Regulators should have some discretion over the frequency with which the required capital boundaries are revised, but generally follow a predictable schedule of updates. We believe that the capital boundaries should be updated more frequently than once per year, especially for large institutions. Quarterly revision seems to address the tradeoff between maintaining adequate and timely boundaries on capital and not imposing too great a burden on institutions or regulators. Additionally, regulators could reserve the right to update the boundaries based on the arrival of material information about the institution or the market.

There are many technical and practical issues that affect the choices of the boundaries s_1 , s_2 , and s_3 . For example, one challenge regulators face is that shocks typically deplete capital in a discontinuous fashion, and by a large discrete amount. In addition, the choice of s_3 will in turn affect the values chosen for s_2 and s_1 . It is possible that s_3 may be an acceptable lower bound on its own, but it may in turn imply unacceptable values for s_2 and s_1 . That is, the choice of s_3 may push s_2 or s_1 down to levels that may be too low to provide earnings retention, or replacement of management, respectively, an adequate chance to recapitalize an institution. Similarly, s_1 may be set too low to provide adequate protection against loss to the taxpayers by preventing the disorderly resolution of weakened institutions. It is especially important that the value for s_1 be sufficiently greater than the insolvency threshold so that a new management team would generally have adequate time to implement a turnaround plan.

The other aspect of our framework that requires additional detail is disclosure regulation. In a system of individualized capital requirements, disclosure of accurate and timely information becomes even more important than before. Public disclosure of capital boundaries is essential to limit the space for regulatory discretion and forbearance. To begin with, the individual capital boundaries s_1 , s_2 , and s_3 for each institution must be publicly disclosed and updated regularly by the supervisory authorities. These boundaries should be announced shortly before the start of the period during which they need to apply. For example, the boundaries could be calculated and announced during the final month of a quarter, in order for the bank to have time to make adjustments before the new boundaries bind.

It may be detrimental, however, to have the regulators' specific calculations disclosed to the public or to the banks themselves. Showing the banks exact formulas for the capital boundaries invites them to game the rules and engage in regulatory arbitrage. Although it is probably impossible to completely prevent banks from inferring the rules and gaming the system, some ambiguity about the regulators' calculations would help curb this activity. On the other hand, it is also unfair to keep the banks completely in the dark regarding how regulators arrived at the particular capital boundaries. A potentially effective partial disclosure could be to follow the example of the Fair, Isaac and Co.'s disclosures of

information that go into the FICO score. Fair, Isaac and Co. discloses the general categories of information that go into the calculation of the FICO score, and the relative weight of each overall area, but does not disclose the details of what exact variables are included or how the credit score is calculated.

The banks, for their part, should of course have to disclose their capital position. To the extent that only common equity would count as capital, this seems like a trivial burden. Nonetheless, increased frequency of reporting this value may be necessary to facilitate effective regulation and market discipline. Currently, common equity is only reported at the end of each quarter. Such a critical number should be updated more frequently, at least monthly, as long as this is both technically feasible and the cost of compliance is not excessive. We believe that, given the development of information systems in banks, and the extensive tracking that IT systems already perform for many bank functions, this goal should be attainable. More frequent financial reporting will still require the estimation of many quantities, however, especially those affected by the principle of accrual. Nonetheless, we are optimistic that estimates of capital with acceptably narrow confidence intervals can be constructed at reasonable cost.

But accuracy of financial reporting has remained a problem, despite efforts such as the Sarbanes-Oxley Act in the U.S., which makes corporate managers personally liable for the accuracy of their companies' financial statements. For example, several instances of "window dressing" on the part of financial institutions were discovered in the wake of the financial crisis. This practice involved moving liabilities off of a financial institution's balance sheets just before the end of a quarter and then bringing them back just after the start of the next quarter, using instruments such as overcollateralized repurchase agreements. Thus, in addition to requiring more frequent disclosure of regulatory capital, banks should be subject to fines based on accuracy and timeliness of information disclosure.

A fee could be imposed whenever regulators have substantial reasons to believe that a financial institution has misreported and/or engaged in improper and inaccurate disclosure, or excessively delayed its required disclosures. In order to limit the potential for arbitrage, this fee would need to be prohibitively high, and to rise exponentially if banks continue to engage in these practices. In addition, the fee should increase based on regulators' assessment of the weakness of the overall banking system. That is, when the system is weakening, fines should increase to reflect the increased social value of accurate and timely information about individual institutions. This standard would be most effective and fair if a globally accepted and commonly applied accounting standard were in place, but we believe it is still worthwhile in a world of disparate and sometimes conflicting accounting standards.

V. A BRIEF DEFENSE OF THE NEW FRAMEWORK

Moving to a system of individualized capital standards admittedly places a large burden on regulators. There are many technical and practical issues that they must decide how to face, and moreover these issues affect each other. Even the elements of the prompt corrective action regime must be chosen carefully. For example, during episodes of turmoil, regulators may try to require banks to raise capital precisely when they are least attractive to investors

and when other banks are also trying to raise capital. Thus, setting capital boundaries and prescribing corrective actions will tax regulators' judgment and experience as well as their quantitative skills.

Many observers will be justifiably skeptical that regulators will ever be up to the task of setting and enforcing individualized bank capital requirements. To this claim, we have three responses. First, the Pillar 3 reforms in our proposal will lead to increased market oversight of regulation. Under our proposal, those outside the banks and outside the regulatory agencies will be able to know the exact capital requirements for individual banks, and to assess their compliance, probably for the first time in the history of bank capital regulation. This will facilitate and encourage market discipline on banks and on regulators as well. As we have discussed above, and continue to discuss below, effective market discipline aimed at the regulators will help prevent, and if necessary, correct, problems in the quality of supervision.

The second point is that improving the capacity and independence of regulators is a critical task that must be undertaken, regardless of the bank capital regulation system chosen. For example, the IMF (2008) concludes that only if supervision is strengthened is there hope to effectively deliver on the challenging regulatory reform agenda. We believe that the set of skills that regulators need to possess in order to truly make the current system of bank capital regulation work as intended is not very different from the set of skills that they need in order to set and enforce capital requirements on a bank-by-bank basis. For example, under the current system, regulators need to deeply and comprehensively understand the technical details of the internal models used by banks to estimate their risk exposures, and they also need to understand the practical issues of implementing these models on actual data equally well, so that they can make a truly informed decision regarding whether to approve a bank's internal risk model. We believe that these skills are virtually identical to the skills that supervisors need to possess in order to competently set a bank's capital requirement. We also discuss this further below.

And finally, we believe that given the current state of knowledge about risk management developed during the past several decades, regulators can access various sources of guidance to help choose capital thresholds. Many of these sources of guidance have already been included in the Basel capital standards, though they are currently implemented by banks rather than supervisors. In Appendix A, we illustrate how some of the lessons learned could be applied by regulators to the specific context of choosing capital adequacy thresholds. Moreover, we believe that banks will continue to create new models that they will persuade regulators to use in setting individualized capital requirements.

A related potential criticism of our framework is that relying on supervisory discretion is inferior to relying on rules. The regulatory (s, S) approach is a step toward the pre-Basel past, in that it leaves capital requirements up to the discretion of the regulators. Admittedly, a potential weakness of this approach is that it may create new opportunities for regulators to apply inconsistent standards across institutions as well as to temporize and exercise lenience. But this is why our framework aims to significantly improve market discipline and focus it directly on the regulators. Improved market discipline will be facilitated by extensive

disclosure of each institution's capital boundaries and the information used to calculate the boundaries (as well as their relative impact on the calculations). This will enable market participants to monitor regulators' actions and compare them across banks. For example, market discipline will enforce the principle that the capital thresholds s_1 , s_2 , and s_3 may differ across banks but must still have the same economic meaning for each institution.

One important type of discretion that regulators would have under our proposal is discretion over how to estimate the capital thresholds. We believe that an important advantage to our approach is that supervisors can use multiple models in order to inform their decisions, rather than relying only on the particular internal model (or possibly models) chosen by the bank. We do not foresee that regulators will develop models per se (though this is possible), but rather they will be in the position to choose the models on which they base the individualized capital requirements. As we argue above, banks will have the incentive to persuade regulators to adopt new sources of data and implement new risk-measurement techniques, in the hopes that these will result in lower levels of required capital. But under our proposal, regulators will have to be convinced to use these new models. We believe that this will motivate banks to provide more and better information about how a new model works and how well it performs relative to existing models. And regulators can take their time to fully understand newly created models, and to subject them to additional testing if they wish.

But the existence of supervisory discretion raises the legitimate concern that a race to the bottom may take place between different bank supervisory agencies, or across jurisdictions, in which regulators relax capital requirements in order to give the banks they supervise a competitive advantage. Supervisors may not be able to withstand the demands for regulatory relief pressed on them by banks and politicians. Unfortunately, "competitions in laxity" have been documented in the past, and indeed a global decline in capital-asset ratios among internationally active banks was one of the motivations that led to the initial adoption of the Basel accords. Any system of capital regulation should try to discourage a race to the bottom.

We believe that resisting pressures to relax existing bank capital requirements can be as difficult in rules-based regulatory systems as it is in discretion-based approaches. Races to the bottom can and do take place in rules-focused regulatory systems, due to the scope for interpretation of the rules. Relaxation of rules emerged as a concern, for example, in connection with the definition of Tier 1 capital during the first two decades of the Basel accords, in which hybrid capital instruments were included as Tier 1 capital.

Lobbying pressure on regulators has also been extremely intense in the past few years as new rules have been drafted, and this has resulted in significant implementation delays as well as alterations of the rules that have been implemented. For example, the new Liquidity Coverage Ratio rule has been significantly amended twice since it initially appeared, in order to allow additional, less liquid instruments to count as part of High Quality Liquid Assets. These amendments were the result of private sector comments and requests. It is not clear, therefore, that a regulatory system that has more emphasis on Pillar 2 would be any more vulnerable to industry pressure than the current system has already revealed itself to be.

One of the best ways to prevent a race to the bottom, we believe, is to reduce industry and political pressures on regulators to lower their standards. We believe that a particularly effective way to do this is by increasing the political independence of regulators, as is argued in Fullenkamp and Sharma (2012). If legislators have less day-to-day influence over supervisors, then supervisors will be better insulated from banks' calls for lower capital requirements, which are now often directed at legislators. In addition, better trained supervisors will have an improved ability to counter the banks' arguments in favor of lower capital requirements. Thus, increased political independence and better training of supervisors are essential to enable any capital regulation system to resist the incentive to participate in a race to the bottom.

We believe that a second highly effective way to combat industry pressures on supervisors is through effective public scrutiny—that is, through enhancing Pillar 3. Our proposal does make regulators more accountable to the market than they are under the current system. This is one of the most innovative features of our proposal: we facilitate improved market discipline on regulators as well as on banks. Enhanced market discipline will greatly mitigate many of the pitfalls of discretion, we believe. The current system of bank capital regulation cannot achieve this enhanced market discipline because of its complexity and the opacity of its measures of capital with respect to the private sector. Under our proposal, each financial institution's capital requirement will be clear to all market participants, and where the institution's actual level of capital stands relative to this requirement will be clear as well. This will significantly improve market monitoring of both financial institutions and regulators. Private-sector participants, including the media, will be able to point out when capital standards appear contradictory or insufficient.

We believe that capital requirements that are easily understood and measured, and which are set on an institution by institution basis, will instigate a lively and penetrating public discussion regarding the levels of required capital and differences in required capital across various institutions and jurisdictions. This discussion will also focus public scrutiny on regulators' decisions regarding the capital requirements they set. Moreover, increased scrutiny will also help impose time consistency on regulator decisions, to the extent that market participants keep records or remember previous decisions.

Finally, as we note above, our proposal creates a dramatic shift in presumption regarding capital adequacy. Under a rules-based system, an institution that complies with the rules is presumed to have adequate capital. If regulators believe that an institution's capital level is inadequate despite regulatory compliance, the regulators must prove that the capital requirement for this institution is too low. Under our proposal, on the other hand, the presumption shifts to the regulators, who set the capital requirements for each institution. That is, the presumption is that the regulators have set appropriate capital requirements, and the financial institution bears the burden of proving that its capital requirements are too high. This places the regulators in a position that is better able to withstand pressure from individual institutions.

Another potential criticism of our proposal is that it would likely require an increase in the number of supervisors, which will be expensive. In addition, the implementation of our

proposal would incur significant startup costs. For example, an intensive review of each financial institution's assets, liabilities, and contingent commitments would be necessary, so that supervisors can plan how they would seize control of any financial institution whose capital falls below its minimum capital level s_1 . Such a review would need to be even more comprehensive than the asset quality review being conducted in the European Union in preparation for the banking union there. We believe that the benefits of an increase in the number of supervisors, and such an intensive review of bank exposures, are worth the cost.

A further potential cost of this proposal is that it will probably lead to more aggressive and invasive monitoring of financial firms by supervisors. Although this is a legitimate concern, it should be noted that on-site supervisors are already embedded in large and systemically important banks. This is done routinely in the United States. In addition, as we mentioned above, closer monitoring is also necessary for effective enforcement of Pillar 1 based approaches, especially to ensure that restrictions on financial institution activities are observed.

In addition to mitigating the concerns that we discuss in Section 2, we believe that our proposed framework for bank regulation offers several further advantages over most countries' current regulatory systems that have not been discussed so far. First, our system mandates regulator intervention before insolvency that is specifically aimed at recapitalizing the bank, which will decrease the likelihood that the institution will need to go through a resolution process. Second, should resolution still be necessary, our approach will minimize the associated market disturbance and taxpayer cost. And finally, our framework has the potential to significantly mitigate the Too Big To Fail (TBTF) problem. We expand on these claims below.

We claim that the supervisory (s, S) approach reduces the likelihood that banks will need to go through a resolution process because intervention will occur much sooner than under the status quo.¹⁵ Under our proposal, bank regulators are obligated to seize control of a bank whose capital falls below the bottom threshold s_1 . As was discussed above, this level of capital will be significantly greater than zero and is intended to give new managers sufficient time to implement a turnaround plan for the institution. The seizure of operating control, moreover, will simply be an escalation of increasingly stringent prompt, corrective action measures that supervisors will be required to take as capital falls below the upper threshold s_3 .

Our integrated approach to recapitalization and resolution also reduces the potential for market disruption associated with resolution. Under our proposal, regulators are involved soon enough so that a contingency plan may be updated, adapted, or changed significantly as both the bank's financial strength and market conditions change. Regulators will become better informed about the true financial condition of a weak bank sooner, as a result of the escalating prompt, corrective action measures that are required to be put in place as the

¹⁵ The FDIC uses a PCA approach, with trigger activated in extreme cases, when capital is below 2%.

bank's capital level falls further below the s_3 level. These advantages of our proposal will lead to contingency plans that are more likely to be successfully implemented.

Earlier intervention is also likely to be less disruptive because of the magnitude of the task at hand. The comments of some banks regarding their contingency plan preparations, as reported in the *Wall Street Journal* (July 3, 2012), are quite suggestive in this regard:

Goldman Sachs Group Inc. said that, in the event it goes under, it would be better to sell its various businesses individually rather than to initiate a companywide asset liquidation that could weigh on markets. The latter option "would likely take more time" and "would likely not achieve maximum recovery for stakeholders as franchise value would likely erode quickly," the bank said.

Citigroup Inc. said in some scenarios it would be better to sell the bank's brokerage businesses before the parent company failed. It also said its banking business could be split off from the parent company and recapitalized as a smaller bank.

UBS AG said that, due to the size of its operations, only its very large competitors would likely be capable of buying its businesses in a crisis.

If selling entire business lines is appropriate, as these comments suggest, then it would be far better to initiate these sales as part of a turnaround program rather than as part of a resolution process. The prices obtained by these sales would be much higher, and the impact on the markets would be much lower, than if regulators wait until the institution is insolvent before intervening. The market disruptions caused by our proposal should also be much smaller because the interventions are gradual, and they are known in advance. In other words, under our proposal, regulatory intervention, even including resolution, should not come as a shock to the market.

The third advantage of our framework is that it has the potential to reduce the Too Big To Fail problem by making it possible to restructure and resolve very large financial institutions without threatening financial stability. We believe that one of the main requirements for successful resolution of large and systemically important institutions is that interventions intended to restructure or resolve an institution must be credible. By credible, we mean that the creditors, counterparties, and shareholders of the weak institution, and the rest of the market as well, must have confidence that the interventions taken will stabilize the financial institution's condition quickly and are likely to improve the institution's financial health in the near term. One of the main reasons why the TBTF problem persists, we believe, is that the current resolution framework does not provide this crucial credibility. Because the current system lacks this credibility, there is understandable reluctance to intervene in large institutions, which contributes to the TBTF problem.

In order for the interventions prescribed by a bank resolution system to be credible, the capacity of the resolution system to deal with a distressed institution must be quite deep. Depth of capacity with respect to resolution means that any persons who intervene in the institution must be well informed about the institution's condition before the intervention

begins, that they have prepared multiple layers of contingency plans in order to deal with anticipated problems in the institution, and that they have the time and ability to react to any surprises that they discover regarding the institution's true financial condition, once the intervention is underway. In addition, those charged with intervening in the troubled institution must be vested with sufficient authority to make all necessary changes to an institution's activities, management, and exposures, and make them quickly.

We believe that our capital regulation framework provides the depth of capacity to resolve large and systemically important financial institutions. This depth stems from the definitions of capital boundaries in our framework, in conjunction with the integration of supervisor-led restructuring and resolution into the PCA requirements. Taken together, these features create an intervention plan that is specific enough to give regulators directives to take concrete actions, yet flexible enough to allow the interventions to be tailored to the individual banks' circumstances and needs. In addition, the progression of intervention is known to all in the markets, which we believe will decrease the uncertainty that often exacerbates the situation.

Our definitions of the capital boundaries contribute to depth of resolution capacity by triggering earlier interventions into an institution's activities. The economic meanings of the capital boundaries imply that the minimum capital boundaries will increase with institutional size, but at an increasing rate. This will occur because, as we argue above, the definitions of "well capitalized," "adequately capitalized," and "critically undercapitalized" should take an institution's contribution to systemic risk into account. To the extent that contribution to systemic risk increases more than proportionally as an institution's size increases, this implies that capital boundaries defined as we have done will also increase more than proportionally with institutional size. Thus, it will take a smaller decrease in capital, relative to the size of the institution, to trigger regulatory intervention into a larger bank's operations than into a smaller bank's operations. This in turn implies that regulators would intervene earlier in a larger bank's distress process—that is, at a greater distance from default—than they would in a smaller bank's distress process. This will increase the likelihood that interventions are given sufficient time to restore the financial strength of an institution.

The integration of supervisor-led resolution into our framework also contributes significant depth of resolution capacity. First, as discussed above, one key aspect of our proposed PCA requirements is that regulators must maintain credible readiness to take over a weak financial institution. This necessarily involves the creation of multiple layers of detailed contingency plans, which in turn are updated frequently. The interventions themselves, moreover, would escalate more quickly for large institutions than small ones, and proceed according to a progression that is known to all in the markets, due to the PCA requirements. The interventions would culminate in liquidation of the institution and imposition of losses on creditors, coordinated by the bank supervisors, if the bank cannot be returned to financial health.

Under our proposal, regulators would have the information, the authority, and the time that together create deep capacity for resolution. We believe that the depth of capacity embodied in our proposal will establish the credibility of supervisors to resolve large and systemically important institutions. Although no intervention is guaranteed to be credible or successful,

we believe that our proposal offers the best way to create sufficiently deep capacity for resolution of any large and systemically important institution.

VI. CONCLUSION: WHERE DO WE GO FROM HERE?

When a crisis of any sort occurs, there is always a push to create laws and regulations to address its perceived causes. But we believe that the response to the global financial crisis so far has relied too heavily on making rules—the first pillar of regulation. The volume and complexity of the new rules that have been implemented and proposed suggest an overemphasis on Pillar 1. The potentially disappointing results of this strategy—unfulfilled objectives, regulatory arbitrage, and unintended consequences—are well known and documented in the recent history of bank capital regulation, yet the political economy of regulation makes it difficult to avoid this path.

If we are to avoid this course, the first step is to develop a credible alternative. In this paper, we presented such an alternative path for future bank regulation. We proposed significant changes to all three pillars of regulation, but the proposal does not place the greatest weight on Pillar 1, in contrast to the current regulatory strategy. Of course, if weight is taken from Pillar 1, it must be reallocated to the other pillars—and our proposal moves most of the displaced weight onto Pillar 2, supervision, as well as moving a significant amount of weight onto Pillar 3, market discipline.

Although we believe that our proposed framework will successfully address the concerns with capital regulation that we discussed in Section 2, a large number of bank capital regulation issues remain to be dealt with. In the remainder of this paper, we summarize these issues and discuss what our proposed framework can contribute to the management of these issues.

One priority of future reforms should be the expansion of capital regulation to include all institutions that perform financial functions. In Fullenkamp and Sharma (2012), it is argued that financial regulation should encompass all financial activity. Given capital regulation's centrality to financial stability, this seems to be a sensible place to begin the process of expanding the perimeter of regulation. The system of capital regulation developed in this paper, and in particular the (s, S) model, could be applied to any institution that performs some financial service.

This paper's focus on integrating resolution into the bank capital framework also highlights the need for improvement and global harmonization of bankruptcy codes for financial institutions. Bankruptcy codes and procedures specific to financial institutions should be developed that facilitate orderly resolution of troubled institutions while minimizing market disturbances that could threaten financial stability. This need is well known, and the Basel Committee (2010) explicitly called for such improvements in bankruptcy codes. The Committee also acknowledged, however, that achieving this goal will require a great deal of time.

But we also believe that in the meantime, effective policies and procedures are needed that can bring troubled institutions, especially large and systemically important ones, through the resolution process successfully. As we argue above, our proposed system of regulation is well suited for bridging this interim period, provided that enabling legislation is put in place that facilitates regulator intervention and regulator-led resolution as described in our proposal. Moreover, the lessons learned from regulators' experience under our proposed system will likely be incorporated into any proposed bankruptcy code for financial institutions. In other words, we believe that our proposed system of capital regulation will be an effective laboratory for discovering policies and procedures that should be included in future bankruptcy codes.

A further area where work is needed is macroprudential risk management. To monitor systemic risk and prevent its sources, such as credit excesses, from getting out of hand, a variety of macro-prudential tools have been suggested. Academics (Brunnermeier *et al* (2009), Hanson *et al* (2011)) as well as institutions such as the BIS (Borio and Lowe (2002)) and Bank of England (2009, 2011), have contributed various approaches and specific models. The IMF has been a particularly active participant in the generation of new ideas in this area, through its semiannual *Global Financial Stability Report*. Since 2009, various chapters of the GFSR¹⁶ have addressed systemic risk measurement, the role of liquidity risk, the redesign of financial regulation and regulatory intervention, among other topics.¹⁷ This development is especially welcome, to the extent that improved measurement of systemic risk will enhance the regulators' ability to set the parameters of the (s, S) approach presented in this paper. Our framework does not rule out using a broad countercyclical measure of excessive credit growth, as in the Basel 3 capital buffer, but it also does not limit regulators to this measure either. Ideally, regulators will experiment and define best practices that help them assign appropriate (s, S) limits to each institution using a combination of institution-specific and systemic risk measures.

International harmonization of bank regulation and supervision remains a difficult and politically charged issue that also needs to be addressed. Harmonization is the topic of debate in many policy fora. One approach to ensure consistency of regulation across jurisdictions could be to use our (s,S) approach not only nationally, but globally. This would require a college of regulators deciding on the capital thresholds s_1 , s_2 , and s_3 , and a common understanding of the resolution strategy to apply to these global institutions.

Although the EU has made progress toward a "banking union"—a single regulatory authority for all banks in the Euro zone—there has been a pronounced trend in many other markets toward less international harmonization. And, as Mervyn King observed, international harmonization tends to weaken or fail during times of market stress—banks are global in life but national in death. The regulatory (s, S) approach proposed in this paper is compatible with any level of harmonization, but like all regulatory regimes it may facilitate

¹⁶ See in particular the April 2009, April 2010, October 2010, April 2011, September 2011, and October 2012 and October 2013 issues.

¹⁷ See IMF (2013b), IMF (2011a) for comprehensive studies on this topic.

international harmonization in some ways and hinder it in others. For example, it removes the pressure on regulators to harmonize to arbitrary standards, such as the 8% capital to risk-weighted asset ratio. On the other hand, however, it could lead to the re-emergence of a concern that originally motivated the Basel standards—reducing capital standards as a means of enhancing the international competitiveness of a country's banks. Regardless of the regulatory regime chosen, finding the optimal scope and extent of international harmonization will be difficult.

On a related note, coordination of capital regulations with monetary policy should be further investigated and encouraged. Taylor (2010) highlights the need for an active role for monetary policy, in order to prevent or correct financial imbalances across all financial markets. Also, Chami and Cosimano (2010) point out that there are significant interactions between capital regulation and monetary policy that need to be better understood. As in the case of macroprudential risk factors, such information will ideally become part of the bank regulators' calculations as they tailor the capital requirements to the individual financial institution and country.

Altering the structure of banking institutions, either to segregate trading activities from commercial banking, or simply to reduce the size of institutions, remains a possible future direction for bank capital regulation. With respect to reducing the size of financial institutions, it is important to realize that breaking up banks today may be a way to buy some time, but it is not a permanent solution. Technology and globalization will continue to push the banking industry to consolidate over time, just as they have done during the past three decades to banks and nonfinancial firms as well. Many countries served by a small number of large banks, moreover, may find it difficult to take the political decision to break up large banks. This is often compounded by the push, seen in many countries, to encourage large “national champion” firms to form through consolidation.

Reforming the basic structure of financial institutions may be a necessary part of future regulation, however, and a workable and effective regulatory regime may require a clear distinction or separation between investment banks and deposit-taking institutions. But this is ultimately an issue of incentives, and specifically, whether incentives in universal banks to use deposit funding to pursue excessively risky activities are too strong to be resisted. Regardless of how this issue is resolved, however, we maintain that our capital adequacy framework remains applicable to any financial institution. If simple deposit-taking and lending are ring-fenced or otherwise separated from other activities, our (s, S) approach of capital and prompt, corrective action requirements may still be applied to each type of institution and indeed are still needed as a means to ensure the orderly resolution of a troubled institution, regardless of size.

Finally, given the lessons of the global financial crisis and a recent surge in opinions expressed in the press as well as in the academic literature, a consensus is emerging that a general increase in capital requirements is desirable. Requiring banks to hold more capital is welcome, within reason. There is ample reason to expect that our proposal will also result in banks' holding larger amounts of capital. Our proposal also has the advantage that the levels of required capital are not chosen arbitrarily but rather correspond to economically

meaningful events.¹⁸ But even though holding more capital is an appropriate response to the lessons learned in the crisis, it cannot completely prevent banks from going into distress and needing orderly resolution, unless capital requirements rise to absurdly high levels. And requiring banks to reduce their leverage too severely may depress their profitability to unattractive levels—with consequences for credit growth and hence economic growth.

Calls to raise the overall level of capital in the banking system have therefore been controversial. For example, Vikram Pandit, Citi's CEO, said "Paradoxically, the higher we set capital requirements for banks, the more money flows into unregulated or less regulated sectors of the system, thereby increasing systemic risk." (WSJ – Market Watch, Sept 23 2011). This comment highlights the concern in the financial industry that higher capital requirements will significantly increase the cost of doing business, leading to the problem of regulatory arbitrage and the potential for risks to migrate to the shadow banking system and other less regulated entities. Others (Admati, DeMarzo *et al* (2012) p. 42-43) argue on the contrary that larger capital requirements would provide large social benefits and cost very little. To the claim that increased capital requirements would lead to a "credit crunch", they argue that "the biggest credit crunch in recent memory, the total freezing of credit markets during the recent financial crisis, was not due to too much equity but to the extremely high levels of leverage in the financial system. In other words, credit crunches arise when banks are undercapitalized". The debate has been ongoing for some time, and will likely remain ongoing for a while.

Although the argument regarding the cost of capital is important, it is somewhat premature. Making financial institutions pay the full cost of the risks they take on should be one of the ultimate goals of regulation. But the path from risk to cost runs through regulatory capital: regulatory capital is the explicit price of taking on risk, which in turn implies some money cost to the firm, in terms of decreased profits. The first step in bank capital regulation should be to find the correct price of risk in terms of regulatory capital. In this paper, we have presented a practical system for finding an economically sensible price of risk, including the risk that the institution will fall into distress and need to be resolved. Once regulators have implemented this system, and shown what the new price of risk is in terms of capital, then a more informed discussion about the money cost of capital and risk can take place.

¹⁸ Our proposal would also tend to reduce the countercyclical nature of bank liquidity illustrated in Acharya et al (2011) (*i.e.* banks may hoard excessive liquidity in business downturns as compared to boom times). This would come about because of the expected increased capital requirement in our framework.

Appendix: Choosing the Capital Boundaries

In this appendix, we discuss various methods that could be used to set the capital boundaries s_1 , s_2 , and s_3 . This discussion is intended only to illustrate the wide range of information and tools that supervisors have available to use for this purpose. Supervisors should use a variety of data and qualitative information to set these boundaries and adopt new methods as more is learned about how to measure individual soundness and systemic impacts of financial institutions.

The intuitive descriptions of the boundaries s_1 , s_2 , and s_3 presented in the paper suggest that a Value at Risk (VaR) methodology can be used as a first step in choosing the values of these boundaries for each institution. Although this methodology has some serious weaknesses in terms of its practical execution, its theoretical underpinnings are simple and sound. But two general weaknesses of the VaR do need to be addressed when choosing values for s_1 , s_2 , and s_3 . The first issue is correlations, both across time and across risks. For example, the procyclicality of VaR critical values with respect to several types of risk such as market risk and credit risk is well documented. In addition, the correlations between losses due to different types of risk, such as operational risk and credit risk, are not well understood. The second issue with the VaR methodology is the inability to estimate expected shortfall, or any VaR critical value in the extreme reaches of the lower tail of the loss distribution, with any precision.

One strategy to help choose appropriate values for the capital boundaries s_1 , s_2 and s_3 is to work from the bottom up. If s_2 and s_1 are chosen based on parameters of the loss distribution that can be estimated with high confidence—say, the 90th percentile and the median, respectively—then it is far less likely that these boundaries will be set too low and leave the institution exposed to unforeseen surges in correlations across time or across types of risk. This is because such surges would have been observed frequently enough to have already been factored into the estimate of the 90th percentile or median critical values.

In addition, we can follow the suggestion of Rebonato (2007), who advocates setting a proxy for expected shortfall based on a simple multiple of an extreme value that can be estimated with high confidence, such as the 90th, 95th, or perhaps even the 99th percentile of the loss distribution. This is the practice with respect to the Basel capital requirement for market risk, for example, which multiplies the 99th-percentile loss by a factor of between 3 and 4, depending on the results of the most recent backtesting exercise. Regulators can take a similar approach, by basing the s_3 boundary on a multiple of the s_2 boundary, and adjusting all three capital boundaries upward whenever the number of exceptions in the backtesting exercise applied to the capital boundaries exceeds a given threshold. This would address the difficulty of matching capital to expected shortfall in a way that also helps mitigate model risk.

An additional strategy aimed at mitigating the expected shortfall problem is to require financial institutions to assess their risk and potential loss levels on the basis of market factors experiencing a period of stress—in other words, through stress testing. These

measures would be institution specific, and guidelines in the construction of the scenarios could be enforced by regulators. Examples of these approaches include measures of stressed-VaR or S-VaR, which involves a window comprised of the last 60 days of operation, and the use of other worst-case scenarios, such as the average of VaR and worst-case VaR. The results of institutional stress testing will then factor into the regulators' estimates of the capital boundaries.

A complement to the use of VaR methods as discussed above would be to identify macroeconomic indicators that signal when capital should be built up (e.g. credit/GDP and real asset price inflation above trend). One such measure is part of Basel 3, in the form of a countercyclical capital buffer that will be applied uniformly to all banks. In our proposal, regulators can integrate countercyclical capital increases directly into each bank's capital requirements. Moreover, the size of the increment to the minimum capital bounds is allowed to vary in response to the size and composition of the balance sheet of the institution under review, therefore requiring SIFIs to set aside a proportionally larger amount of capital in case of overexpansion of credit. And under our proposal, there is no predetermined limit for countercyclical increases in capital. Regulators may increase capital requirements quickly and dramatically in case of economic overheating or suspected asset price bubbles. Of course, identifying when countercyclical measures should be released is more difficult. Managing such policies may require some degree of discretion combined with a rule to create predictability. Indeed, the setting up of countercyclical adjustments to minimum capital thresholds must take into account the potential for adverse market dynamics, linked to common exposures and the arbitrage between supervisory rules and supervisory discretion. In addition, as Borio (2012) points out, the financial cycle often differs from the business cycle, so that financial indicators will often contradict macroeconomic data regarding the state of the financial markets.

REFERENCES

- Acharya, V., H. Shin and T. Yorulmazer, 2011, “Crisis resolution and bank liquidity,” *Review of Financial Studies* 24(6), pp. 2166–2205.
- Acharya, V., H. Mehran, T. Schuermann, and A. Thakor, 2011, *Robust Capital Regulation*, Federal Reserve Bank of New York Staff Report 490.
- Acharya, V., R. Engle, D. Pierret, 2013, *Testing Macroprudential Stress Tests: The Risk of Regulatory Risk Weights*, NYU Stern mimeo.
- Admati, A., P. DeMarzo, M. Hellwig and P. Pfleiderer, 2012, *Fallacies, Irrelevant Facts, and Myths in the Discussion of Capital Regulation: Why Bank Equity is not Expensive*, The Rock Center For Corporate Governance at Stanford University WP 86. Stanford GSB Research paper 2063.
- Admati, A., and M. Hellwig, 2012, *The bankers’ new clothes: What’s wrong with banking and what to do about it*, Princeton University Press.
- Bank of England, 2011, *Instruments of Macroprudential Policy*, Discussion Paper (London: Bank of England).
<http://www.bankofengland.co.uk/publications/other/financialstability/discussionpaper111220.pdf>
- Bank of England, 2009, *The Role of Macroprudential Policy*, Discussion Paper (London: Bank of England). <http://www.bankofengland.co.uk/publications/news/2009/111.htm>
- Barofsky, Neil M., 2012. *Bailout: An Inside Account of How Washington Abandoned Main Street While Rescuing Wall Street*. New York: Free Press.
- Basel Committee on Banking Supervision, 2010, *Proposal to Ensure the Loss-Absorbency of Regulatory Capital at the Point of Insolvency* (August).
- Basel Committee on Banking Supervision, 2011a, *Global Systemically Important Banks: Assessment Methodology and the Additional Loss Absorbency Requirement* (rules text), November, Basel: Bank for International Settlements.
<http://www.bis.org/publ/bcbs207.pdf>
- , 2011b, *Revisions to the Basel II Market Risk Framework* (December 31, 2011 Update), Publication 193. Basel: Bank for International Settlements.
- , 2011c, *Basel III: A global regulatory framework for more resilient banks and banking systems*. (June), Publication 189. Basel: Bank for International Settlements.

- Borio, C. and Lowe, 2002, *Asset Prices, Financial and Monetary Stability: Exploring the Nexus*, BIS WP 114.
- Borio, C., 2012, *The financial cycle and macroeconomics: What have we learnt?* BIS Working Papers 395.
- Calomiris, C., 2011, *An Incentive-Robust Program for Financial Reform*, Mimeo.
- Brunnermeier, M., A. Crockett, C. Goodhart, A. Persaud, H. Shin, 2009, *The fundamental principles of financial regulation*, Geneva Reports on the World Economy 11.
http://scholar.princeton.edu/markus/files/liquidity_credit_crunch_nber.pdf
- Chami, R. and T. Cosimano, 2010, “Monetary Policy with a Touch of Basel,” *Journal of Economics and Business*, 62, pp. 161–175.
- European Commission, 2012, *High Level Expert Group on reforming the structure of the EU Banking sector: Final Report*, October 2, Brussels.
http://ec.europa.eu/internal_market/bank/docs/high-level_expert_group/report_en.pdf
- Financial Stability Board, 2011, *Key Attributes of Effective Resolution Regimes for Financial Institutions*, October, Basel.
www.financialstabilityboard.org/publications/r_111104cc.pdf
- Fisher, R. W., 2013, *Ending Too Big to Fail*, Remarks before the Conservative Political Action Conference, March 13.
<http://www.dallasfed.org/news/speeches/fisher/2013/fs130316.cfm>
- Fullenkamp, C. and S. Sharma, 2012, *Good Regulation: Changing the Process is Crucial*, ICFR/FT Research Prize Paper.
- Fullenkamp, C., C. Rochon and S. Sharma, 2013, *A Real Options View on Contingent Convertible Debt and Recapitalization*, Mimeo.
- GAO-11-612, 2011, *Bank Regulation. Modified Prompt Correction Action Framework Would Improve Effectiveness*, Report to Congressional Committees.
- Hanson, S. G., A. K. Kashyap, and J. C. Stein, 2011, “A Macroprudential Approach to Financial Regulation,” *Journal of Economic Perspectives*, 25(1), pp. 3–28.
- Haldane, A., 2012, *The Dog and the Frisbee*, Speech at the Federal Reserve Bank of Kansas City’s 36th Economic Policy Symposium, Jackson Hole, Wyoming.
- International Monetary Fund (IMF), 2009–13, *Global Financial Stability Report*, various issues.

- International Monetary Fund (IMF), 2013a, *Creating a Safer Financial System: Will the Volcker, Vickers, and Liikanen Structural Measures Help?* Staff Discussion Note 13/4.
- International Monetary Fund (IMF), 2013b, *Key Aspects of Macroprudential Policy*, IMF Policy Paper.
- International Monetary Fund (IMF), 2011a, *Macroprudential Policy: An Organizing Framework*, IMF Policy Paper. www.imf.org/external/np/pp/eng/2011/031411.pdf
- International Monetary Fund (IMF), 2011b, *Crisis Management and Resolution: Early Lessons from the Financial Crisis*, IMF Staff Discussion Note SDN/11/05. <http://www.imf.org/external/pubs/ft/sdn/2011/sdn1105.pdf>
- International Monetary Fund (IMF), 2010, *The Making of Good Supervision: Learning to Say No*, IMF Staff Position Note SPN 10/08.
- Kane, Edward J., 2003, “What Economic Principles Should Policymakers in Other Countries Have Learned from the S&L Mess?” *Business Economics* 38(1), pp. 21–30.
- Kane, Edward J., 2010, “The Importance of Monitoring and Mitigating the Safety-Net Consequences of Regulation-Induced Innovation,” *Review of Social Economy* 68(2), pp. 145–161.
- Kashyap, A., R. Rajan, and J. Stein, 2008, *Rethinking Capital Regulation*, Paper presented at the Federal Reserve Bank of Kansas City Symposium at Jackson Hole, Wyo., August 23. www.kc.frb.org/publicat/sympos/2008/KashyapRajanStein.09.15.08.pdf.
- Kowalik, M., 2011, *Countercyclical Capital Regulation: Should Bank Regulators Use Rules or Discretion?* *Economic Review*, Federal Reserve Bank of Kansas City.
- Morris, S. and H. Shin, 2008, *Financial regulation in a system context*, *Brookings Papers on Economic Activity*, pp. 229–274.
- Rebonato, R., 2007, *Plight of the Fortune Tellers: Why We Need to Manage Financial Risk Differently*, Princeton, NJ: Princeton University Press.
- Seamans, M., 2013, *When Gauging Bank Capital Adequacy, Simplicity Beats Complexity*, *Dallas FED Economic Letter* 8 (2).
- United Kingdom HM Treasury, 2012, *Banking Reform: delivering stability and supporting a sustainable economy*, June, London, UK.
- United Kingdom Independent Commission on Banking, 2011, *Final Report and Recommendations*, September, London, UK.

United States Department of the Treasury, 2011, *Prohibitions on Proprietary Trading and Certain Investments in, and Relationships With, Hedge Funds and Private Equity Funds*, Office of the Comptroller of the Currency, 12 CFR Part 44, October 11.
<http://www.occ.gov/news-issuances/news-releases/2011/nr-occ-2011-126a.pdf>

United States Federal Deposit Insurance Corporation and Bank of England, 2012, *Resolving Globally Active, Systemically Important, Financial Institutions*, Joint Paper, December 10. www.fdic.gov/about/srac/2012/gsifi.pdf

United States Financial Crisis Inquiry Commission, 2011, *Final Report of the National Commission on the Causes of the Financial and Economic Crisis in the United States*, January.
http://fcic-static.law.stanford.edu/cdn_media/fcic-reports/fcic_final_report_full.pdf