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How to Strengthen the Regulation of Bank Capital: Theory, Evidence, and A Proposal

by Shekhar Aiyar, International Monetary Fund, Charles W. Calomiris, Columbia University, and Tomasz Wieladek, Bank of England

This paper addresses questions of prudential capital regulation that are critical to regulatory policy. We begin by summarizing theoretical perspectives on the role of capital in banking, the need for regulation of bank equity capital ratios, and the costs and benefits of raising minimum equity capital ratio requirements. Next we discuss some empirical evidence about the costs and benefits of such capital requirements; and in the light of such evidence, we assess the adequacy of the current requirements. Third and last, we identify the pitfalls of today's main regulatory approach of relying on book equity requirements, and then propose a way of avoiding those pitfalls that combines the continued use of minimum book equity ratio requirements with other tools, notably contingent capital (or CoCos) and required cash holdings.¹

What is The Role of Bank Equity?

Equity serves two crucial functions in banks. It is a first absorber of losses, which reduces the risk of default on senior (debt) financing. By so doing, it reduces the exposure of the insurers of those debts in the presence of a public safety net. Perhaps equally important, an adequate equity cushion—defined as a sufficient amount of equity relative to the risk of a bank's assets—also provides the top managements of banks with stronger incentives for effective risk management.²

What is the Role of Setting Minimum Equity-to-Asset Ratio Requirements as Part of Prudential Bank Regulation?

Left to their own devices, the bank executives who decide banks' capital structure may not have incentives to raise sufficient equity relative to debt. This can occur for at least three reasons: (1) bank failures may have social costs—"externalities" such as those related to contractions of credit supply or disruptions of the payment system—that are not borne by the providers of bank funding; (2) the presence

of safety nets that protect bank creditors creates potential subsidies, and hence inducements, for risk-taking that have led bank managers to game the safety net by increasing cash flow risk while maintaining only the minimum amount of capital;³ and (3) bank managers may face incentives to increase risk at the expense of shareholders if managers obtain "private benefits" from maintaining high default risk and if the prudent management of risk in the interest of shareholders cannot be contractually specified and enforced.

What Are the Social Costs of Raising Minimum Bank Equity-to-Asset Ratios?

The social costs of raising equity requirements consist of two types: (1) those borne within the financial system, notably in the form of inefficiencies and other expected negative effects on banks' profitability and values that can be attributed to required equity capital ratios that are either too low or too high; and (2) costs borne by the non-financial sectors—especially would-be bank borrowers—when excessive equity requirements result in reduced lending. The latter category represents social costs only to the extent the borrowers' projects are worth funding (have positive net present values) and would not be funded in the absence of bank credit.

We emphasize that the social costs we focus on in no way depend on the existence of tax deductions for borrowers' interest payments, or on the existence of safety net subsidies that encourage debt. Of course, we recognize that the deductibility of interest payments will influence the optimal combination of debt and equity. And government protection of banks generally encourages banks to increase their subsidized default risk (to take advantage of the subsidy).⁴ But economic theory points to other, more fundamental influences on banks' capital structure decisions. Such influences help explain why banks have chosen for centuries to operate with more leveraged capital structures and greater reliance

1. This is a shorter, less technical version of the authors' paper, "A Primer on Bank Capital: Theory, Empirics, and Public Policy, which was published by the *IMF Economic Review*. The views expressed herein are its authors', and do not necessarily represent the views of the International Monetary Fund or the Bank of England. The authors thank Luc Laeven and Lev Ratnovski for helpful comments on an earlier draft.

2. Provided also that the bank manager's incentives are aligned with equity owners. See Calomiris and Kahn (1991); Holmstrom and Tirole (1997, 1998); Calomiris, Heider and Hoerova (2014). Full citations of all articles are provided in the References at the end of the article.

3. For a brief list of the relevant studies, see Calomiris and Haber (2014), pp.461-462.

4. As described by Robert Merton (1977) and documented in numerous empirical studies. Two particularly influential ones are Demiguc-Kunt and Detragiache (2002), and Barth, Caprio, and Levine (2006).

on short-term debt than non-bank corporations, often in environments where debt conferred no tax advantage or safety net subsidy on banks.

In their recent and much publicized book, Anat Admati and Martin Hellwig argue that leverage choices in banking are irrelevant in the sense that such choices are unlikely to affect the activities or value of banks, apart from the benefits of tax deductions and safety net subsidies.⁵ But in making this argument, the authors' analysis is based on a critical misreading of finance theory—specifically, their assumption that the total costs to banks of their capital structure choices are limited to just the returns expected by their investors. In the words of Admati and Hellwig, “The cost of equity essentially corresponds to the returns that corporations must provide to shareholders to justify the money it has received from them.”⁶ But for issuers of equity, there are other important costs—and benefits—associated with capital structure choices that are only indirectly related to the returns expected by investors. And for that reason, the costs to a bank of issuing equity and the expected return received by equity investors who buy the new offering can diverge significantly.

In fact, one might describe the main subject of the entire literature on capital structure choice in banking, and in corporate finance generally, as the *difference* between the costs a firm experiences as a result of its decision to issue a given security—both when announcing that decision and later as a result of having issued the security—and the expected return to investors who purchase it. The expected consequences of different capital structure choices have the potential to make the costs associated with raising and operating with too much equity considerably greater than the expected return earned by equity investors. Let's consider two potentially important reasons why bank shareholders often prefer that banks limit their use of equity.

As Stewart Myers and Nicholas Majluf showed in a much-cited 1984 paper, there can be large “adverse selection” costs associated with raising external equity that result from information “asymmetries”—that is, the possibility for significant differences between management's and other insiders' view of a company's future earnings prospects, and what outside investors are able to know.⁷ Such adverse selec-

tion costs are reflected, first and foremost, in the significant negative average market reactions to the announcement of equity offerings.⁸ To the extent the price drops force issuers to raise equity at prices that are well below fair value, such offerings end up “diluting” the value of existing shareholders.

In addition to these “adverse selection” or “signaling” costs associated with raising equity,⁹ operating with equity ratios that are “too high” can have undesirable effects on managerial efficiency—consequences that are well understood by investors, and almost certainly part of the explanation for their negative reaction to such offerings under normal circumstances. In the case of banks, although moderate increases in equity requirements are likely to encourage better risk management, requiring banks to hold too much equity is likely to create significant agency problems by insulating bank managers from market pressures and thereby blunting the urgency of their push for efficiencies.¹⁰

In sum, the expected consequences of different capital structure choices have the potential to make the cost of issuing equity considerably greater than the expected return earned by equity investors. What's more, recognizing the consequences of its financing choices for the overall value of a bank has been the unifying theme of theoretical models of optimal capital structure in banking.¹¹ As this theory implies, there is a leverage ratio—or, alternatively, a ratio of equity to total assets—for each individual bank that can be expected to maximize its value. And deviations from that optimal leverage ratio can result in significant reductions in banks' profitability and value.¹²

Other Costs of Raising Equity Requirements: Effects on Borrowers and the General Economy. The social costs of imposing inefficiently high equity financing requirements on banks are not limited to expected negative effects on bank performance and values. When banks are forced either by sudden equity losses or increased regulatory requirements to raise their ratio of equity to assets, many often decide to reduce lending rather than raise equity. And, of course, significant contractions of credit can reduce economic growth. Moreover, it's worth emphasizing that the reduction in loan supply that comes from raising equity ratios is not just a one-time cost. A higher required equity ratio will mean that, as the banking system grows, a larger percentage of bank equity will have to be raised

5. Admati and Hellwig (2013).

6. For a detailed discussion of Admati and Hellwig (2013) see Calomiris (2014). For a similarly mistaken view of the neutrality of bank capital structure choices, see the bold proposal for 100% equity banking by Kotlikoff (2011).

7. Myers and Majluf (1984).

8. But such costs are also reflected in the much higher underwriting costs paid by companies to issue equity rather than debt, which reflect attempts by issuers to overcome asymmetric information problems during “road shows” in which their investment bankers meet with institutional investors to explain the issuers' motives for raising capital and attempt to allay any concerns they may have about the prospects of the issuer. See Calomiris and Tsoutsoura (2011).

9. Such “adverse selection” (or “signaling”) costs are typically estimated as the sum of those negative price effects—or, more precisely, the dilution of existing shareholders' value caused by issuing underpriced equity—and the costs paid to underwriters to mitigate adverse selection through road shows and other marketing costs that help to reduce the extent of asymmetric information. For a review of the determinants of underwriting

costs, see Calomiris and Raff (1995), Calomiris (2002), and Calomiris and Tsoutsoura (2010).

10. See Kashyap, Rajan, and Stein (2008).

11. Although much of the discussion about bank funding focuses on debt vs. equity, it is important to note that, both theoretically and empirically, there are important distinctive aspects to the structure of debt finance in banking, especially deposit vs. non-deposit funding. A greater reliance on core deposits relative to other debts tends to be associated with lower default risk of the bank, either because core deposits entail less liquidity risk than other short-term debts (such as brokered deposits), or because a bank's ability to attract core deposits is itself an indication of lower default risk. For empirical evidence, see Ratnovski and Huang (2009), Calomiris and Mason (2003a), and Calomiris and Carlson (2014).

12. For a review of capital structure theory in banking, see Thakor (2014). For a recent example of a theory of optimal bank capital structure in which different banks choose different interior optima as their capital structures, see Mehran and Thakor (2011).

externally rather than through the retention of earnings. And to the extent it is costly to raise outside equity for the reasons just discussed, banks will face permanently higher funding costs. Such higher funding costs can in turn be expected to lead to a permanent reduction in the supply of bank lending.

To be sure, not all of the reduced lending that results from higher equity ratio requirements is socially undesirable. To the extent that safety-net distortions encourage banks to engage in excessive lending, forcing banks to curtail lending could be beneficial.¹³

What Evidence Do We Have About These Costs?

The most direct and visible evidence of potentially large costs associated with requiring banks to hold more equity are the well-documented negative market reactions to announcements of new equity offerings. But as a number of observers have suggested, to the extent that the new equity issues are perceived by investors as “involuntary”—that is, required by a regulatory mandate—the adverse-selection costs that raise the costs of new equity issues may well be significantly reduced if not eliminated altogether.

In thinking about this question, however, it’s important to bear in mind that raising a minimum equity ratio requirement does not require banks to raise equity. Banks can satisfy the higher requirement by choosing to shrink their assets instead. And because there could thus still be significant differences among banks in the extent to which they choose to raise equity, the signaling costs from announcing equity offerings could still be important. To the extent they are, the strongest banks—particularly those with high-quality risky assets whose value might be very hard to reveal to outsiders—will have an incentive to avoid dilutive equity offerings and instead reduce their asset size until asymmetric information problems have been resolved.

For this reason, equity offerings in response to increases in equity ratio requirements will not generally avoid signaling costs altogether—although the regulatory mandate could work to limit such costs by reducing some of the suspicion that management is attempting to “time” the market. Empirical evidence, however, suggests that signalling costs remain large. A study of the wave of bank equity issues that followed the U.S. S&L crisis during the 1980s found that such issues in response to a change in regulatory capital requirements resulted in a substantial negative reaction in market prices.¹⁴ The authors of this study also reported smaller price effects

for relatively small equity offerings; but once the offerings reached a certain size threshold—expressed as a percentage of outstanding equity—the market responses become progressively more negative, and the potential dilution of existing shareholders a more important reason to limit equity issuance and shrink the asset base instead.

Consistent with this last argument, a large number of studies have shown that when banks need to raise their equity-to-asset ratios, they often choose to do so by cutting back on new loans, which avoids the need to raise new equity and the high costs associated with it. These studies divide into two groups: (1) those that focus on cutbacks in bank lending in response to losses in equity that result from loan losses; and (2) those that examine responses to increases in equity ratio requirements.¹⁵

With respect to the first group, two studies involving one of the present writers (Calomiris) have documented large contractions in credit supply resulting from losses by U.S. banks during the Depression.¹⁶ One of these studies has also shown that, although New York City banks engaged in frequent equity offerings during the boom years of the 1920s, they avoided capital offerings entirely after 1930.¹⁷ The New York banks also cut dividends to preserve capital and so limit contractions of loan supply. Rising bid-ask spreads for bank equity during the 1930s are also consistent with a dramatic increase in adverse selection costs, which made equity offerings prohibitively expensive.

More generally, studies of bank lending in the wake of large loan losses document large contractions in bank credit associated with losses of bank capital and high costs of replacing bank capital during recessions. And, indeed, it was this behavior of U.S. banks during the 1980s that gave rise to the use of the term “capital crunch” to denote large credit-supply reductions in response to large and widespread losses of bank capital.

Now let’s turn to the second group of studies, which document the credit supply effects of changes in capital requirements. A number of these studies have focused on a set of changes in the U.K.’s bank-specific capital requirements that were enacted in the decade prior to the 2008 crisis.¹⁸ Another study has examined the effects on Spanish banks of bank-specific “provisioning” requirements, which involve temporary, “front-loaded” increases in effective capital requirements.¹⁹ And still another study has analyzed the effects on

13. Even if in the absence of safety nets banks do not properly internalize the social costs of taking risks, regulation that forces them to maintain equity ratios in excess of what they would choose in the absence of requirements could be socially beneficial even if it results in lower bank lending and lower economic growth. It’s also important to recognize that equity ratio requirements that force banks to maintain higher ratios do not always result in reduced credit supply. In cases where banks have suffered large losses or shocks, they may find themselves facing what Stewart Myers has described as “debt overhang”—that is, clearly in need of new equity but reluctant to raise it because much of the value would represent a wealth transfer from existing shareholders to the banks’ “underwater” creditors.

14. See Table 6 of Cornett and Tehranian (1994).

15. For reviews of the literature, see VanHoose (2008) and Aiyar, Calomiris and Wieladek (2014a). Studies examining credit-supply effects of lost equity include Peek and Rosengren (2000), Calomiris and Mason (2003b), and Calomiris and Wilson (2004).

16. Calomiris and Mason (2003b) and Calomiris and Wilson (2004).

17. In so doing, the New York banks participated in a cyclical pattern observed more generally for other industries and other time periods. See Calomiris and Wilson (2004).

18. These include Aiyar (2011, 2012), Aiyar, Calomiris and Wieladek (2014a, 2014b, 2014c), and Aiyar, Calomiris, Hooley, Korniyenko and Wieladek (2014).

19. Jimenez, Saurina, and Peydro (2011).

the lending of French banks during the transition from Basel I to Basel II, which effectively created different capital requirements for different classifications of French banks.²⁰

The bottom line of all of these studies is that changes in capital requirements have very large short-term effects on the supply of lending. And the size of the effects are fairly consistent across these three different countries—the U.K., France, and Spain—once one takes account of the differences between provisioning requirements and capital requirements.

What's more, the estimated "elasticities" of loan supply—measures of the percentage reduction in lending in relation to the percentage increase in capital requirements—produced by all of the studies are much larger than those that were assumed in a 2011 statement by the Bank for International Settlements that provided the basis for establishing its guidelines for cyclical variation in capital requirements. To cite one example, for every one percentage point increase in required equity ratios in the U.K. (say, from 10% to 11% equity to assets), the results of the studies imply that the loan supply to domestic nonfinancial borrowers in the U.K. will contract during the next year by about six or seven percent, implying an elasticity of loan supply of roughly negative 0.6 or 0.7. Such increases in U.K. capital ratios were also found to lead to reductions of about five percent (implying an elasticity of roughly negative 0.5) in cross-border interbank lending, which tends to be disproportionately concentrated in borrowing countries that are not part of the bank's core customer base. The responses of French banks' lending to capital requirement changes have been similar in magnitude. The loan-supply response to provisioning requirements for Spanish banks implies a somewhat lower elasticity—roughly 0.3. But in this last case, if we assume that a dollar of provisioning—which, again, is a temporary increase in capital—is equivalent in present value to about half a dollar of capital, the estimated elasticities are comparable.

The studies also show that U.K. banks, besides reducing their lending in response to increases in capital requirements, temporarily draw down their capital "buffers"—the amounts of capital they hold over and above the regulatory requirement—and then rebuild them over the ensuing quarters. The studies also suggest that larger buffers are reflections not of the slackness of the regulatory constraint, but rather of the banks' tendency to self-insure against shocks. Additionally, banks with higher buffers show a higher response elasticity of loan supply to increases in capital requirements, which lends more support to the idea that many banks make strategic decisions to hold higher than required levels of capital to cushion their lending activity against future shocks.

Although these findings provide strong evidence of high costs associated with raising equity capital, one cannot simply extrapolate these elasticities to assess the loan-supply responses to very large changes in capital requirements. For

the U.K. sample of banks, few capital requirement changes have exceeded one and a half percentage points—say, from 11% to 12.5%. A very large regulatory change, such as a doubling of the average capital ratio requirement from 11% to 22%, surely would not result in a 77% decline in lending; banks would be more likely to respond to such an increase with large equity offerings and a much smaller percentage change in loan supply. Because such capital requirement changes are not present in the data, it's impossible to predict with any confidence the extent to which the percentage loan-supply response will change with the size of the capital requirement increase.

Nor do such short-term estimated elasticities say much about long-run loan-supply responses to capital requirement changes. It is difficult, amidst the noise of many other influences, to gauge the long-term responses of loan-supply growth to capital requirement change; but surely the responses become smaller when measured over longer time intervals because of banks' ability to adjust in other ways—for example, by cutting dividends and so increasing retained earnings.

In sum, the studies' estimates of loan-supply reductions in response to increases in capital requirements provide consistent evidence of a significant social cost to raising equity capital requirements. But there is still much that we do not know about the precise size of those costs when considering large changes in capital requirements, about banks' long-term responses to such changes, and about the responses of banks that are near or already in financial distress.

Are Bank Equity Ratios for Global U.S. and European Banks Too Low?

The goal of prudential regulation, including capital requirements, is to effectively target the desired level of default risk for banks. Stated in this way, the goal implies that the appropriate equity ratio for banks should be commensurate with the riskiness of their assets, and should deliver the desired low frequency of bank failures.

Some of the world's most stable banking systems—Canada's, for example, which has never suffered a major banking crisis during its nearly two centuries of operation—have been able to achieve stability with lower historical equity ratios than U.S. banks despite having higher loan-to-asset ratios.²¹ Historically, the low equity ratios and high loan ratios of Canadian nationwide branching banks have reflected their greater portfolio diversification and other risk-reducing attributes, in contrast to the much riskier single-office (unit) banks in the United States. As an illustration of such high risks, national banks in the United States operating in the South and West around the turn of the 20th century maintained average book equity-to-asset ratios of 33%, which were higher than those of other U.S. banks, and much higher

20. Brun, Fraise and Thesmar (2014).

21. Calomiris (2006), Chapter 1; Calomiris and Haber (2014), Chapter 9.

than Canadian banks, operating around the same time.²²

But more important, the equity ratios of U.S. banks have varied dramatically over time, and in ways that have clearly reflected changes in their asset risk. Consider, for example, the decline in the market equity-to-asset ratios of New York City banks during the 1930s, from about 30% of assets in 1929 to about 15% by 1939. That 50% reduction in capital, during what was a difficult economic period, reflected the substantial reduction in the asset risk of such banks that was accomplished through the very large increases in their holdings of cash assets.²³

The clear lesson here, then, is that there is no single, “one size fits all” equity ratio that delivers stability; equity ratios should vary with the riskiness of bank cash flows. And as we stated above, the most simple and straightforward way to address the question of whether current banks’ equity capital ratios are too low *relative to their risk of their assets* is to ask whether banks’ default risk is too high.

One way of assessing default risk is by observing the “propensity for crises.” The financial crisis of 2007-2009 wasn’t the first to show that protected banking systems tend to blow up, imposing huge losses on taxpayers who are left to foot the bill. Since the 1970s, there have been over 100 major banking crises worldwide.²⁴ Scores of academic articles on this unprecedented pandemic of banking crises have consistently identified the protection of banks as one of the primary causes. Indeed, one could even say that there is no topic in financial economics that has achieved such a clear consensus among researchers as the proposition that government protection of banks has been a major contributor to the recent wave of costly bank failures around the world—failures on a scale that has never been witnessed before.²⁵

It is also possible to use models of bank fragility, which use market-based information about bank risk and market equity capital values, to assess the fragility of banks. When the authors of two very recent studies apply their version of such a model—which they call “SRISK”—to evaluate the adequacy of prudential regulatory requirements of U.S. and European banks, they find that banks remain quite risky, especially in Europe.²⁶

Another study that uses a different methodology²⁷ has reported finding that the largest U.S. banks have not changed their risk-taking behavior very much since the introduction of the Dodd-Frank Act, implying that the Orderly Liquidation Authority (OLA) and the living wills requirements established under Dodd-Frank have not had the desired regulatory impact

on banks. In fact, critics of the OLA have long argued that it has actually institutionalized too-big-to-fail by creating a formal bailout procedure and earmarking a new source of tax revenue to fund bailouts. This research would seem to confirm that fear.

What are the Shortcomings of Using Book Equity Ratios as Prudential Tools?

Regulating banks’ equity ratios credibly and effectively to achieve prudential goals is easier said than done, even if one were able to identify the right amount of equity that is needed relative to any given level of bank risk. First, effective book value equity requirements depend upon honest accounting for the value of tangible assets. But bankers, regulators, and politicians have reasons not to be forthcoming; understating losses in downturns avoids politically and financially undesirable contractions in credit that result from loss recognition.²⁸

Second, banks’ true equity values are not well measured even by accurate book equity ratios. As studies have shown,²⁹ the persistently low market values of U.S. banks after the subprime crisis primarily reflected reductions in banks’ cash flows that were unrelated to the values of their tangible assets or liabilities. Book values of equity simply do not accurately capture true economic value, and the differences can be dramatic.

Balance sheet fetishism—the belief that book equity ratios meaningfully reflect true equity ratios—is a major source of systemic risk. The market values of U.S. banks’ equity relative to assets fell dramatically from 2006 to September 2008, and regulators did not force banks to maintain those ratios. Ultimately, as market value ratios for some banks declined to roughly 2%, creditors became unwilling to roll over bank debt obligations. From this perspective, Lehman’s failure is best seen as a signalling match in a tinderbox of declining market perceptions of banks’ counterparty risks. The key to a stable banking system is ensuring that banks are not allowed to permit their true, as opposed to their book, equity ratios to decline to unsafe levels. Prudential capital regulation based on book values is a highly imperfect tool for preventing such a decline.

Third, given our prior discussion of the need to set equity relative to risk, riskier banks should be required to maintain higher minimum ratios. But risk measures are prone to manipulation by banks and measurement errors by regulators.³⁰ How can book equity ratios be used to limit bank failures when banks window-dress risks with impunity?

22. Calomiris and Carlson (2014); Calomiris (2006), p. 41.

23. Which yield comparable default risk on bank debt in the two years (Calomiris and Wilson 2004).

24. Laeven and Valencia (2013).

25. For reviews of that literature, see Calomiris (2011a) and Calomiris and Haber (2014), Chapter 14.

26. Acharya, Engel and Pierret (2013) and Acharya and Steffen (2013).

27. Ignatowski and Korte (2014).

28. Regulators may also be concerned about contagion effects from loss recognition. That concern, however, presumes that markets are unaware of unrecognized losses. Data on market valuation of banks during the recent crisis (Calomiris and Herring 2013) suggest that market values of equity ratios reflected bank condition better than regulatory values.

29. See Calomiris and Nissim (2014).

30. See Haldane (2013).

What Additional Policies Should Accompany an Increase in Minimum Required Equity Ratios?

As a number of studies have proposed, all three of these problems with book capital regulation can be addressed by requiring, alongside higher book equity-to-assets, another funding requirement known as contingent capital (or “CoCos”). CoCos are a form of debt that is convertible into equity on the basis of a “trigger” that could be tied to the bank’s market value.³¹

How would CoCos fit into a bank’s capital structure and, perhaps most critically, what changes in a bank’s market value would trigger conversion of the debt into equity?

Let’s say a bank has a 10% book equity-to-asset requirement. On top of that requirement, the bank could also be required to issue an amount equal to 10% of its assets in CoCos that convert from debt into equity under the following circumstances: the market value of the bank’s equity relative to assets falls below a critical ratio—and let’s make it 10% too—on average for a period of, say, 120 days. If and when conversion does occur, CoCos convert at a premium of, say, 5%—which means that CoCo holders end up with shares worth 5% more than the face value of their debtholdings.

How would this CoCos requirement solve the three problems that plague book equity requirements? Using the market value of equity as a conversion trigger in this way would give a bank’s management a strong incentive to maintain sufficient economic (as opposed to book) capital. To avoid triggering such a dilutive CoCos conversion, a bank’s managers would choose to issue new equity to offset declines in their market valuation. Managers would make that choice because dilutive conversion could be very costly to existing stockholders—dilutive enough that both the holders of newly converted shares and existing shareholders may well agree to oust a management incompetent enough to permit such a conversion.

The use of a 120-day moving average ensures that banks have plenty of time to arrange an offering in response to market perceptions of losses. And setting the trigger at 10%—far above the insolvency point of the bank—ensures that the bank will have access to the market (whereas insolvent banks may lose such access) so that they can make voluntary equity offerings to avoid CoCos conversion.

Such CoCos are designed to be “preemptive” in the sense that relying on market values to trigger CoCos conversion encourages banks to issue equity at the point when the market believes banks have suffered a sufficiently large loss, but long before they near an insolvency point. This link to market perceptions solves all three of the major problems with book equity requirements. First, banks’ market values are very likely to reflect the loan losses that bankers and regulators

may choose to understate. Second, market expectations about cash flows determine the market value of equity, which avoids unwarranted emphasis on balance sheets when assessing the health of banks. Third, the greater the risk of a bank’s cash flows, the higher the market equity-to-assets ratio the bank will target. For example, if the trigger ratio for market equity relative to market assets—where market assets is the sum of the face value of bank debt plus market equity—were 10%, a bank with little risk might target an 11% ratio, while a bank with much higher risk might target a 13% ratio. That connection between risk and the targeted equity ratio also encourages banks to improve risk management and eliminate unwarranted risk.

Most important, a market-based requirement may well be uniquely effective in preventing liquidity crises. The failure of Lehman caused a crisis because it led the market suddenly to revise downward its assessment of the value of many financial institutions about which it already had grave doubts. Those doubts were reflected in the deterioration of banks’ market equity ratios that started in 2006. The primary purpose of capital requirements is to ensure that banks are able to maintain market confidence, whether or not that confidence is “accurate.” What better way to prevent a crisis than to actually use market values when evaluating banks’ creditworthiness?

But if this is true, then why not just replace the book equity requirement with a market equity requirement? The history of regulatory “forbearance” is replete with examples of politically motivated relaxation of requirements. Requiring banks to enter into CoCos with other market participants, with pre-specified market-based triggers, uses the banks’ contractual agreements with investors—which cannot be altered by regulatory forbearance—to prevent regulators and politicians from relaxing the discipline of market opinions.

How Should Cash Requirements be Integrated with Equity Requirements?

In a number of recent papers, one of the present authors (Calomiris) has proposed the introduction of a cash reserve requirement for banks—held in the form of remunerative deposits by banks at the central bank—that would exist alongside capital requirements and serve as a substitute for the two Basel III liquidity ratios that have been introduced.³² Unlike the Basel liquidity requirements, the proposed reserve requirement is conceived as a way of dealing with both liquidity risk and solvency risk, and it is grounded in the recognition that all “liquidity shocks” in real-world banking crises result from heightened insolvency risk.³³ When cash reserve requirements are combined with effective equity capital requirements, they can have unique advantages as prudential tools for reduc-

31. See, for example, a recent policy proposal by Calomiris and Herring (2013), which is the latest in a long series of similar proposals by many other authors.

32. Calomiris (2011b, 2012a, 2012b) and Calomiris, Heider and Hoerova (2014).

33. Calomiris, Heider and Hoerova (2014).

ing default risk and encouraging efficient risk management, which make them more desirable than “liquidity regulation.” Cash requirements focus on regulating the amount of *gross cash reserves* held by the bank, which effectively requires that a minimum proportion of assets be held in the form of Treasury securities deposited at the central bank.³⁴ This is different from the Basel III liquidity requirements, which prescribe a minimum amount of *net liquid assets*, which are (broadly defined) as liquid assets net of the bank’s debts that are deemed to be relatively subject to liquidity risk.

The use of cash requirements has two main advantages in reducing default risk: (1) unlike book equity, cash at the central bank is a real asset, not an accounting entry, and its value is known; (2) cash held at the central bank is riskless, and its risk cannot be increased by any action taken by the bank. These two features of cash have important consequences for risk management incentives: by raising the lower bound of the bank’s liquidation value, cash reduces incentives for risk shifting of loans and, in so doing, encourages more effective risk management. With these features in mind, one of us has proposed a “20-20” solution that combines loss-absorbing capital (equity plus CoCos) of 20% alongside a 20% cash reserve requirement.³⁵

Conclusion

Prudential capital regulation targets the default risk of banks by establishing a relationship between asset risk and minimum capital ratio requirements. The primary objective of such a framework is to ensure the safety and soundness of the banking system. The recent unprecedented worldwide pandemic of banking crises shows that the combination of generous safety net protection and prudential capital regulation—intended in part to limit the abuse of safety nets—has for the most failed to accomplish that objective.

Higher minimum book equity-to-asset requirements are a necessary step to achieve appropriate banking system stabil-

ity, but these requirements must be measured credibly and established relative to effective restraints that ensure that the level of capital is commensurate with the level of asset risk. A mix of higher book equity requirements, a carefully designed CoCos requirement, cash reserve requirements, and possibly other measures will be much better able to meet prudential objectives than book equity requirements alone. The focus of the Basel III system on ill-defined concepts of liquidity ratios, book capital ratios and internal models of risk must be replaced by a system of credible rules that combine valid concepts with objective, market-based information into a simplified and credible regulatory process.

Nevertheless, raising minimum capital requirements will not be without social costs. Bank profitability and share prices are likely to suffer, and loan supply will likely be constrained significantly compared to the free-wheeling world of safety net protection and paper-thin capital buffers. (And the size of such effects are one of the main reasons for supplementing higher book equity requirements with mandatory CoCos and cash holdings; both proposals are intended to serve as substitutes for still higher—and less effective—book equity requirements.) But credible reform would be worth it: the dramatic consequences of banking crises, both in the form of huge burdens on taxpayers, and in the form of lost GDP would more than repay the costs of somewhat lower credit supply.

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34. Depositing the assets at the central bank prevents window dressing by banks, who might otherwise hold cash only once per quarter on accounting report dates.

35. This proposal was made in Calomiris (2012). More generally, both cash and equity are prudential tools whose marginal costs (the cost of raising equity capital, and the

foregone quasi rents from lending, respectively) increase with the amount banks make use of each. That implies that an interior solution that combines some cash and some equity is likely to be cost-minimizing relative to a solution that requires either in isolation.

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