

REGULATING CAPITAL*

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ABSTRACT

Most observers agree that the excessive debt or leverage of systemically important financial institutions (SIFIs) was a central reason why the housing crash of 2007–2009 led to a recession. The Dodd-Frank Act authorizes the Financial Stability Oversight Council and the Federal Reserve to adopt new prudential standards for regulating these institutions. A fundamental challenge for these standards is how to restrain the leverage of SIFIs by prescribing a minimum amount of capital or equity they must hold relative to their assets.

This Article develops a framework for the regulation of capital in SIFIs that departs from current regulatory practice. Starting from the assumption of perfect capital markets, it first shows that a limit on leverage is an optimal regulatory policy when capital markets are perfect, but bank failures entail an external social cost. It then argues that capital regulation can be effectively adapted to the imperfections that exist in real financial markets such as taxes, transaction costs, and incomplete information. Many of these imperfections strengthen the argument for capital regulation. In cases where capital regulation may inefficiently reduce lending, suitable regulatory design can mitigate this effect. This Article proposes a security design—automatic convertibles—to mitigate the cost of issuing capital; considers the strategic responses of SIFIs to regulation; and critiques current regulations as well as other market-based proposals in this literature.

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“I can’t help smiling at complaints from bankers about their capital requirements, knowing that they have always imposed even stronger requirements on people in debt to them.”¹

Merton Miller (1993)

INTRODUCTION

The financial crisis of 2008–2009 revealed unanticipated weaknesses in the regulation of U.S. financial markets. This financial meltdown led to the largest economic downturn in the United States since the Great Depression.² The legislative response has been dramatic. The sprawling Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 (Dodd-Frank Act) is the most significant piece of financial legislation enacted since the New Deal. Federal regulators continue their flurry of rulemaking in response to the Dodd-Frank Act’s dictates.

The causes and consequences of this crisis will be analyzed and debated for decades. There is widespread agreement that a bubble in real estate prices was a key triggering event.³ But there is less agreement over why the bursting of this bubble, of considerable but by no means unprecedented size, had such devastating spillover effects on the broader financial system and economy.⁴

¹ Merton Miller, *Do the M&M Propositions Apply to Banks?*, 19 J. BANKING & FIN. 483, 487 (1995).

² See CARMEN M. REINHART & KENNETH S. ROGOFF, *THIS TIME IS DIFFERENT: EIGHT CENTURIES OF FINANCIAL FOLLY* (2009).

³ See generally FIN. CRISIS INQUIRY COMM’N, *THE FINANCIAL CRISIS INQUIRY REPORT* (2011), available at <http://fcic.law.stanford.edu/report/conclusions>.

⁴ *Id.* at 413–439 (dissent of Keith Hennessey, Douglas Holtz-Eakin, and Bill Thomas).

Many attempts to answer this question focus on the role of excessive debt or leverage⁵ in the financial system. One prominent line of argument places the blame for this excessive leverage in the hands of regulators.⁶ Regulators abandoned capital requirements⁷ that limit the amount of leverage a financial institution can incur.⁸ Another line of argument places the blame on financial institutions for adopting evasive if not fraudulent strategies to avoid limits on leverage.⁹ Both arguments circulated widely in the print and online media.

This concern with leverage and capital animates important parts of the Dodd-Frank Act. Title I of the Dodd-Frank Act creates the Financial Stability Oversight Council (FSOC). The FSOC and the Federal Reserve are tasked, in part, with proposing new, prudential standards for regulating systemically important financial institutions (SIFIs). In particular, Section 165 of Title I mandates enhanced supervision and prudential standards for bank holding companies (BHCs) and non-bank financial companies (NBFCs) with assets greater than \$50 billion. It also requires that the Federal Reserve establish risk-based capital requirements and leverage limits in consultation with the FSOC.¹⁰ The Dodd-Frank Act's instructions to strengthen capital adequacy are consistent with broader, international developments. The Basel Committee on Banking Supervision adopted a new capital adequacy framework known as Basel III in order to make banks more resilient to financial distress.¹¹

⁵ Leverage refers to the amount of debt that a firm has relative to its equity. Leverage is often expressed in terms of a ratio, such as debt to equity or debt to assets. By definition, the sum of equity and debt in a firm equals its assets. Following the convention in banking, I will use the terms equity and capital interchangeably. See generally RICHARD A. BREALEY, STEWART MYERS, & FRANKLIN ALLEN, *PRINCIPLES OF CORPORATE FINANCE* (10th ed. 2011).

⁶ See, e.g., Stephen Labaton, *Agency's '04 Rule Let Banks Pile Up New Debt*, N.Y. TIMES, Oct. 2, 2008. But see *Testimony Concerning Oversight of Risk Management at Investment Banks: Hearing Before Subcomm. on Sec., Ins., & Inv. of the S. Comm. on Banking, Hous., and Urban Affairs*, 110th Cong. (2008) (statement of Erik Sirri, Dir., Div. of Trading and Markets, U.S. Sec. & Exch. Comm.); Andrew W. Lo, *Reading About the Financial Crisis: A Twenty-One-Book Review*, 50 J. ECON. LITERATURE 151, 155 (2012).

⁷ Capital requirements specify that the ratio of capital to assets be above a prescribed level. I will refer to the ratio of capital to assets as the capital ratio. Capital is distinct from reserves, which are assets that are held as cash or as a deposit account with a central bank. An increase in reserves reduces the amount of funds that a financial institution can lend or invest. An increase in capital only alters the sources of funds from which a bank can acquire its assets. See generally KENNETH SPONG, *BANKING REGULATION, ITS PURPOSES, IMPLEMENTATION, AND EFFECTS* (4th ed. 1994).

⁸ See Labaton, *supra* note 6.

⁹ See Viral V. Acharya & Matthew P. Richardson, *Causes of the Financial Crisis*, 21 CRITICAL REV. 195, 195–210 (2009); Michael J. de la Merced & Andrew Ross Sorkin, *Report Details How Lehman Hid Its Woes*, N.Y. TIMES, Mar. 12, 2010, at A1.

¹⁰ Dodd-Frank Wall Street Reform and Consumer Protection Act, Pub. L. No. 111–203, § 165, 124 Stat. 1376, 1423–32 (2010) [hereinafter Dodd-Frank Act]. The Federal Reserve has proposed rules for implementing Section 165 and requested comments at 12 C.F.R. Part 252 (Jan. 5, 2012).

¹¹ See generally BASEL COMM. ON BANKING SUPERVISION, *BASEL III: A GLOBAL REGULATORY FRAMEWORK FOR MORE RESILIENT BANKS AND BANKING SYSTEMS* (Dec. 2010), <http://www.bis.org/publ/bcbs189.pdf>. The Basel Committee is a group of banking supervisory au-

The relationship between capital regulation and the financial crisis has received considerable attention from scholarly commentators.¹² Influential scholars, in both law and economics, criticize the effectiveness of the current regulatory structure and offer a variety of market-based solutions to reduce systemic risk.¹³ Prominent examples include requiring banks (i) to issue debt securities that would convert to equity under conditions defined by contract or by a regulator¹⁴ and (ii) to purchase capital insurance against “systemic events.”¹⁵ Legal scholars have sought to refine these proposals by more carefully considering questions of contractual design and administrative feasibility. For example, John Coffee further develops the idea of convertible debt securities and proposes a framework to allocate voting rights, define conversion events and authority, and avoid the destabilizing potential of large triggering effects.¹⁶ Other legal scholars suggest improvements to the current disclosure regime that would introduce greater market discipline.¹⁷

These scholars provide a critical perspective on the regulatory framework of U.S. banking as well as the Basel Accords. They also propose market mechanisms to buttress regulatory discretion. Their purpose is not, however, to engage closely with the existing regulatory framework, which would remain a complement to these market mechanisms. As a result, they do not attempt to salvage what may be useful in current practice or to offer

authorities from different countries that collectively develop and coordinate bank supervisory issues.

¹² See, e.g., Anat R. Admati et al., *Fallacies, Irrelevant Facts, and Myths in the Discussion of Capital Regulation: Why Bank Equity Is Not Expensive* (Stanford Graduate Sch. of Bus., Research Paper No. 2065 2011); Markus K. Brunnermeier, *Deciphering the Liquidity and Credit Crunch 2007–2008*, 23 J. ECON. PERSP. 77, (2009); John C. Coffee, Jr., *Systemic Risk After Dodd-Frank: Contingent Capital and the Need for Regulatory Strategies Beyond Oversight*, 111 COLUM. L. REV. 795 (2011); KENNETH R. FRENCH ET AL., *THE SQUAM LAKE REPORT: FIXING THE FINANCIAL SYSTEM* (2010). While this literature reveals widespread differences over means and ends, there is nearly unanimous support for the view that the capital regulation of financial institutions should be improved.

¹³ See, e.g., Mark J. Flannery, *No Pain, No Gain? Effecting Market Discipline via “Reverse Convertible Debentures”* in CAPITAL ADEQUACY BEYOND BASEL: BANKING, SECURITIES, AND INSURANCE (Hal S. Scott ed., 2005); Viral Acharya, Thomas Philippon, Matthew Richardson, & Nouriel Roubini, *The Financial Crisis of 2007-2009: Causes and Remedies*, 18 FIN. MARKETS, INSTITUTIONS, & INSTRUMENTS 89 (2009); Robert P. Bartlett, III, *Making Banks Transparent*, 65 VAND. L. REV. 293 (2012); Coffee, *supra* note 12; French et al., *supra* note 12; Anil K. Kashyap, Raghuram Rajan, & Jeremy Stein, *Rethinking Capital Regulation* (Federal Reserve Bank of Kansas City Symposium on Financial Stability, 2008); Steven L. Schwarcz, *Systemic Risk*, 97 GEO. L.J. 193 (2008); Hal S. Scott, *Reducing Systemic Risk Through Reform of Capital Regulation*, 13 J. INT’L ECON. L. 763 (2010).

¹⁴ See, e.g., Coffee, *supra* note 13; Charles Calomiris & Richard Herring, *Why and How to Design a Contingent Convertible Debt Requirement* (2011) (Working Paper) (Wharton Fin. Institutions Ctr.), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1815406; Flannery, *supra* note 13; French et al., *supra* note 13.

¹⁵ See, e.g., Kashyap, Rajan, & Stein, *supra* note 13.

¹⁶ See Coffee, *supra* note 12, at 805–06.

¹⁷ See, e.g., Bartlett, *supra* note 13, at 369; Scott, *supra* note 13, at 776 (emphasizes the need for market discipline through greater disclosure of the information in supervisory assessments and the results of stress tests). This line of research intersects with the “Third Pillar” of the Basel Committee’s capital framework, “market discipline.” See generally BASEL COMM. ON BANKING SUPERVISION, *supra* note 11.

guidance for improvement within the institutional constraints of current practice. This literature suggests that existing regulation is both ineffective and incapable of improvement within the current framework. I argue that this conclusion is premature.

In contrast to those advocating novel, market-based designs, a group of prominent scholars advocate simple capital ratios as the most effective regulatory tool with which to mitigate risk in the financial system.¹⁸ In an influential paper, Anat Admati, Peter DeMarzo, Martin Hellwig, and Paul Pfleiderer (ADHP) point out that the relative simplicity of capital limits make it a regulatory safeguard that is robust to complacency or mistakes by both regulators and market participants. They rely on arguments in the tradition of Miller and Modigliani (MM), who first observed that in a complete financial market the choice of debt and equity is irrelevant to a firm's cost of capital and therefore its real investment decisions.¹⁹ ADHP consider why violations of the MM assumptions would affect both a financial institution's choice of equity and debt and its investment decisions, but they conclude that these considerations do not trump the regulatory interest in higher capital levels.

While ADHP provide compelling conceptual arguments for the use of simple capital requirements, they do not address many of the questions that arise in building a framework for capital regulation. For example, while they are aware of the issue, they do not fully consider the ways in which capital regulation may exacerbate economic downturns. There are, however, sound theoretical reasons as well as empirical evidence that capital regulation may have such an effect.²⁰ They also do not analyze how financial institutions will respond to higher capital ratios or consider how regulation should anticipate and mitigate this response. As a result, they do not discuss aspects of capital regulation—such as assigning risk weights to assets and monitoring off-balance-sheet transactions—that are related to the issue of bank response. In general, their analysis does not consider many of the regulatory difficulties that arise in implementing seemingly simple rules.²¹

This Article suggests an approach to capital regulation that is sensitive to these difficulties but retains the virtue of simplicity. Such an approach can mitigate both regulation-induced pro-cyclicality in bank lending and strategic responses by banks that can undo or distort regulatory aims. Implement-

¹⁸ See, e.g., Admati et al., *supra* note 12, at 59–63.

¹⁹ See Merton Miller & Franco Modigliani, *The Cost of Capital, Corporate Finance, and the Theory of Investment*, 48 AM. ECON. REV. 261, 262 (1958).

²⁰ See Joe Peek & Eric Rosengren, *Bank Regulation and the Credit Crunch*, 19 J. OF BANKING & F. 679, 680 (1995); Joe Peek & Eric Rosengren, *The Capital Crunch: Neither a Borrower nor a Lender Be*, 27 J. MONEY, CREDIT, & BANKING 625, 625 (1995) (noting that the economic downturn was precipitated because banks reduced credits supply to the market in order to meet minimum capital requirements).

²¹ ADHP have also been criticized as naïve for relying on the stylized assumptions of a model (MM) that has limited applicability in actual financial markets. See, e.g., Coffee, *supra* note 12, at 804 n.28. I argue that the latter criticism is unfounded.

ing such an approach would entail changing the focus of current regulatory practice and its methods. It would not, however, involve reinventing the regulatory wheel. This presents an advantage over approaches to financial regulation that do not take advantage of the existing stock of regulatory structure, practice, and expertise.

A Framework for Regulating Capital

This Article develops a framework for analyzing capital regulation in SIFIs that starts from the assumption of perfect capital markets.²² It systematically considers the ways in which the real world does not conform to these assumptions, and how bank regulation can respond to the resulting market imperfections. While this approach is common in areas of legal scholarship such as antitrust or bankruptcy, it has not made comparable inroads in the study of banking law and regulation.²³ This Article seeks to move the legal literature in banking law and regulation in this direction.²⁴

Capital regulation is a topic marked by considerable uncertainty and disagreement. The framework developed in this Article attempts to clarify the nature of this uncertainty and to consider the evidence in support of competing views. A central aim of this Article, independent of its specific recommendations, is to provide an analytical structure in which these competing views can be evaluated. This analytical structure is organized by the assumptions of modern finance, as opposed to a *prima facie* rejection of this theory as a guide for analysis because its assumptions are found wanting. Where the Article makes specific recommendations with respect to regulatory policy, it attempts to describe the tradeoffs involved, identify the key assumptions and evidence that inform its recommendations, and specify what new evidence would undermine or reverse them.

A number of implications emerge from this analysis. First, capital regulation can be anchored in a simple, market-based minimum capital ratio with a buffer for when banks approach this ratio. This ratio can be set at a level that is substantially higher than current U.S. regulations or the level proposed under Basel III.²⁵ Second, regulation can facilitate regular issues of

²² For the remainder of this paper, I will frequently refer to SIFIs as banks because banking describes their function in the economy. The analysis, however, applies to SIFIs. The FSOAC has issued a final rule detailing the criteria by which it will designate such institutions. See Auth. to Require Supervision & Reg. of Certain Nonbank Financial Companies, 76 Fed. Reg. 64, 274 (proposed Oct. 18, 2011) (to be codified at 12 C.F.R. pt. 1310).

²³ See, e.g., RICHARD SCOTT CARNELL ET AL., *THE LAW OF BANKING AND FINANCIAL INSTITUTIONS* (4th ed. 2009).

²⁴ For a different view, see generally Dan Awrey, *Complexity, Innovation, and the Regulation of Modern Financial Markets*, 2 HARV. BUS. L. REV. 235 (2012).

²⁵ For U.S. bank holding companies, Federal Reserve regulations stipulate that primary capital be at least 5.5% of total assets and that total capital be at least 6% of total assets. 12 C.F.R. pt. 225, app. B (2013). Bank holding companies with at least \$500 million in total assets must maintain a ratio of total capital to risk weighted assets to be equal or more than 8%. 12 C.F.R. pt. 225, app. A (2013). Basel III's leverage requirement stipulates a minimum

equity so as to minimize the informational content of the act of issuing to the market. Third, the capital ratio can adjust pro-cyclically over the business cycle so that it increases when credit growth is high and falls when credit growth is low.²⁶ This cyclical adjustment can be done, in part, through pre-determined formulas. In particular, regulators should have little discretion to adjust capital requirements during times of high credit growth. Fourth, regulators can manage the short-term, adverse impacts of higher capital requirements by prescribing a slow transition path to higher capital ratios from their current level. In this transition, most of the accumulation of bank capital should take place during times of high credit growth. Fifth, regulators can mitigate the effects of bank responses to capital requirements by developing better measures of the systemic risk posed by individual financial institutions. Such measures make use of information that is already contained in market prices. However, regulators should rethink whether these measures should be automatically applied to determine bank capital requirements, as is currently done. Regulators should consider using these measures to adjust capital requirements in a discretionary manner.

These implications differ substantially from the current regulatory approach of doubling down on the existing Basel system. The substantive—as opposed to methodological—aim of this Article is to provide arguments and evidence that this approach to regulation is feasible and deserves to be a part of the public conversation. The debate over capital regulation might then turn to constraints imposed by political coordination across jurisdictions and to the consequences of SIFI regulation for less regulated parts of the financial system. These issues are distinct from the ones considered in this Article. A brief account of these five implications is provided below, but their development is left to the main body of the Article.

Capital requirements can be based on market values. For example, the required capital ratio could be defined as the ratio of the market value of equity to adjusted total assets.²⁷ Adjusted total assets would equal the sum of the market value of equity and the market value of liabilities. Where the market value of liabilities is not readily available, this value could be computed using general accounting principles.

This capital ratio can be substantially higher than current requirements. I emphasize “substantially” because, as I argue below, there is little theoretical or empirical evidence that modest increases in bank capital levels will enhance bank safety. Limited increases in capital may even encourage banks to take on further risk and be more susceptible to failure.²⁸ Regulators could

ratio of 3% for Tier 1 capital to total consolidated assets, 4.5% for common equity to risk-weighted assets, and 6% of Tier 1 capital to risk-weighted assets. See BASEL COMM. ON BANKING SUPERVISION, *supra* note 11, at 61, 64.

²⁶ If the capital ratio is pro-cyclical, its effect on credit growth will be counter-cyclical.

²⁷ For a similar, market-based definition of a capital ratio in a different context, see Calomiris & Herring, *supra* note 14, at 16.

²⁸ The classic statement of this result is Michael Koehn & Anthony M. Santomero, *Regulation of Bank Capital and Portfolio Risk*, 35 J. FIN. 1235, 1243–44 (1980).

insist on minimum capital ratios for SIFIs that are eventually required to be 20 to 30%.²⁹ They can also insist on a capital buffer to accompany this ratio. For example, 5% would be a candidate for an appropriate number. Banks that are within this range of the regulatory minimum would, at a minimum, be unable to make dividend payouts to equity holders. The buffer would thus prevent a bank's payout policy from reducing its capital near the regulatory minimum.

In the sphere of capital regulation, the virtues of simplicity are twofold. The first and most familiar argument is that a simple framework is feasible for regulators to implement. The second, less familiar proposition is that the economic environment of large, complex financial institutions is one for which a simple framework may be a constrained optimum.³⁰

The second argument begins with Miller and Modigliani's observation that in a perfect capital market a firm's capital structure—its mix of debt and equity—is irrelevant to its investment decisions.³¹ Without an ideal benchmark, it is difficult to give a coherent account of when and why capital structure matters.³² This Article considers the main reasons why capital structure is not irrelevant for SIFIs and evaluates the empirical evidence supporting these claims. It then considers the implications of these deviations from the benchmark case for capital regulation. Taken together, the theory and evidence suggest that a framework proposed in this Article may be optimal, given the relevant institutional and informational constraints.

There are two main objections to substantially raising capital requirements for banks. The first concerns the importance of bank debt for satisfying the demand for liquidity, while the second concerns a potential increase in the funding costs of banks.

A criticism of substantial capital requirements is that they would inhibit the issuance of liquid liabilities to bank creditors. The argument proceeds as follows. Unlike other firms that issue debt and equity, a fundamental function of the banking system is to satisfy the demand for liquidity. Therefore, the argument suggests, substantially restricting the issuance of liabilities in the banking or financial system entails a social cost that would not occur if similar restraints were imposed in other sectors.³³

²⁹ Because this ratio uses market values as inputs, its magnitude is not directly comparable to the magnitude of capital requirements that are based on regulatory definitions of capital. For example, survey evidence indicates that most hedge funds use debt-to-equity ratios of less than two to one, corresponding to a capital ratio of 33% or more. See BANK OF ENG., FINANCIAL STABILITY REPORT NO. 29, at 16 (2011).

³⁰ For a related statement of this argument, see Admati et al., *supra* note 12, at 56.

³¹ See Miller & Modigliani, *supra* note 19, at 292. See also Miller, *supra* note 1, at 488.

³² Regardless of its particular recommendations concerning capital regulation, a central premise of this paper is that the perfect benchmark should structure the regulatory theory and practice of financial regulation.

³³ See, e.g., Gary Gorton, Stefan Lewellen, & Andrew Metrick, *The Cost of Bank Capital: Thinking Beyond Modigliani and Miller* (2011) (unpublished research paper) (on file with authors); Harry DeAngelo and Rene Stulz, *Why High Leverage is Optimal for Banks* 3 (Nat'l

The provision of liquidity to households, firms, and other institutions is undoubtedly a core feature of the banking system. Deposit liabilities to households that are issued by FDIC-insured entities are, however, a small part of aggregate liquid liabilities, and their volume would be unaffected by a substantial increase in SIFI capital. For liquid liabilities that are intermediated through markets—for example, through a money market mutual fund—a household or firm is unconcerned whether that debt is issued by a financial institution, industrial company, or secured pool of assets so long as the liabilities function like deposits. It is unclear what is so special about the market demand for *financial* sector debt that it should change the assessment of the relative merits and demerits of capital requirements.

High capital ratios are also criticized for increasing the funding costs for banks and other financial institutions.³⁴ Higher costs decrease the aggregate amount of lending, leading to lower output and growth. These criticisms, however, often fail to distinguish between the private and social costs of capital regulation. The private costs of capital regulation to financial institutions may indeed be substantial. However, the existence of these private costs is often evidence of the social benefits of capital regulation.³⁵

While some social costs to larger equity requirements may exist, routinizing equity issues can mitigate these costs by minimizing the informational content of equity issues to the market. If equity issues at all banks are routine and announced well in advance of the issue date, this dampens the negative signaling effect that can make banks reluctant to issue equity.³⁶ This Article also proposes an automatically convertible hybrid security that would aid banks in lowering their issue costs. This security would act similarly to a bond in that it would have a fixed maturity, face value, and interest payment. If, at the time of maturity, an investor did not relend the face value payment of the security—effectively rolling over the bank's debt—she would receive the face value in shares of the bank at current market prices.³⁷

Ensuring that the majority of equity issues take place during periods of credit growth will also lower the cost of issuing equity. To accomplish this, the capital ratio can be tied to credit growth in the economy so that it is procyclical. The growth of assets held by the financial sector would be one such candidate measure of credit. As credit expands in the economy, the capital

Bureau of Econ. Research, Working Paper No. 19139, 2013), available at <http://www.nber.org/papers/w19139>.

³⁴ See Douglas J. Elliott, Higher Bank Capital Requirements Would Come at a Price (Feb. 20, 2013) (research paper) (Brookings), available at <http://www.brookings.edu/research/papers/2013/02/20-bank-capital-requirements-elliott>.

³⁵ These arguments are presented in detail in Parts I and II of this Article.

³⁶ For a similar argument, see Stewart C. Myers & Nicholas S. Majluf, *Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have*, 13 J. FIN. ECON. 187, 196 (1984).

³⁷ For example, if the face value of the security is \$100, an investor who does not wish to roll over the security when it matures will receive shares in the bank with a market value equivalent to \$100. This feature distinguishes such a security from mandatory convertible securities that convert on terms that subject security holders to greater price risk.

ratio could adjust upward according to a predetermined formula, and as credit contracts it could adjust downward. This ensures that the effect of capital regulation is countercyclical.³⁸ This logic also implies that the desired minimum ratio should not be adopted immediately. Instead, regulation can phase in this ratio gradually so that most of the capital is built up during times of credit growth.

The ability to phase in capital increases during periods of growth also provides an opportunity to test the theory that informs the regulation. If, during the phase-in period, the imposition of higher capital requirements has a substantial impact on aggregate economic trends, then capital requirements can be scaled back. If equity investors are as eager to purchase bank equity as they are to purchase bank debt during times of growth, then this is evidence that a much higher, steady-state ratio of capital in SIFIs is feasible.

In periods of credit growth, regulators should have limited discretion to allow banks to depart from the prescribed minimum capital ratio as it increases. During a downturn, regulators can have greater discretion to waive the minimal ratio. This discretion should be used so that capital requirements do not trigger asset sales that may exacerbate a downturn. Regulatory action to recapitalize banks during a downturn should focus on managing troubled assets, issuing equity, and limiting payouts, as opposed to insisting on a target ratio. Regulatory discretion during a downturn is not without its drawbacks. In particular, regulatory forbearance can exacerbate downturns by delaying the restructuring of troubled banks. However, because it is difficult to formulate regulatory rules *ex ante* to perfectly guide such action, some amount of countercyclical regulatory discretion with respect to capital requirements would be useful.

Capital requirements can be adjusted in accordance with the risks posed by particular institutions and with aggregate risks. Regulators should continue to pursue more sophisticated, market- and model-based assessments of appropriate capital levels. In particular, regulators should continue to adopt better tools to estimate capital requirements in the presence of credit risk, market risk, and liquidity risk and to implement stress tests to simulate the effects of large realizations of these risks. They should also develop explicit measures of systemic risk—that is, the risk posed by particular institutions to the financial system as a whole.³⁹ These tools will remain imperfect and

³⁸ See Markus Brunnermeier et al., *The Fundamental Principles of Financial Regulation* 29–35 (Int'l. Ctr. for Monetary and Banking Stud., Geneva Rep. on the World Econ. No. 11, 2009), available at <http://www.princeton.edu/~hshin/www/Geneva.pdf>. See also BASEL COMM. ON BANKING SUPERVISION, *supra* note 11, at 57 (discussing a countercyclical buffer regime to “be deployed . . . when excess aggregate credit growth is judged to be associated with a build-up of system-wide risk to ensure the banking system has a buffer of capital to protect it against future potential losses . . .”).

³⁹ See Viral Acharya et al., *Measuring Systemic Risk 1* (Fed. Res. Bank of Cleveland, Working Paper No. 10-02, 2010), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1573171; Eric Talley & Johan Walden, *The Supervisory Capital Assessment Program: An Appraisal in CONG. OVERSIGHT PANEL, JUNE OVERSIGHT REPORT: STRESS TESTING*

will lag private developments in the financial sector. However, these assessments are important for advancing regulatory understanding and for keeping regulatory practice in touch with industry innovation, even if this occurs with a lag.

The development of these measures should focus less on risks that occur in the ordinary course of business. Regulation aimed at everyday risk management is appropriate when regulators stand in the shoes of bank creditors.⁴⁰ Regulators are forced into this role when bank creditors are insensitive to risk because of government guarantees. This insensitivity is most acute for smaller banks that rely heavily on retail deposits for funding. As a result, risk-based capital requirements are part and parcel of the regulatory scheme for insured, depository institutions. Though it may seem paradoxical, a simple capital ratio is likely to be a more effective regulatory instrument for a large, complex financial institution than it is for a small commercial bank.⁴¹ For banks with actively traded equity and debt that would qualify as a SIFI, regulation can place greater reliance on market forces to police ordinary risks and focus its gaze on extraordinary risks. Market monitoring of SIFIs will be suboptimal if creditors view them as too-big-to-fail. Nevertheless, market prices still contain useful information that regulators can use to assess the systemic risks posed by SIFIs.⁴²

Regulators should use these advanced, risk-based methods in a discretionary way. Making risk-based capital requirements automatically apply to banks may exacerbate the effects of imperfections in these models. For example, if regulation misestimates a risk posed by a particular class of investments, it can result in the concentration of risk in regulated entities that might not otherwise occur. If banks are presented with an entire menu of investments—each paired with its regulatory risk assessment—they will be able to identify the worst risk estimates. Automatic application of risk-based capital requirements will also have harmful pro-cyclical effects. These measures will understate risks during a boom and overstate them in a downturn. As a result, they will induce pro-cyclical and coordinated behavior by regulated banks.⁴³ While discretion brings with it the potential for non-enforcement, this could be offset in part by the existence of a substantial, mandatory capital ratio that operates in a countercyclical fashion.

AND SHORING UP U.S. BANK CAPITAL 46 (2009). See generally Tobias Adrian & Markus K. Brunnermeier, *CoVaR* (Nat'l Bureau of Econ. Research, Working Paper No. 17454, 2011).

⁴⁰ See Fischer Black, Merton Miller & Richard Posner, *An Approach to the Regulation of Bank Holding Companies*, 51 J. BUS. 379, 385 (1978).

⁴¹ See Andrew Haldane & Vasileios Madoume, *The Dog and the Frisbee*, Address at the Federal Reserve Bank of Kansas City's Symposium: 'The Changing Policy Landscape' (Aug. 31, 2012), available at <http://www.bis.org/review/r120905a.pdf>.

⁴² See Adrian & Brunnermeier, *supra* note 39; Acharya et al., *supra* note 39, at 5. In their current form, these measures are better suited to capturing the cross-sectional distribution of risk among banks at a particular point in time, as compared to measuring systemic risk or its evolution over time.

⁴³ See Samuel G. Hanson et al., *A Macroprudential Approach to Financial Regulation*, 25 J. ECON. PERSP. 3, 5 (2011).

The major obstacles to implementing robust capital standards for SIFIs arise from actions taken by these institutions to counteract regulation. These actions include increasing portfolio risk so as to increase the return on equity, gaming the risk-weighting system by holding the riskiest assets consistent with lower capital requirements, increasing off-balance-sheet exposures, and moving risk to unregulated parts of the financial sector. The regulatory challenges to detecting and limiting these actions by financial institutions are considerable. They are not, however, so insurmountable that they render capital requirements toothless. This Article suggests ways in which the effects of institutional response can be mitigated.

Part I of this Article lays out a simple framework with which to understand the basic goals of financial regulation and the relationship of capital adequacy to risks that society seeks to mitigate. In this framework, the benchmark model of perfect capital markets provides a way of clarifying both the positive and normative implications of real-world deviations from this model. Part II considers the main financial market imperfections that have been identified in the theoretical and empirical literature that complicate the framework introduced in Part I. Those imperfections with the most serious consequences for financial regulation counsel against the use of debt. Part III considers the likely strategies of financial institutions in response to higher capital levels and suggests ways to mitigate these effects. Part IV situates this Article's analysis in relation to contingent convertible debt and other market-based approaches to capital regulation in the literature and critiques these approaches.

I. BANK REGULATION

This Part develops from first principles the argument for regulating banks through the use of a simple capital ratio. First, this Part describes the basic rationale for bank regulation. The goal of bank regulation should be to limit the social costs of bank failures while preserving the ability of banks to choose profitable investment opportunities. Stating the objective of bank regulation in this way highlights the advantages of a regulatory framework that emphasizes the *liability side* of a bank's balance sheet. If regulation can reduce the cost of failures by restricting the liabilities of banks while preserving their flexibility in lending, then it should be viewed as successful.

Second, this Part describes the assumptions for which simple capital ratios are an optimal regulatory tool to achieve this objective. These assumptions were first articulated by Miller and Modigliani (MM) (i) to explain under what conditions the investment decisions and value of a firm are independent of its financial structure and (ii) to derive an expression for how the cost of equity and debt finance varies with leverage to make this true. Like the model of perfectly competitive markets, the MM assumptions provide an analytical framework to consider real-world deviations from this ideal type.

The framework developed in Part I of this paper sets the stage for Part II, which considers the implications of market imperfections.

A. *Why Regulate Banks?*

Define a bank to be an institution that creates liquidity and engages in financial intermediation. Economic theory assumes that without transaction costs and with perfect information, banks will trade to a mutually beneficial outcome. The need for regulation arises when markets are incomplete, and, as a result, such trades cannot take place. These missing markets are termed externalities.

The failure of banking institutions results in two main externalities. One externality follows from the role banks play in the payment system. This can be described as a *liquidity externality*. The role of the payment system, and money in general, is to facilitate transactions between parties at low cost. Money in this sense includes cash as a medium of exchange between individuals, but also securities that are commonly exchanged to facilitate transactions between large institutions. When a bank fails, its disruptive effects can extend beyond the bank's owners and direct creditors. If individuals lose confidence in the integrity of the payment system, then potential gains from trade will go unrealized.

A second externality arises from a bank's role in financial intermediation—that is, the transformation of savings into investment. This can be described as an *intermediation externality*. If bank failures cause individuals to withdraw their savings from financial intermediaries, then potential gains from investment—or inter-temporal trade—will similarly go unrealized. Undoubtedly, there are other reasons to regulate banking institutions. But liquidity and intermediary externalities form the basic social rationale for regulating the “safety and soundness” of banks.

The existence of such externalities is a necessary but not sufficient reason for extensive banking regulation. Their magnitude also plays a crucial role. The externalities from bank failures are potentially large for at least three reasons. First, unlike most other institutions, banks have some liabilities that are held by households, which are incapable of adequately monitoring bank activity.⁴⁴ As a result, these households would experience substantial, uninsured losses in the event of a bank failure.

Second, as a result of their financial structure, banks are particularly fragile institutions. Banks are vulnerable to runs or panics by depositors or short-term debt holders that can lead to widespread failures even when banks are fundamentally solvent. This possibility arises due to the informational asymmetry between depositors and bank management and to banks' role in

⁴⁴ See MATHIAS DEWATRIPONT & JEAN TIROLE, *THE PRUDENTIAL REGULATION OF BANKS* 31–32 (1991). This fact also provides a reason why insurance companies are extensively regulated.

maturity and liquidity transformation.⁴⁵ Banks issue short-term, liquid liabilities and hold longer-term, less liquid assets. A depositor's decision to withdraw funds from the bank in response to bad news about a bank's asset value depends on what other depositors will do. Because of this strategic interdependence, bank runs can become self-fulfilling prophecies. The failure of one bank can trigger runs on other, fundamentally sound banks if depositors have reason to believe that losses in the failed bank signal a higher likelihood of losses in other banks and that other depositors will react to this signal by withdrawing their funds. Third, the presence of large, interconnected, systemically important banks ensures that the externalities from their failure will be large.⁴⁶

How should regulation seek to reduce bank failure? Regulation could stipulate that banks hold only liquid, safe assets.⁴⁷ For example, this is the animating principle behind the regulation of money market mutual funds. While this would undoubtedly be effective in minimizing the risk of failure, it illustrates a fundamental tradeoff involved in bank regulation. Direct regulation of the asset side of banks' balance sheets interferes with the role of banks as financial intermediaries. Regulation could insist that banks hold high levels of reserves. Reserves are funds that banks must hold against deposit liabilities in the form of vault cash or deposits in a Federal Reserve Bank. Increasing reserve requirements makes banks safer, but crowds out risky investments that have positive social value.⁴⁸

Because the regulation of assets has its limits, the other logical possibility to examine is whether regulating the liability side of the balance sheet can limit bank failure. The MM framework—and the approach to finance that builds on their insights—provides a methodical way of approaching this question.⁴⁹ MM establish conditions under which the capital structure of a bank or any firm, financial or otherwise, is irrelevant to its operational decisions. Under these conditions, regulations can lower the risk of bank failure by manipulating banks' structure of debt and equity and impose no costs on society by distorting the investment decisions of banks. By starting with this case, it is possible to systematically identify imperfections that can cause

⁴⁵ See Douglas A. Diamond & Phillip H. Dybvig, *Bank Runs, Deposit Insurance, and Liquidity*, 91 J. POL. ECON. 401, 402 (1982).

⁴⁶ See REINHART & ROGOFF, *supra* note 2, at 144–45; Ben S. Bernanke, *Nonmonetary Effects of the Financial Crisis in Propagation of the Great Depression*, 73 AM. ECON. REV. 257, 259 (1983). See also DARRELL DUFFIE, *HOW BIG BANKS FAIL AND WHAT TO DO ABOUT IT* 29–36 (2010).

⁴⁷ This was the motivation for Irving Fisher's proposals for 100% reserve banking. See, e.g., IRVING FISHER, *100% MONEY* (1936). Milton Friedman and Merton Miller advocated a similar system for insured deposits. See Milton Friedman, *A Monetary and Fiscal Framework for Economic Stability*, 38 AM. ECON. REV. 245, 247 (1948); Miller, *supra* note 31, at 485.

⁴⁸ Reserve requirements are nonetheless an important feature of safety and soundness regulation for commercial banks and a tool of monetary policy. See RICHARD SCOTT CARNELL ET AL., *supra* note 23.

⁴⁹ The insights of Miller and Modigliani form the basis for *all* of modern asset pricing. See, e.g., JOHN H. COCHRANE, *ASSET PRICING* (2nd ed. 2005).

capital structure to affect a bank's investment decisions and to assess the positive and normative implications of different regulatory schemes.

B. A Perfectly Competitive (MM) Model of Banking

Consider an economy in which (i) markets are complete and all participants can buy and sell securities at market prices, (ii) there are no taxes or transaction costs associated with issuing securities or with bankruptcy, and (iii) all participants share the same information about the future earnings from investments. Under these assumptions the value of a firm is the market value of its assets and, therefore, is unaffected by its choice of capital structure (MM Proposition 1). There is also an explicit relationship between firm leverage and the expected returns on debt and equity (MM Proposition 2).⁵⁰

A simple example, Case 1 below, illustrates the logic of this argument and the power of the "no arbitrage" principle. These arguments generalize readily under the modern theory of asset pricing. With the caveats discussed in Part II, the principles developed below are used to determine prices in modern capital markets.

1. Case 1: Riskless Debt

Consider a bank that has access to an investment opportunity that, for an initial expenditure of \$50 (F), will pay off \$140 (X_H) if the economy does well and \$80 (X_L) if the economy does poorly. The probability that the economy does well is one half (p_H). The risk free rate of return is 4% (r_F). Investors are risk averse and there is a positive risk premium for other investments with these payoffs of 6% (r_P). The risk premium is the additional return that investors demand to hold a risky asset over and above the risk-free rate. The market rate of return for such an investment is therefore 10% (r_A).⁵¹ The risk-adjusted expected present value of the cash flows generated by the investment opportunity is then \$100⁵² and the expected net present value is \$50.

Consider the bank's choice of financing for the project. If the bank finances its investment through equity, it promises to pay out all cash flows from the project to equity owners. Because investors can buy and sell securities at market prices, the bank's equity will be worth \$100.⁵³ What if the bank finances the same project through a mix of debt and equity? Suppose the bank issues \$50 (D) in debt. The payoffs to the investment are large enough

⁵⁰ See Miller & Modigliani, *supra* note 19, at 268–71.

⁵¹ $4\% + 6\% = 10\%$ or $r_F + r_P = r_A$

⁵² $(\frac{1}{2} * \$140 + \frac{1}{2} * \$80) / (1.10) = 100$. The general formula for the risk-adjusted, expected present value is $(p_H * X_H + (1 - p_H) * X_L) / (1 + r_A)$. The expectation refers to the probabilities, while the risk adjustment occurs through r_A .

⁵³ The argument here relies on the assumption of complete markets. That is, it assumes that there are other investment opportunities in the economy that can be combined to generate payoffs of \$140 in a good economy and \$80 in a bad economy. It also assumes that the price of such a portfolio would be \$100.

that the debt will be repaid whether the economy does well or poorly ($D = X_L$). The debt can thus be financed at the risk-free rate of 4%.

What will be the price of equity? Before MM, it was common to argue as follows: From the prices we observe in the market we see that equity holders demand a rate of return of 10%. If the economy does well, the payout to shareholders will be $\$140 - \$52 = \$88$.⁵⁴ If the economy does poorly, the payout will be $\$80 - \$52 = \$28$.⁵⁵ The risk adjusted, expected present value of these flows “should” be $(\frac{1}{2} * \$88 + \frac{1}{2} * \$28)/(1.10) = \$52.72$. This is the price the bank would be able to get if it floats its shares. If the share price were any lower, the rate of return would be greater than 10% and equity investors would bid up the price. If the share price were any higher, the rate of return would be less than 10%, equity investors would be uninterested, and the share price would fall. The total value of the bank’s securities—its debt plus equity—would be $\$50 + \$52.72 = \$102.72$. Under this analysis, the value of the bank increases by adding leverage.⁵⁶

This analysis is consistent with the commonly held view that equity is more expensive than debt because shareholders demand a higher rate of return. Therefore, by funding investments with cheap debt, a bank can increase its value. One can continue to find statements of the view that equity is expensive—without further elaboration—in media and industry analysis of banking regulation.

In fact, the above analysis *cannot hold* in a competitive market. This is because the rate of return on equity is itself a function of the bank’s debt. Suppose the above analysis was correct and the value of equity in the levered bank was $\$52.72$. Then an investor could short the levered bank, go long in an investment with the same cash flows, and make a costless arbitrage profit of $\$2.72$.⁵⁷ The key idea is that if a bank can make its investment more profitable by financing itself partly with debt, then in a complete mar-

⁵⁴ $X_H - D * (1 + r_F)$

⁵⁵ $X_L - D * (1 + r_F)$

⁵⁶ In terms of the more general notation $[(p_H * X_H + (1 - p_H) * X_L - D * (1 + r_F)] / (1 + r_A) + D = [p_H * X_H + (1 - p_H) * X_L] / (1 + r_A) + D * [1 - (1 + r_F) / (1 + r_A)] > [p_H * X_H + (1 - p_H) * X_L] / (1 + r_A)$

⁵⁷ The general expression for arbitrage profits is $D * [1 - (1 + r_F) / (1 + r_A)]$.

Transaction	Period 1 Cash Flow	Period 2 Cash Flow	
		Good Economy	Bad Economy
Borrow Levered Equity	$[(p_H * X_H + (1 - p_H) * X_L - D * (1 + r_F)] / (1 + r_A)$	$-(X_H - D * (1 + r_F))$	$-(X_L - D * (1 + r_F))$
Borrow Debt	$\$D$	$-D * (1 + r_F)$	$-D * (1 + r_F)$
Buy Unlevered Equity	$-(p_H * X_H + (1 - p_H) * X_L) / (1 + r_A)$	X_H	X_L
Total	$D * [1 - (1 + r_F) / (1 + r_A)]$	0	0

ket an investor who can buy and sell stock and bonds can do same thing. This action by the investor is known as “homemade leverage.”

Transaction	Period 1 Cash Flow	Period 2 Cash Flow	
		Good Economy	Bad Economy
Borrow Levered Equity	+\$52.72	-\$88	-\$28
Borrow Debt	+\$50	-\$52	-\$52
Buy Unlevered Equity	-\$100	+\$140	+\$80
Total	+\$2.72	0	0

Such an arbitrage opportunity exists for any value of equity other than \$50. Therefore, the value of equity in the levered bank must be \$50,⁵⁸ and the value of the bank’s securities (\$50 debt + \$50 equity = \$100) is independent of its capital structure. The bank’s investment decisions are also independent of its capital structure. The bank will undertake any investment that produces these cash flows if its initial cost (F) is less than \$100.

The mistake in the previous view—that leverage can lower the cost of external finance and increase the value of the bank—arises from assuming that the market return on equity will not change when a bank partly finances itself through debt. Once it is determined that the no-arbitrage price of equity should be \$50, we can see that this assumption is incorrect. The return on equity in the levered bank is $(\frac{1}{2} * \$88 + \frac{1}{2} * \$28)/50 - 1 = 58/50 - 1 = 16\%$. Owners of equity demand a higher risk premium (12%) to compensate them for the greater risk in their investment from the presence of debt financing.⁵⁹ The risk premium on levered equity (12%) is twice the risk premium for un-levered equity (6%) in this example. Moreover, this phenomenon is *independent of the default risk of debt*. In this example, the probability of default on the bank’s debt of \$50 is zero. The risk premium on equity increases with leverage even in the presence of risk-free debt.⁶⁰

Under these assumptions, it is possible to precisely describe the relationship between leverage and return on levered equity. The argument proceeds as follows. We have seen that the value of a firm’s equity plus debt is equal to the value of its assets. This relationship holds in *every* state of the economy. In this example, the relationship held at the time of financing (\$50 + \$50 = \$100), when the economy did well (\$52 + \$88 = \$140), and when the economy did poorly (\$52 + \$28 = \$80). Because this statement holds

⁵⁸ $(p_H * X_H + (1 - p_H) * X_L) / (1 + r_A) - D$

⁵⁹ The general expression for the return on the levered bank is: $[(p_H * X_H + (1 - p_H) * X_L - D * (1 + r_F)] / [(p_H * X_H + (1 - p_H) * X_L) / (1 + r_A) - D] - 1 = r_M + D * (r_A - r_F) / [(p_H * X_H + (1 - p_H) * X_L) / (1 + r_A) - D]$. The expression in italics is positive and is the increase over the rate of return demanded for levered equity.

⁶⁰ The magnitude of the risk premium is related to the variation in return in levered equity relative to that for un-levered equity. This relationship is analogous to “beta” in the capital asset pricing model (CAPM). A derivation of beta in this model is available from the author. See BREALEY ET AL., *supra* note 5, at 176.

for prices, it also holds for the returns (r), adjusted by the relative mix of debt and equity:⁶¹

$$r_A = (D / (D + E)) * r_D + (E / (D + E)) * r_E$$

The expression on the right is the bank's weighted cost of external finance.⁶² This is the appropriate rate at which a bank should discount cash flows in deciding whether to fund an investment project. This expression restates the conclusion from the example in more general form. Because the cost of external finance is independent of leverage, the bank's investment choices are independent of its leverage.

Rearranging this expression results in an expression for the return on levered equity that informs the analysis of capital regulation:

$$r_E = r_A + D / E * (r_A - r_D)$$

Because this relationship holds for *every* realization of returns, it also holds for expected returns, which are a probability-weighted sum of actual returns:

$$E[r_E] = E[r_A] + D / E * E[(r_A - r_D)]$$

The expected return on levered equity equals the expected return on assets (un-levered equity) plus the difference between the expected returns on assets and debt ($E[(r_A - r_D)]$), adjusted by a multiplicative factor equal to the ratio of debt to equity (D/E). If the debt is risk free ($E[r_D] = r_F$), the latter term ($E[(r_A)] - r_F$) is the risk premium on assets. In the example, when debt is risk free, the expected return on equity is $10\% + D/E * 6\%$.

This example illustrates several, fundamental insights into the relationship between capital structure and risk that should inform capital regulation. First, the risk-adjusted rate of return on equity increases with the level of debt (leverage). As leverage falls, so does the expected return investors demand on equity. *In other words, equity becomes cheaper as leverage falls.* This occurs even when debt is riskless and when there are no costs associated with bankruptcy. This price adjustment occurs through market trading of equity and debt that eliminates arbitrage opportunities. *In a complete market, there is no such thing as a required return on equity that makes equity expensive for a firm to issue.*

Second, in a perfectly competitive capital market, a bank cannot lower its cost of external finance by changing the mix of debt and equity that it offers. This can be seen both from the logic of no arbitrage and the explicit

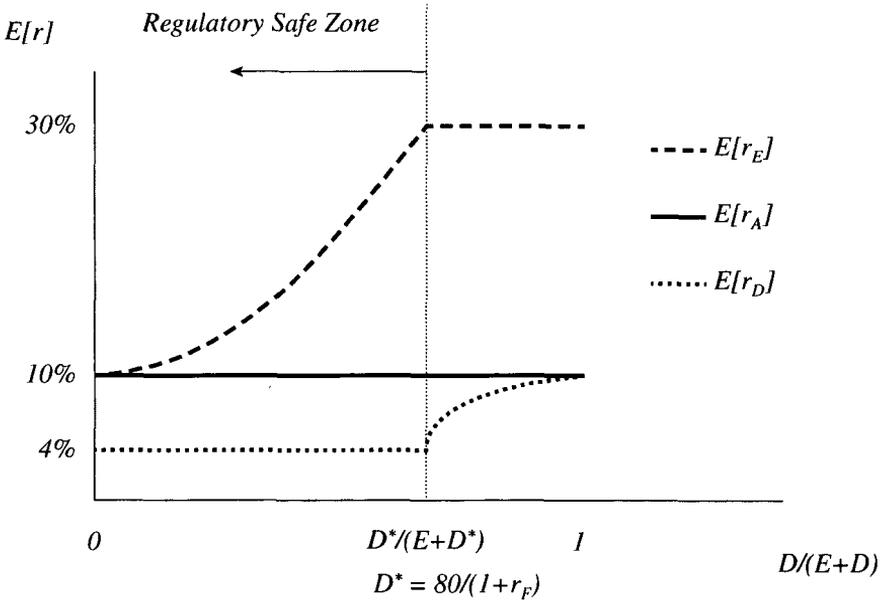
⁶¹ For any portfolio of securities, the rate of return on the portfolio is a weighted average of the return of the individual investments, with weights given by the fraction of the investment's contribution to the total portfolio value. From our example, if we consider the returns in a good state of the economy, we have $140/100 - 1 = .5 * (52 / 50 - 1) + .5 * (88/50 - 1)$ or $40\% = .5 * 4\% + .5 * 76\%$. The relationship also holds in a bad economy.

⁶² In the corporate finance literature, this is usually referred to as the weighted average cost of capital (WACC). See generally BREALEY ET AL., *supra* note 5, at 216. I will refer to it as the cost of external finance in order to use the term capital to refer to a bank's equity, as is done in the banking literature.

derivation of the cost of external finance, which does not depend on leverage. Third, because a bank's cost of external finance is independent of its mix of debt and equity, its investment (asset) choices are also independent of this mix. Changes to the liability side of its balance sheet have no effect on the asset side.

2. Case 2: Risky Debt

The example above analyzes a case in which a bank issues riskless debt. The central concern of bank regulation, however, is bank failure. In the example, this corresponds to situations where the bank issues debt with face value greater than \$80. Does this change any of the above conclusions about the pricing of debt and equity? It does not. The case of risky bank debt can be analyzed using the tools of asset pricing.⁶³ This analysis enables a graphical representation of capital regulation in this model.



The vertical axis on the graph is expected returns.⁶⁴ The horizontal axis is a measure of leverage—the debt of a bank as a fraction of total assets. The long-dash line represents the expected return on equity ($E[r_E]$). When the bank has no debt, the expected return on equity is 10%. The expected return on equity increases with the bank's level of debt. The short-dash line repre-

⁶³ This analysis is available from the author on request.

⁶⁴ Recall that the relationships we derived held for any realization of returns. Therefore, these relationships hold for expected returns, which are a probability-weighted average of realizations.

sents the expected return on debt ($E[r_D]$). Debt earns the risk-free rate until so much debt is issued (D^*) that the bank cannot fully repay in the bad state of the economy. In the “all leverage” case when a bank funds itself with only (risky) debt, debt holders will receive an expected rate of 10%. For any combination of equity and debt, the expected weighted cost of external finance to the bank ($E[r_A]$)—depicted as a solid line—is 10%. Market determined rates of return on debt and equity adjust to keep a bank’s cost of external finance constant.

C. Regulation in the Baseline Model

Bank regulation is premised on externalities from bank failures. In the model thus far, there is no reason for *any* form of financial regulation. The price of risky debt adjusts so that debt holders are compensated for any risk they bear. A simple model of bank regulation introduces a single imperfection to the model. Assume that default on bank debt represents a cost to society that is not fully born by holders of bank debt. In terms of the example, assume that default entails a social cost (c) so that the total social value of the bank’s project is worth $\$80 - c$ in the event that it cannot pay debt holders. This occurs when the bank’s second period debt payment exceeds $\$80$. Assume that debt holders do not bear this cost. They continue to receive $\$80$ in the event of a bank default.

Under these assumptions, the regulatory task is simple: *Set the ratio of capital to total assets at any level in which bank debt trades publicly at the risk free rate.* The no-arbitrage condition implies that the choice of financial structure is reflected in the price of debt and equity. The regulator needs only the authority to set the capital ratio and the ability to observe the price of publicly traded bank debt. Regulation is costless because it does not affect the allocation of investment in the economy. A capital ratio is therefore an optimal regulatory policy to correct this externality.

The regulator can set a minimum capital level for banks that, from (very) long-run historical data, would result in nearly risk-free interest rates for bank debt over the business cycle.⁶⁵ The regulator could also make further use of information contained in market prices and maintain safeguards against regulatory mistakes. The minimal capital ratio can be adjusted upward if the market spread of a bank’s debt over a suitable benchmark portfolio of debt securities rises. The applicable minimal capital ratio would be the maximum over (i) a specified minimum and (ii) a risk-adjusted level that takes into account the spread on the bank’s debt. Through the use of market prices to adjust minimal capital levels, regulatory capital levels will reflect

⁶⁵ Under these assumptions, it is not crucial to calibrate capital requirements to the particular risks posed by individual banks. One can think of the regulator as choosing the maximum ratio over that set. For an excellent description of the challenges involved in such a calibration exercise, see Thomas J. Brennan & Andrew W. Lo, *Do Labyrinthine Legal Limits on Leverage Lessen the Likelihood of Losses?*, 90 TEX. L. REV. 1775, 1804–10 (2012).

the market's perception of the cross-sectional distribution of bank risk. Riskier banks will be required to hold more capital. Regulatory capital levels will also reflect the component of systemic risk that is privately borne by bank debt-holders. If bank spreads rise across the board, then regulatory capital levels will rise.

This reliance on market information to enhance capital requirements is especially useful when regulators have limited information relative to market participants. As long as the private costs of bank failure to debt holders are positively correlated with their social costs, the use of such risk-adjusted capital ratios⁶⁶ will improve the effectiveness of capital regulation.

Regulation in this baseline case provides a point of departure for a coherent theory of capital regulation.

II. CAPITAL REGULATION WITH MARKET IMPERFECTIONS

Part I presents a simple framework for capital regulation in an environment with (i) no subsidies or taxes, (ii) complete markets, and (iii) perfect information. The model contains one externality—a social cost of bankruptcy not born by debt holders. This Part considers whether this regulatory framework would continue to be effective and feasible in the world of actual financial markets, where these assumptions do not hold. It considers the ways the real environment of financial institutions diverges from the baseline case and examines the implications of this divergence for capital regulation. In this process, it further develops the logic behind the “Framework for Capital Regulation” described in the Introduction.

Whether any remnants of this framework survive when these assumptions are relaxed, the baseline case still provides a positive and normative benchmark for the analysis of financial regulation. First, it is difficult if not impossible to produce a coherent analytical account of real-world imperfections without first analyzing the perfect case. Second, this case provides a normative justification for regulatory action to improve the functioning of existing markets. In this sense, the model of perfectly competitive capital markets should occupy the same role in financial regulation as the model of perfect competition between firms occupies in antitrust and competition law.

A. Subsidies, Taxes, and Transaction Costs

The existence of subsidies, taxes, and transaction costs has the following implications for capital regulation. First, because subsidies for bank debt increase the level of financial sector leverage, such subsidies strengthen the case for capital regulation. Second, the policy justifications for why debt is a tax-preferred form of financing relative to equity are weak compared to the

⁶⁶ The risk adjustment described here is distinct from the risk weighting of assets under current regulatory practice. See *infra* Part III.

importance of financial safety and soundness. The empirical evidence suggests that tax and transaction cost factors do not explain much of the variation in financial structure across industries and firms. This implies that any increased tax burden from heightened capital requirements will be manageable and, moreover, can be offset through tax policy.

Subsidies

The subsidies accorded to bank debt are the elephant in the room of financial regulation. These subsidies distort the size of the banking sector relative to other sectors. Within the banking sector, the allocation of resources will be biased toward institutions able to obtain the largest subsidies. Subsidies also distort the tradeoff between risk and return taken by such institutions because bank debt is not appropriately priced. Left unregulated, these subsidies encourage excessive leverage from a social point of view.

Deposit insurance provides the leading conceptual example. Deposit insurance makes bank depositors insensitive to the risks in a bank's investment portfolio. Because the risk of these investments will not be reflected in the bank's cost of debt finance, banks will make excessively risky investments. For banks with insured deposits, the aim of regulation is *both* (i) to step into the shoes of bank creditors and monitor bank risk through pricing and covenants and (ii) to prevent externalities.⁶⁷

More than deposit insurance, the issue of concern for SIFIs is whether they are able to borrow at a discount because they are viewed as too big to fail. It is difficult to estimate the value of the implicit subsidy to SIFIs or to the financial system as a whole.⁶⁸ Nevertheless, the best new empirical research on this question suggests that the insurance benefits to these institutions are substantial.⁶⁹

Why not simply end bank subsidies rather than create a regulatory structure designed to limit leverage or other effects of such subsidies?⁷⁰ Ending the implicit subsidy to large financial institutions is a worthy, but difficult task. The Dodd-Frank Act's financial resolution authority is a step in this direction, but it is difficult to measure the effect of such actions on investor sentiment. The government faces a dynamic consistency problem. It cannot

⁶⁷ See Black et al., *supra* note 40, at 385–88.

⁶⁸ For summaries of these attempts and the various methodologies employed, see Joseph Noss & Rhiannon Sowerbutts, *The Implicit Subsidy of Banks* (Bank of England, Financial Stability Paper No. 15, 2012). See also Sebastian Schich & Sofia Lindh, *Implicit Guarantees for Bank Debt: Where Do We Stand?* 28 OECD J. FIN. MARKET TRENDS 1, 9–11 (2012).

⁶⁹ See Bryan Kelly et al., *Too Systemic to Fail: What Option Markets Imply About Sector-wide Government Guarantees* 24 (Chicago Booth Fama-Miller Paper Series No. 11-12, 2012) (showing that the systemic component of financial sector risk was substantially underpriced due to the expectation of government insurance).

⁷⁰ In the case of deposit insurance, the policy question of providing insurance to households is well settled.

credibly promise not to intervene in markets when financial turbulence threatens to spill over to other parts of the real economy.

The government can nevertheless take other actions to lower this subsidy. These include reducing the size and scope of financial institutions, as well as operating parts of the financial plumbing of the economy—such as derivatives markets—more like a regulated utility. Such actions can be viewed as complements to—rather than substitutes for—capital regulation. There is enough uncertainty over the relative efficacy of regulatory actions that it is wise to take a portfolio approach. The too-big-to-fail problem is a central problem of financial regulation, and it is beyond the scope of this Article to address the issues it raises. For this Article, it is sufficient to show that the subsidy to banks as a result of deposit insurance and implicit guarantees is potentially large. The existence of large subsidies *strengthens* the case for capital regulation.

Taxes and Transaction Costs

The different tax treatment accorded to debt and equity is another reason for banks to prefer debt to equity. Equity entails double taxation because earnings are taxed at the institution level and again at the individual level when they are received as dividends or capital gains.⁷¹ Payments to debt holders, on the other hand, are deducted from earnings at the institution level.⁷²

All other things equal, a bank should prefer debt to equity as a form of financing. In the example from Part I, a bank would choose to finance itself solely through risky debt. By doing so, it would achieve a lower cost of capital and higher value (profits). Because the value of the bank under debt financing would exceed its value under equity financing, the choice of financing affects the choice of investment.⁷³ Some projects that would not be profitable if financed through equity would be profitable if financed through debt. By forcing banks to hold equity, capital regulation in the presence of double taxation raises the cost of external financing and lowers the overall amount of bank lending. Capital regulation acts like a tax on banks.

How important a consideration should this be for financial regulation? Tax consequences of this nature should not, as a matter of principle, determine regulatory policy toward banks.⁷⁴ Moreover, because tax consequences are not a fundamental empirical factor driving the choice of debt and equity across different firms and industries, there is no compelling reason to pre-

⁷¹ See BREALEY ET AL., *supra* note 5, at 407.

⁷² *Id.* at 440.

⁷³ See Merton H. Miller & Franco Modigliani, *Corporate Income Taxes and the Cost of Capital: A Correction*, 53 AM. ECON. REV. 433, 441 (1963).

⁷⁴ For a related argument, see Admati et al., *supra* note 12.

serve a tax advantage for the financial sector that other industries do not similarly exploit.

Financial regulation should not subordinate its goals to distortions created by the tax code. There is no strong policy justification for the different tax treatment accorded to debt and equity. In contrast, standard tax theory suggests that equal treatment would have a less distortionary effect on savings and investment⁷⁵ and there is some empirical evidence supporting this claim.⁷⁶ As a result, there have been a variety of proposals to equalize the tax treatment of debt and equity.⁷⁷ Whatever the resolution of this debate, weighed against the minimal virtues of the tax status quo are the significant costs of excessive leverage in the financial sector.

Views also differ on whether the taxation of banks or other corporations is too light or too severe. In principle, this does not pose a problem for capital regulation. The tax consequences of capital regulation can be made consistent with either view. If one holds the view that the tax burden of capital regulation would be oppressive, it is possible to lower this burden, end the differential tax treatment of debt and equity, and institute sensible capital regulation. If, on the other hand, one holds the view that debt receives an unwarranted tax subsidy, then ending the tax-favored treatment of debt can be implemented alongside capital regulation.

Even if the current tax regime remains in place, banks possess many tools to minimize the tax burden of holding more equity. First, banks can delay the payment of dividends. By making less frequent dividend payments, banks would give equity holders the chance to realize income through share price appreciation in a way that minimizes its tax consequences. Even in the absence of tax considerations, with enhanced capital requirements banks would have incentives to make less frequent dividend payments in order to maintain their capital levels. Second, banks holding ample capital can repurchase shares. Shareholders would then be able to make strategic purchases and sales of other investments in the tax year in order to offset any capital gains. In general, banks are some of the best-placed institutions to minimize the increased tax burden that would result from higher levels of bank capital.

Moreover, while taxes undoubtedly play a role at the margin, there is little evidence that tax considerations are a fundamental determinant of a firm's (average) choice between equity and debt finance.⁷⁸ Little of the cross-

⁷⁵ See Alan Auerbach, *Taxation and Corporate Financial Policy*, in 3 HANDBOOK OF PUBLIC FINANCE 136, 148 (Alan Auerbach & Martin S. Feldstein eds., 2002).

⁷⁶ See Larry Summers & James Poterba, *The Economic Effects of Dividend Taxation* 2-4 (Nat'l Bureau of Econ. Research, Working Paper No. 1353, 1984).

⁷⁷ See, e.g., *Tax Policy Aspects of Mergers and Acquisitions: Hearing Before the H. Comm. on Ways and Means*, 100th Cong. 214 (1989) (statement of Martin Feldstein, President, the National Bureau of Economic Research); Alan Auerbach, *Tax Policy and Corporate Borrowing*, 33 FED. RES. BANK OF BOS. CONFERENCE SERIES 136 (1989).

⁷⁸ See John Graham, *A Review of Taxes and Corporate Finance*, 1 FOUNDATIONS & TRENDS IN FIN. 573, 584-87 (2006).

sectional variation in leverage across firms can be explained by taxes.⁷⁹ Unknown industry-specific and firm-specific effects explain most of the variation in corporate financial policy. If industrial firms can shoulder the tax burden of their market-determined, high capital ratios without drastic economic consequences, then the financial sector should be able to do the same.

Analyzing the transaction costs of issuing securities presents many of the same issues that arise when considering taxation. Issuing debt securities would, all else equal, be preferable to issuing equity if debt could be issued with lower transaction costs. Transaction costs include explicit costs such as fees to investment banks as well as the spread or difference between the price received from the investment bank and the price at which the investment bank sells to the public. They also include implicit costs such as the possible underpricing of the offering. If the transaction costs for equity exceed those for debt, then capital regulation that forces banks to regularly issue more equity would again act as a tax on the bank. As with taxes, however, there is little evidence that differences in the transaction costs of issues can explain broad patterns in external financial structure.⁸⁰

Therefore, it is true that the presence of subsidies, taxes, and transaction costs make the model of perfectly competitive capital markets an inaccurate description of real world financial institutions. But none of these imperfections weaken the conclusions of the model for capital regulation in Part I or suggest that a different regulatory approach is in order. These conclusions reinforce the importance of systematically identifying the consequences for regulation of deviations from the baseline case. Not all deviations are important for the purpose of defining the goals and methods of financial regulation.

B. *Incomplete Markets and Imperfect Information*

In the theory of finance, the most important reasons why a firm's choice between equity and debt can matter for real economic decisions concern asymmetric information and incomplete markets.⁸¹ These reasons are also the most relevant for identifying what is special about financial institutions.⁸² The assumptions of asymmetric information and complete markets are closely related. Asymmetric information implies incomplete markets. If a bank can distinguish risky investments from safe ones, but investors in a bank's securities are unable to do so, then securities with payoffs from safe and risky investments will trade at the same price. When two investments with different risk profiles trade at the same price, this violates the complete markets assumption.

⁷⁹ *Id.* at 587–88.

⁸⁰ *See id.* at 651.

⁸¹ *See* JEAN TIROLE, *THE THEORY OF CORPORATE FINANCE* 237–49 (2005).

⁸² *See* DEWATRIPONT & TIROLE, *supra* note 44, at 31–32; XAVIER FREIXAS & JEAN-CHARLES ROCHET, *MICROECONOMICS OF BANKING* 305–38 (2008).

The differing financial claims involved in debt and equity securities give rise to conflicts of interest between equity holders and debt holders.⁸³ In the presence of asymmetric information, this gives each group an incentive to take unobserved actions at the expense of the other. This Article argues that the presence of these informational asymmetries, considered together, makes the case for capital regulation stronger. It first considers informational asymmetries that raise the social cost of debt financing and suggests that these concerns are heightened in the context of financial institutions. It then considers asymmetries that imply social costs to limiting debt finance and suggests that sensible regulatory design can minimize these costs.

1. *Disadvantages of Bank Debt*

i. *Asset Substitution*

For any given level of equity, debt, and prices for both instruments, equity holders prefer a greater amount of risk in a firm's underlying assets than debt holders prefer. This is also true for managers whose incentives are aligned with equity through their compensation contracts. Therefore, if equity holders can make ex post adjustments to asset risk that are unobservable to debt holders, they will. If debt holders are unable to anticipate and respond to these actions, then this will result in an inefficiently high level of asset risk. This increase in the riskiness of project choice due to asymmetric information is known as asset substitution.

Asset substitution arises from the very nature of equity as a financial claim. If the firm's assets turn out to be worth more than the level of debt, then equity holders keep the difference. If the assets are worth less, then equity gets nothing. Equity holders get the benefit of the upside but have a limited downside. Stated precisely, asset substitution arises because, for any choice of assets and capital structure for a firm, equity holders possess a call option on the value of the firm with a strike price given by the outstanding level of debt.⁸⁴ Equity holders have a greater incentive to increase the riskiness of assets when the firm is levered or in distress. For example, during the recent crisis, banks sold relatively safe and liquid assets to pay dividends to shareholders. These payments left the banks holding riskier assets.⁸⁵

⁸³ For reviews of this literature, see generally Milton Harris & Artur Raviv, *The Theory of Capital Structure*, 46 J. FIN. 297 (1991); TIROLE, *supra* note 81.

⁸⁴ See Robert C. Merton, *On the Pricing of Corporate Debt: The Risk Structure of Interest Rates*, 29 J. FIN. 449, 450–52 (1974). The existence of asset substitution does not depend on the underlying risk preferences of equity holders and debt holders. The price (value) of this option is a function of risk preferences in the economy. But the incentive of equity holders to engage in asset substitutions is unrelated to the level of this price. This incentive arises because the price of equity increases with the risk or volatility of the underlying assets. As in other areas of economics, incentives relate to margins not levels.

⁸⁵ See Viral V. Acharya et al., *Dividends and Bank Capital in the Financial Crisis of 2007–2009* 3–4 (Nat'l Bureau of Econ. Research, Working Paper No. 16896, 2011); Murray Carlson & Ali Lazrak, *Leverage Choice and Credit Spreads When Managers Risk Shift*, 65 J.

In large, complex financial institutions, the potential for increasing systemic risk through asset substitution is substantial. Managers receive large fractions of their pay in performance compensation tied to the value of equity.⁸⁶ It is in principle and in practice very difficult to determine if an increase in the return on equity in a financial institution is a result of managerial talent—often called alpha or excess return—or hidden portfolio risks.⁸⁷ Even if debt holders learn the riskiness of these asset choices over time and either raise the price of credit or insist on protective covenants, this learning may take place too slowly to prevent costly realizations of these risky choices.

Moreover, some protective actions by debt holders can have systemic consequences. Debt holders may insist on short maturity structures so they can preserve the option to exit if risky choices begin to reveal themselves. The aggregate effect of a shorter maturity structure for debt could be to increase the probability of bank runs in the event of bad news about a bank's performance.⁸⁸

Debt holders in such large institutions are also likely to have poor incentives to monitor certain kinds of risk. If, as in the case of deposits, bank debt is guaranteed, then debt holders have little incentive to monitor the risk profile of bank assets. Even if the government does not formally guarantee bank debt, implicit guarantees in the event of widespread bank failures provide a subsidy to debt holders. This subsidy dampens the incentive of debt holders to monitor the risk of bank failures. As a result, equity holders or managers can increase the riskiness of bank assets through asset substitution without paying a commensurate penalty through higher interest rates or restrictive debt covenants.

Implicit guarantees are also likely to affect the risk composition of a bank's assets. If only systemic events trigger such guarantees, then asset substitution will result in the buildup of such systemic or tail risk. It is exceedingly difficult for regulators to assess the risk profile of assets in large, complex financial institutions. In the absence of guarantees, estimating the systemic component of risk would be a difficult exercise even if aided by robust position disclosure.

FIN. 2323, 2356 (2010); Assaf Eisendorfer, *Empirical Evidence of Risk Shifting in Financially Distressed Firms*, 63 J. FIN. 609, 622 (2008).

⁸⁶ See Rüdiger Fahlenbrach & René M. Stulz, *Bank CEO Incentives and the Credit Crisis* 4 (Nat'l Bureau of Econ. Research, Working Paper No. 15212, 2009). See also Lucian A. Bebchuk & Holger Spamann, *Regulating Bankers' Pay*, 98 GEO. L.J. 247, 251 (2010). If managers' incentives are imperfectly aligned with shareholders', then their incentives can be more complex. See Yoram Landskroner & Alon Raviv, *The 2007–09 Financial Crisis and Executive Compensation: An Analysis and a Proposal for a Novel Structure* 3 (N.Y.U., Working Paper No. FIN-09-003, 2009).

⁸⁷ See Raghuram G. Rajan, *Has Financial Development Made the World Riskier?* 18 (Nat'l Bureau of Econ. Research, Working Paper No. 11728, 2005).

⁸⁸ See Markus K. Brunnermeier & Martin Oehmke, *The Maturity Rat Race* 23 (Nat'l Bureau of Econ. Research, Working Paper No. 16607, 2010).

ii. *Debt Overhang*

When a firm carries a large stock of senior debt, new investors may decline to invest in profitable or positive net present value projects. This can occur even if those projects would generate enough revenue to pay off the old debt. While this phenomenon is as old as debt itself, Stewart Myers provided a concise formulation, which is now described under the moniker “debt overhang.”⁸⁹

If the actions of the managers are observable, then profitable projects will be funded independently of the firm’s stock of debt. But, if these actions are not observable, then managers or equity holder must have enough “skin in the game” to take actions that will result in profitable projects. Managers, then, cannot be given the appropriate incentives to undertake these projects if too large a fraction of any project’s returns are promised to prior debt holders. New investors, realizing this incentive problem, will fail to invest. The analysis of debt overhang illustrates that high levels of debt can interact with the information asymmetry between new investors and existing managers or equity holders in a way that lowers aggregate investment.

In the case of banks, this possibility is of central empirical concern.⁹⁰ Banking crises result in large write-downs of the value of assets on banks’ balance sheets. They also produce the possibility of substantial future write-downs. Further, it is often unknown which financial institutions are solvent.⁹¹ In such an environment, a new investor in a bank understands that the cash flows from new projects will likely be used to pay down existing debt. The government—either through the central bank or treasury—is often the only institution that can step in and provide liquidity. As a result, financial crises often beget fiscal crises.⁹² The political turmoil associated with financial and fiscal crises is seldom ideal for far-sighted financial and economic restructuring.⁹³

⁸⁹ Stewart Myers, *The Determinants of Corporate Borrowing*, 5 J. FIN. ECON. 147, 155 (1977).

⁹⁰ See REINHART & ROGOFF, *supra* note 2, at xl–xli.

⁹¹ See Stijn Claessens et al., *Financial Restructuring in Banking and Corporate Sector Crises: What Policies to Pursue?* 7 (Nat’l Bureau of Econ. Research, Working Paper No. 8386, 2001), available at <http://www.nber.org/papers/w8386> (observing that without support, good banks cannot provide sufficient intermediation to the corporate sector).

⁹² See REINHART & ROGOFF, *supra* note 2, at 163. See also Patrick Honohan & Daniela Klingebiel, *The Fiscal Cost Implications of an Accommodating Approach to Banking Crises*, 27 J. BANKING & FIN. 1539, 1540 (2003) (finding that repeated, incomplete recapitalizations of troubled banks tend to increase the fiscal costs of bank crises).

⁹³ See Roberta Romano, *Regulating in the Dark* 5 (Yale L. & Econ. Research, Paper No. 442, 2012), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1974148. See also Atif Mian, Amir Sufi & Francesco Trebbi, *Resolving Debt Overhang: Political Constraints in the Aftermath of Financial Crises* 27 (Nat’l Bureau of Econ. Research, Working Paper No. 17831, 2012), available at <http://www.nber.org/papers/w17831>.

iii. Bank Runs

The liquidity and maturity transformation functions of banks make them vulnerable to withdrawals or loss of confidence by short-term debt holders. Banks engage in liquidity transformation to the extent that their assets are less liquid than their liabilities. They engage in maturity transformation to the extent that their assets pay off over a longer period of time than their liabilities.⁹⁴ In the presence of imperfect information, this liquidity and maturity mismatch increases the fragility of banking institutions.⁹⁵ A bank cannot satisfy the simultaneous withdrawal or non-renewal of its short-term debt without liquidating some of its assets in a way that destroys value. The amount that a debt holder can recover if she withdraws her funds decreases according to the amount that other debt holders withdraw. The withdrawal decisions of debt holders are therefore strategic complements.⁹⁶ As a result, any information that increases the likelihood of withdrawals—such as a sudden increase in demand for liquidity or news of an unexpected loss to the bank—can result in an inefficient run on a bank.

Even though deposit insurance has ended bank runs by depositors on commercial banks, the potential for panic by short-term creditors remains an issue for any financial institution that engages in maturity and liquidity transformation.⁹⁷ These dynamics were central to the collapse of large investment banks and broker-dealers during the recent financial crisis. Short-term debt holders lost confidence in the value of the asset-backed commercial paper that investment banks posted as collateral for short terms loans. When large banks began to report losses from mortgage-backed securities, short-term creditors refused to roll over this debt.⁹⁸ The ensuing flight to quality by institutional investors resulted in the failure or sale of major investment banks and broker-dealers such as Bear Stearns and Lehman Brothers. Stand-alone investment banks Merrill Lynch and Goldman Sachs converted to bank holding companies to receive government-provided liquidity.

Unlike deposit insurance or other forms of debt guarantees, capital requirements cannot eliminate the possibility of bank runs. Capital require-

⁹⁴ The maturity of assets and liabilities can be compared using the concept of duration, which is a time-weighted average of the present value of future cash flow. See BREALEY ET AL., *supra* note 5, at 51.

⁹⁵ See Diamond & Dybvig, *supra* note 45, at 401.

⁹⁶ Strategic complementarity implies that each debt holders' marginal gain from withdrawing increases with the level of withdrawals of other debt holders. See TIROLE, *supra* note 81, at 455.

⁹⁷ See Gary Gorton, Slapped in the Face by the Invisible Hand: Banking and the Panic of 2007, at 33–34 (Prepared for the Federal Reserve Bank of Atlanta's 2009 Financial Markets Conference: Financial Innovation and Crisis) (May 9, 2009), available at <http://www.frbatlanta.org/news/conferen/09fmc/gorton.pdf>; Tobias Adrian & Hyung Song Shin, *The Shadow Banking System: Implications for Financial Regulation 4* (Federal Reserve Bank of New York, Staff Report No. 382, 2009).

⁹⁸ Gorton, *supra* note 97, at 34.

ments, nevertheless, lower the probability of runs and panics by limiting the coordination problem among debt holders. A larger cushion of bank capital is available to absorb losses, reducing the incentive of debt holders to withdraw funds in response to a fall in the value of bank assets or withdrawal by other debt holders. Capital requirements are a particularly valuable regulatory tool when the volume of bank debt to guarantee is beyond the fiscal capacity of the government. This is the case for much of the short-term debt issued by large financial institutions.

Therefore, three key consequences of informational imperfections in the financing of banks—asset substitution, debt overhang, and bank runs—suggest that regulation should limit the amount of debt financing by banks.

2. *Advantages of Bank Debt*

i. *Adverse Selection and The Pecking Order Theory*

When bank management has better information about the earnings prospects of bank assets than outside investors, debt contracts minimize the costs of raising external finance. This observation gives rise to the “pecking order” theory of external finance.⁹⁹ In this account, there is a hierarchy of sources of funding that firms use to fund projects. Banks first finance projects with retained earnings and, when this source is exhausted, they turn to debt. Banks generally issue equity as a last resort.

The intuition behind this argument is that banks must pay a premium to outside investors for the possibility that their investments could be lemons. The larger the information asymmetry, the larger the premium that banks must pay. Banks can mitigate this problem by first issuing securities whose value is not sensitive to this information asymmetry. Riskless debt provides the best example of such a security.

The pecking order theory of external finance matches some key stylized facts concerning corporate finance. Most investment by nonfinancial companies relies on internal cash flows. External sources of finance usually account for less than 20% of real investment.¹⁰⁰ Most external financing is done through debt issues. In many years, net equity issues are negative because the value of share repurchases exceeds that of new issues.

The pecking order theory implies that issuing equity is expensive because it reveals bad news about a firm’s investment prospects to the market. If some banks issue equity and others do not, market participants will infer that issuing banks are overvalued, and their stock price will fall. Banks, anticipating this effect, may choose to forego profitable investments if they believe that the negative market reaction to an equity issue will be large.

⁹⁹ See BREALEY ET AL., *supra* note 5, at 462–63; Myers & Majluf, *supra* note 35, at 188.

¹⁰⁰ Stewart C. Myers, *Capital Structure*, 15 J. ECON. PERSP. 81, 82 (2001).

The pecking order theory also has implications for the timing of equity issues. The information asymmetry between bank insiders and outside investors is smaller during boom periods. During good times, an equity issue is less informative of the magnitude of the adverse selection problem facing bank investors. As a result, banks have an incentive to issue equity when the market is up in order to minimize the informational costs of the issue.

The empirical evidence on seasoned equity issues is consistent with the pecking order theory. Seasoned equity offerings are associated with falls in firm value, and this fall tends to be larger in the presence of information asymmetries.¹⁰¹ Conversely, issues of investment-grade debt have little impact on the market capitalization of issuing firms.¹⁰² Consistent with the market-timing hypothesis, firms are more likely to issue equity when their market capitalization is high relative to past values or relative to book value.¹⁰³ Surveys of chief financial officers also indicate that market timing plays an important role in equity issues.¹⁰⁴

In addition to the type of security offered, adverse selection also has implications for maturity structure. If issuing costs are lowest for securities that minimize the information asymmetry between issuers and investors, then short-term debt will be a cheaper form of financing than long-term debt. Holders of short-term debt are protected against middle to long-term risks that are known to insiders but not to outside investors. Therefore, banks can signal their confidence to outside investors about their future prospects by issuing short-term debt.¹⁰⁵ There is empirical evidence that firms with greater information asymmetries tend to issue more short-term debt.¹⁰⁶ Shortening the maturity structure of bank debt can increase the probability of bank runs.¹⁰⁷

ii. Regulatory Implications of Adverse Selection

The pecking order, or adverse selection, theory implies that capital requirements could impose substantial costs on banks by requiring them to raise equity. These costs would in turn raise the price of lending and limit

¹⁰¹ See Paul Asquith & David W. Mullins, Jr., *Equity Issues and Offering Dilution*, 15 J. FIN. ECON. 61, 62 (1986); Nathalie Dierkens, *Information Asymmetry and Equity Issues*, 26 J. FIN. ECON. & QUANTITATIVE ANALYSIS 181, 197 (1991).

¹⁰² See B. Espen Eckbo, *The Valuation Effects of Corporate Debt Offerings*, 15 J. FIN. ECON. 119, 121 (1986).

¹⁰³ See Malcolm Baker & Jeffrey Wurgler, *Market Timing and Capital Structure*, 57 J. FIN. I, 29 (2002).

¹⁰⁴ See John R. Graham & Campbell R. Harvey, *The Theory and Practice of Corporate Finance: Evidence from the Field*, 60 J. FIN. ECON. 187, 232 (2001).

¹⁰⁵ See Douglas W. Diamond, *Debt Maturity Structure and Liquidity Risk*, 106 Q. J. OF ECON. 709, 731 (1991).

¹⁰⁶ Michael J. Barclay & Clifford W. Smith, Jr., *The Maturity Structure of Corporate Debt*, 50 J. FIN. 609, 609 (1995). The authors use the ratio of market to book value—a measure of the market's valuation of the firm's growth opportunities—to proxy for the size of the information asymmetry.

¹⁰⁷ See Brunnermeier & Oehmke, *supra* note 89, at 29–34.

the amount of credit in the economy, depressing output and growth. These conclusions follow when issuing equity reveals private information about the poor economic prospects of a bank. However, when equity issues do not convey such information, adverse selection no longer makes equity “expensive.” Regulatory policies that minimize the informational content of equity issuances can therefore make capital requirements less expensive.

a. Countercyclical Capital

Adverse selection implies that equity issues are less costly when asset prices are high. Regulation could therefore force banks to issue capital in economic upturns, for example by tying requirements to economy-wide measures of credit growth or bank-balance-sheet growth.¹⁰⁸ In downturns, by contrast, the information costs of issuing equity are high. Capital regulation can attempt to ensure that regulatory capital ratios are not binding in a downturn. This can be partly accomplished by building up a capital buffer during boom periods, but there is always the risk that this buffer may prove inadequate.

Banks respond to regulatory capital constraints in a downturn by selling assets and retiring debt, and by limiting new lending and retaining earnings to raise the capital ratio. Both these actions can exacerbate a downturn.¹⁰⁹ If the banking sector is thinly capitalized, regulation can operate through capital issues rather than insisting on a desired ratio. Regulation can further limit the informational content of equity issues in a downturn by imposing issues uniformly across classes of banks instead of singling out particular institutions.

These aspects of capital regulation fall under the topic of macroprudential regulation because they are related to the traditional, central bank responsibilities of monetary and business cycle policy. Unlike other aspects of bank regulation, countercyclical capital regulation must be closely coordinated with central bank actions that affect inflation expectations, interest rates, open-market purchases, and management of the central bank’s balance sheet. As a result, the details of such implementation fall outside the scope of this Article.

The issue of discretion versus rules in setting countercyclical capital requirements also interacts with an older literature on this issue in monetary

¹⁰⁸ In this way, the effects of bank capital regulation would be countercyclical. The Basel Committee has included a countercyclical capital component, although its level for the U.S. would be zero. BASEL COMM. ON BANKING SUPERVISION, *supra* note 11, at 57–58. For other accounts of the importance of countercyclical capital regulation, see Markus Brunnermeier et al., *supra* note 39, at 29–35; Hanson et al., *supra* note 43, at 24; Anil K. Kashyap & Jeremy C. Stein, *Cyclical Implications of the Basel II Capital Standard*, 28 FED. RES. BANK CHI. ECON. PERSP. 18, 18 (2004).

¹⁰⁹ The empirical evidence on this point is particularly strong. See Peek & Rosengreen, *supra* note 20, at 688–89.

policy.¹¹⁰ It is difficult for regulators to insist on raising capital requirements when the economy is growing because measured risks will be low. Therefore, to the extent possible capital regulation should be rule-bound in upturns. Banks should be forced to raise capital when credit growth and asset growth are strong, and regulators should be unable to waive these requirements or be able to do so only by invoking extraordinary circumstances.¹¹¹

It is even more difficult to insist on such rules in a downturn. Whatever the theoretical content of the monetary policy literature on rules versus discretion, the empirical reality is that no central bank has ever adopted an entirely rule-based regime for monetary policy. It is unlikely that rules can be formulated *ex ante* to address all contingencies. Regulators should therefore be given additional discretion in a downturn to waive minimal capital ratios, suspend dividend payments and, if feasible, force banks to issue fixed amounts of equity. In this sense, the discretionary component of capital regulation should also be countercyclical.

This discretion would, however, come with costs. Regulators are likely to forego or delay actions that will result in realizing large losses or restructuring banks. This can magnify the length and severity of downturns. Rules can still be useful in specifying the circumstances under which regulators can waive capital requirements, but they will inevitably have limits.

b. Regular Issues and Automatic Convertibles

There are other measures that regulators can introduce to limit the informational content of equity issues. Regulation can stipulate that banks make regular, preannounced equity issues. If equity is issued on a fixed temporal schedule, then the timing of issues does not convey information to the market. If an equity issue is announced that will only take place with a significant time delay, then this will mitigate adverse selection costs because the information asymmetry with respect to a bank's future condition will be smaller than the asymmetry with respect to its current condition. Banks already take advantage of this by issuing debt that mandatorily converts into equity after a given time period. Because such debt securities usually convert to a fixed number of shares, however, their value is closely related the value of equity.

Another way for banks to issue future equity is to offer a debt-like security with a face value payment in equity if the investor does not renew the debt. For example, a bank could issue a one-year note with face value of \$100 and an annual interest rate of 3% that makes monthly coupon payments. At the end of one year, the security holder would be entitled to \$100 of equity. In other words, the security holder would receive a number of

¹¹⁰ See generally Stanley Fischer, *Rules Versus Discretion in Monetary Policy*, (Nat'l Bureau of Econ. Research, Working Paper No. 2518, 2012), available at <http://www.nber.org/papers/w2518>.

¹¹¹ See generally, Brunnermeier et al., *supra* note 38; Hanson et al., *supra* note 43.

bank shares equal to \$100 at current market prices if she decides not to roll the debt over. A bank could issue short-maturity securities with the same payment structure. In a liquid market for bank shares, an investor can always sell the shares received at close to the market price. A principal payment in shares of equal market value, then, is almost as good as a payment in cash. As a result, this security should trade at a price very close to that of bank debt. The security holder also has the upside of the equity option. If he or she believes bank shares are underpriced, then he or she can exercise this option by refusing to roll over bank debt and holding the security as opposed to selling. Only in extreme events where short term funding to the bank is in jeopardy is the security holder faced with the choice of either rolling over risky bank debt or receiving equity that may fall in value before the security holder can sell. An automatic convertible with this structure provides a way for banks to simultaneously issue debt while pre-committing to a future equity issue.

iii. Debt as a Disciplinary Device

The finance literature suggests that debt can serve as an important informational and disciplinary device for monitoring insiders. Debt acts to discipline the managers of a firm because debt holders have the ability to liquidate the firm's assets in the event of a default.¹¹² Debt can prevent managers from diverting free cash flow into potentially unprofitable investments.¹¹³ Debt also provides a mechanism to communicate operational performance. The ability of any firm to stay current on its debt payments conveys positive information about the firm to outside investors.¹¹⁴

This literature does not provide much guidance on the level of debt necessary to perform this function. There is little empirical evidence that a marginal dollar of debt continues to play a strong disciplining or signaling role at the debt levels observed in financial institutions. Moreover, the informational and disciplining functions that debt may serve in financial institutions can be attained by other means. The free cash problem is not a central one for financial institutions because they rarely have enough earnings to significantly expand their balance sheets and must turn to external sources.¹¹⁵ If debt acts as an earnings signal, then more extensive or frequent earnings disclosure by financial institutions would achieve this effect directly. Mana-

¹¹² Milton Harris & Artur Raviv, *Capital Structure and the Informational Role of Debt*, 45 J. FIN. 321, 321 (1990).

¹¹³ See Michael Jensen, *Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers*, 76 AM. ECON. REV. PAPERS & PROC. 323, 323-24 (1986). See also Oliver Hart & John Moore, *Debt and Seniority: An Analysis of the Role of Hard Claims in Constraining Management*, 85 AM. ECON. REV. 567, 567-68 (1995).

¹¹⁴ See Harris & Raviv, *supra* note 112, at 322. See generally Hayne Leland & David Pyle, *Informational Asymmetries, Financial Structure, and Financial Intermediation*, 32 J. OF FIN. 371 (1977); Stephen A. Ross, *The Determination of Financial Structure: The Incentive-Signaling Approach*, 8 BELL J. ECON. 23 (1977).

¹¹⁵ DEWATRIPONT & TIROLE, *supra* note 44, at 22.

gerial behavior need not be controlled through debt. Performance monitoring, compensation, and termination are the main drivers of managerial incentives. Adjustments to these terms of a manager's contract provide a more direct method of altering managerial behavior than adjustments to corporate financial structure.¹¹⁶

In conclusion, an analysis of the key informational imperfections in financial institutions, taken as a whole, strengthens the case for capital regulation. The presence of asset substitution and debt overhang as well as the possibility of bank runs provides a compelling reason to limit the amount of debt that financial institutions can hold. Moreover, for each of these phenomena, a limitation on debt poses no impediment to efficient lending in the economy.

Adverse selection, which follows from the inability of outside investors to distinguish the quality of a bank's assets, is the main issue that can make equity more expensive than debt as a form of external financing. The above analysis suggests there are affirmative steps that regulators and banks can take to lower the cost of issuing equity for banks. In contrast, the privately optimal response to the presence of this information asymmetry entails social costs. Adverse selection gives banks the incentive to issue excessive amounts of short-term debt.

It is of course possible that the social costs of substantially raising capital requirements for SIFIs are impermissibly high.¹¹⁷ Raising the capital ratio provides a way to find out. The transition to a higher capital level can be structured so that most of the increase in bank capital occurs during periods of economic expansion. For example, suppose that during such an expansion SIFIs are required to finance their balance sheet expansion with forty cents of equity for the marginal dollar of assets. If the phase-in of these requirements caused a substantial deviation from prior trends in macroeconomic fundamentals, then regulators could then reassess the feasibility of substantially higher capital requirements. This Article suggests that this would be a worthy experiment and that, as in past expansions, investors would willingly buy equity.

III. BANK RESPONSES TO CAPITAL REQUIREMENTS

Even if the social benefits of capital regulation outweigh their private costs to the banking sector, regulation will trigger strategic responses by affected financial institutions that can upset this balance. This is a particularly daunting challenge in the case of financial institutions that are able to reconstruct their portfolios through a bewildering variety of securities. Critics of capital requirements assert that they impose almost no restrictions on the riskiness of a bank's asset holdings. In their view, given appropriate in-

¹¹⁶ For a similar argument, see Admati et al., *supra* note 12, at 31–32.

¹¹⁷ See, e.g., Gorton et al, *supra* note 33; DeAngelo & Stulz, *supra* note 33.

centives a bank will be able to reconstruct—without leverage—the same return profile for equity holders as they held with leverage.¹¹⁸ While no system of regulation can rule out this possibility, this Part suggests that appropriate regulatory design can help to mitigate this risk.

Capital regulation must account for two key responses of banks. First, banks may respond to capital regulation by increasing their portfolio risk. It is possible that raising capital requirements can increase the probability of systemic bank failures. This perverse effect of capital regulation is likely when banks can take on risk in ways that are difficult for debt holders or regulators to observe.

For this reason, a substantial increase in the capital ratio is necessary for capital requirements to have an effect on the systemic risk posed by SIFIs.¹¹⁹ If capital levels are substantially higher, then both bank creditors and regulators can more easily observe the substantial increase in asset risk that would be necessary to raise the return on equity. In contrast, this risk is difficult to observe in a highly levered bank that holds low-risk assets because the tail risk of those assets cannot be precisely estimated. A definition of the capital ratio based on market values—such as total market capitalization divided by the sum of total market capitalization and total market debt—can also better utilize both agency and market information in regulation.

Capital regulation has traditionally relied on risk-weighting schemes to account for differing levels of portfolio risk across banks. Part III describes and critiques the current system of risk weighting. Part III also argues that developing better quantitative tools for risk assessment is an important regulatory aim. In particular, it urges regulators to continue to undertake comprehensive, quantitative risk assessments of banks, but to use the results of these assessments to increase capital requirements for specific risks in a discretionary way. The current risk-weighting scheme, in contrast, gives banks a menu of risk assessments for each asset type. Part III suggests that this framework gives banks too many opportunities to exploit their superior knowledge of risk modeling relative to their regulators. Regulatory risk assessments are better at identifying potential sources of destabilizing risk than, as is currently done, producing a comprehensive risk estimate for the entire bank. Regulation can also require banks to disclose the specific results

¹¹⁸ I have used the term leverage to denote balance sheet borrowing. Such borrowing makes the return on the bank's equity very sensitive to changes in the bank's assets. Positions on the asset side of the balance sheet, however, can have embedded leverage. For example, the return on derivative securities can be very sensitive to changes in the price of the reference asset. A bank that is unlevered in the traditional sense can still take on risk through embedded leverage. See Andrea Frazzini & Lasse H. Pedersen, *Embedded Leverage* 21 (Nat'l Bureau of Econ. Research, Working Paper No. 18558, 2012).

¹¹⁹ Part II suggested that this increase be built up gradually over time, with most of the change coming in a period of high credit growth.

of these risk assessments to the market so that they will be reflected in the market-based capital ratio.¹²⁰

Second, banks may move more of their risks off-balance-sheet. Capital regulation traditionally accounts for off-balance-sheet transactions through “conversion factors” that convert these items into “credit-equivalent amounts” on the asset side of the balance sheet.¹²¹ Risk weights are then applied to these credit equivalent amounts. Because the use of off-balance-sheet transactions gives rise to the same regulatory difficulties as on-balance-sheet risk shifting, Part III treats the two issues together.

A. Risk Shifting

In principle, the more risk that a bank holds on its balance sheet, the more capital it should hold to maintain a given probability of insolvency. If the goal of capital regulation is to maintain a target or maximum probability of insolvency, then the capital ratio should vary with the bank’s portfolio.¹²² Because this portfolio will vary over time, as will external economic factors that affect aggregate risk, the target capital ratio should also evolve dynamically.¹²³ The motivation for risk weighting, that riskier assets require more capital, arises from this principle.

A related justification for risk weighting arises from the strategic response of banks to capital regulation. In the presence of informational asymmetry, banks may respond to capital regulation by increasing the risk of their underlying portfolios. An increase in a bank’s capital, all else equal, will lower the return on equity. If debt holders are unable to monitor the riskiness of bank’s portfolio or if debt holders are insensitive to this risk because of implicit guarantees, then equity holders will favor an increase in risk and return. This is the familiar phenomenon of asset substitution described in Part II. Asset substitution is *both* a cause and a consequence of bank regulation.

Through asset substitution, an increase in required capital can actually increase the expected social cost of bank failure.¹²⁴ Capital requirements that are adjusted for portfolio risk, however, can prevent this effect.¹²⁵ As a re-

¹²⁰ Recent regulation has moved toward such disclosures. *See, e.g.*, Capital Adequacy Guidelines for Bank Holding Companies: Market Risk, 12 C.F.R. pt. 225, app. E (2013); Regulatory Capital Rules: Advanced Approaches Risk-Based Capital Rule; Market Risk Capital Rule, 77 Fed. Reg. 52,978 (proposed Aug. 30, 2012) (to be codified at 12 C.F.R. pt. 217).

¹²¹ *See* CARNELL ET AL., *supra* note 23, at 259.

¹²² *See* Brennan & Lo, *supra* note 65, at 1779.

¹²³ *See id.*

¹²⁴ *See* Koehn & Santomero, *supra* note 28, at 1240–44. This is a fundamental result in the literature on prudential regulation.

¹²⁵ *See id.* at 1236–40. Koehn & Santomero derive the optimal risk weights on assets in a mean-variance framework. These weights are a function of the market risk of a particular asset. In the capital asset pricing model, this takes the familiar form of the “beta” of the asset—the covariance of its return with the return of the market portfolio, relative to the variance of the market portfolio. *Id.*

sult, risk weighting can also be motivated as a way to prevent banks from increasing their portfolio risk in response to capital regulation.

Both the heterogeneity in bank risk and the strategic response of banks imply that capital requirements should be tailored to bank risk. While optimal risk weights can be defined in simplified economic models, it is a considerable challenge to determine these weights in practice. For this reason, a substantial increase in bank capital requirements is a useful regulatory tool.¹²⁶ For the net effect of a large increase in capital to increase the risk of bank failure, this will require a correspondingly substantial level of asset substitution by banks. This makes it more likely that both regulators and market participants will be able to recognize this asset substitution and mitigate its effects. For an incremental increase in bank capital, it may be beyond the capacity of both market participants and regulators to detect any asset substitution that would render the increase ineffectual.

The risk-weighted capital requirements under U.S. banking regulations and the Basel process reflect this regulatory challenge. Both U.S. regulation and the original Basel Accord (Basel I) group assets into broadly defined risk classes.¹²⁷ The general formula for the risk-based capital ratio is total capital divided by risk-weighted assets.¹²⁸ Risk-weighted assets are calculated by assigning a risk class to balance sheet assets and a risk-adjusted, balance sheet equivalent to all off-balance-sheet liabilities. Under the simplest approach, balance sheet assets fall into four categories, each of which demands a different capital charge. These charges range from 0% for cash to 100% for loans to private borrowers.¹²⁹

Such risk weights provide a crude proxy for differences in risk across bank assets. As Merton Miller once quipped, “Surely no private lending institution using anything as arbitrary as the definitions under the Basel accords could hope to survive long as a major player in a competitive lending market.”¹³⁰ Differences in risk weights provide an opportunity for banks to select their assets to minimize their regulatory capital levels. Simplistic risk-weighting schemes can encourage the buildup of concentrated positions in assets that carry low capital charges. For example, the large increase in mortgage lending and the issuance of mortgage-backed securities in the period leading up to the financial crisis lowered bank capital requirements. Risk

¹²⁶ For reasons of adverse selection, Part III suggests that this increase should be phased in gradually over time.

¹²⁷ See Capital Adequacy Guidelines for Bank Holding Companies: Risk Based Measure, 12 C.F.R. pt. 225, app. A (2013); BASEL COMM. ON BANKING SUPERVISION, PROPOSALS FOR INTERNATIONAL CONVERGENCE OF CAPITAL MEASUREMENT AND STANDARDS, annex. A (1987), available at <http://www.bis.org/publ/bcbs03a.htm>.

¹²⁸ See 12 C.F.R. pt. 225, app. A (2013). Total capital is the sum of Tier 1 and Tier 2 capital, with some restrictions on the amount and composition of Tier 2 capital. Tier 1 capital includes common shareholder equity, non-cumulative perpetual preferred shares, and minority shareholdings in consolidated subsidiaries.

¹²⁹ *Id.*

¹³⁰ Miller, *supra* note 31, at 487.

weights could also turn on the credit rating of a particular borrower or security.¹³¹ The ratings agencies, however, failed spectacularly in their ratings of mortgage-backed securities. This failure had even greater consequences for the financial system because of the extent to which regulatory requirements relied on those ratings.

Over time, regulators have developed more sophisticated approaches to adjust capital requirements for risk. The Basel Committee developed an internal-ratings-based (IRB) approach that utilizes banks' internal estimates of (i) probability of default, (ii) exposure at default, and (iii) loss given default.¹³² It remains in use under Basel III and continues to form the basis of the Federal Reserve's approach to "core banks."¹³³ The IRB approach takes these inputs from banks and computes a "conditional expected loss," or expected loss from a credit portfolio during an economic downturn. This approach is a particular application of a value-at-risk (VaR) credit model that computes the minimal loss for an event with a given probability of occurrence.¹³⁴ The capital requirement is an amount necessary to cover this conditional expected loss in the event of a downturn.

The framework for the IRB computation builds on a long line of research and practice in modeling credit and portfolio risk.¹³⁵ As a method to tailor capital requirements to the actual risk posed by a particular financial institution, it is superior to the risk bucket approach. Still, the IRB suffers from substantial limitations as a tool for evaluating the portfolio risk of banks.

The model is based on a single factor that determines how the probability of default varies with economic conditions. The use of a single factor is a necessary condition for the capital framework to be portfolio invariant.¹³⁶ Portfolio invariance implies that the required capital for a given asset depends only on the properties of that asset, and not on the entire investment portfolio. While this feature of the IRB model is appealing for reasons of

¹³¹ Section 939A of the Dodd-Frank Act directs the federal banking agencies to review and remove any reference to credit ratings in any regulatory assessment of creditworthiness. Dodd-Frank Act § 939A.

¹³² See BASEL COMM. ON BANKING SUPERVISION, INTERNATIONAL CONVERGENCE OF CAPITAL MEASUREMENT AND CAPITAL STANDARDS (NOV. 2005).

¹³³ BASEL COMM. ON BANKING SUPERVISION, *supra* note 11, at 25; Risk-Based Capital Standards: Advanced Capital Adequacy Framework—Basel II, 12 C.F.R. pt. 208 (2007). Core banks are required to apply the advanced approach. "Core banks are those with consolidated total assets (excluding assets held by an insurance underwriting subsidiary of a bank holding company) of \$250 billion or more or with a consolidated total on-balance-sheet foreign exposure of \$10 billion or more." *Id.*

¹³⁴ Alternatively, the VaR computes the probability that a loss will be of a given magnitude or higher. The model estimates the cumulative distribution function of losses. Either losses or probabilities of losses can be obtained using this function. See JOHN C. HULL, *OPTIONS, FUTURES, AND OTHER DERIVATIVES* 435 (6th ed. 2006).

¹³⁵ See, e.g., Michael Gordy, *A Risk-Factor Model Foundation for Ratings-Based Bank Capital Rules*, 12 J. OF FIN. INTERMEDIATION 199, 201 (2003); Merton, *supra* note 84; Oldrich Vasicek, *The Distribution of Loan Portfolio Value*, 15 RISK 160 (2002).

¹³⁶ See Gordy, *supra* note 135, at 201.

analytic tractability and regulatory uniformity, it is highly restrictive. The IRB approach also models the correlation between the (random) probability of loss of a particular investment and a single, systemic risk factor through a single coefficient. This feature of the model is analogous to the risk bucket approach. The IRB approach also does not account for the concentration of risk within a portfolio.

There are further issues with the IRB framework. First, the systemic risk of an investment is treated as unrelated to the choices of banks.¹³⁷ During a period of crisis, however, this risk is itself a function of common actions taken by banks. For example, the decision by banks to sell assets during a time of economic stress can have a cascading effect on the general price level that increases systemic risk.¹³⁸ Second, because the measurement of the systemic risk factor is estimated from past behavior, it will tend to understate risk during upturns and overstate it during downturns. Third, the model's forecasts can be off by orders of magnitude during periods characterized by a structural break, where the model's assumption of a stationary process governing its key variables no longer holds. Fourth, for a given probability, VaR models only convey that a loss will be of a given magnitude or more. They do not provide a range or average of this (conditional) magnitude. Fifth, the assumption that losses are governed by a normal distribution is a poor one and understates the probability of large losses.

The IRB approach illustrates that regulatory risk-weighting schemes will inevitably have imperfections. But the IRB approach also illustrates that a sophisticated regulatory framework for risk weighting is desirable even if it operates with a lag. The framework still provides plausible estimates of risk-based capital for individual institutions and for the system as a whole. The IRB approach is capable of detecting institutions with unacceptably high levels of risk, as measured by conventional tools.

Financial regulation should, however, ask different questions of these models than market participants ask. Regulation should be focused on extreme events and on risks to the system. With this focus, regulators armed with inferior models may produce better risk estimates than market participants with superior models. Producing and evaluating such models also facilitates regulatory learning. The ongoing criticism of these models enables their improvement. It is important to keep regulatory practice and understanding at least within striking distance of industry. These are compelling reasons to continually produce and update a regulatory framework for risk-based capital.

The recent history of regulation in this area illustrates both its strengths and weaknesses. The federal banking agencies have conducted extensive

¹³⁷ See Jon Danielsson et al., *An Academic Response to Basel II 4* (London Sch. of Econ. Fin. Mkt. Grp., Special Paper Series No. 30, 2001).

¹³⁸ See Brunnermeier, *supra* note 12, at 78.

rulemaking to address risks made salient by the recent crisis.¹³⁹ The agencies added new requirements for market risk (“Market Risk Capital Rule”) to their capital guidelines.¹⁴⁰ The Market Risk Capital Rule insists that banks develop a comprehensive risk management system to deal with risks on their trading book¹⁴¹ and introduces a stressed VaR-based capital requirement.¹⁴² It also requires banks to make periodic, quantitative, and qualitative disclosures to the public concerning market risk, including an analysis of any discrepancy between predicted and realized losses.¹⁴³ The agencies have also issued a notice of proposed rulemaking (“NPR”) on advanced approaches to determining risk-weighted assets.¹⁴⁴ The NPR proposes changes to the calculation of risk-weighted assets to account for general credit risk, securitization exposures, equity exposures, and operational risk.¹⁴⁵

Both the Market Risk Rule and the NPR suggest important improvements to the current scheme of risk weighting. The operational requirements for assessing risk are ones that banks should already have if the right incentives were in place. The requirement of the stressed VaR’s, with stress inputs from a pronounced crisis period may be an operational test that banks previously ignored. Both focus on increasing capital against exposures—securitizations, credit derivatives, financial collateral, and counter-party risk—that resulted in substantial losses to banks during the financial crisis. The introduction of detailed disclosures that are comparable across institutions may aid market participants in policing both idiosyncratic and aggregate banks risk.

Even so, these changes do not instill much confidence that banks will be more robust to unanticipated risks. The new capital guidelines that follow the Dodd-Frank Act essentially double down on the prior regulatory frame-

¹³⁹ See, e.g., Capital Adequacy Guidelines for Bank Holding Companies: Market Risk, 12 C.F.R. pt. 225, app. E (2013); Capital Adequacy Guidelines for Bank Holding Companies: Internal-Ratings-Based and Advanced Measurement Approaches, 12 C.F.R. pt. 225, app. G (2013); Regulatory Capital Rules: Advanced Approaches Risk-Based Capital Rule; Market Risk Capital Rule, 77 Fed. Reg. 52,978 (proposed Aug. 30, 2012) (to be codified at 12 C.F.R. pt. 217).

¹⁴⁰ See Capital Adequacy Guidelines for Bank Holding Companies: Market Risk, 12 C.F.R. pt. 225, app. E (2013).

¹⁴¹ Banks are required to maintain clearly defined policies for trading, hedging, monitoring, and valuing their covered positions. Covered positions include all assets and liabilities that banks hold as short-term positions in relatively liquid markets. *Id.*

¹⁴² *Id.*

¹⁴³ The quantitative disclosures include the high, low, and mean over the reporting period of (i) the VaR-based estimate of losses on covered positions and (ii) the stressed VaR-based measure, including individual component requirements for default risk, correlation risk, and migration risk. Banks are required to report the separate measures for interest rate risk, credit spread risk, equity price risk, foreign exchange risk, and commodity price risk used to calculate the overall VaR-based measure. *Id.*

¹⁴⁴ Regulatory Capital Rules: Advanced Approaches Risk-Based Capital Rule; Market Risk Capital Rule, 77 Fed. Reg. 52,978 (Aug. 30, 2012) (to be codified at 12 C.F.R. pt. 217). The NPR would apply to a bank with consolidated total assets of over \$250 billion and total, on-balance-sheet foreign exposure of over \$10 billion. *Id.* at 52,993.

¹⁴⁵ *Id.* at 53,001.

work. They retain the limitations of the IRB framework, and they remain very sensitive to the superior information of banks. There is little in their design that provides a backstop against regulatory mistakes or lack of complete foresight.

For these reasons, regulators should rethink whether estimates of risk-based capital from these models should be automatically applied to banks. Regulators could instead use these estimates to establish a system of comparable disclosures—which they are doing—and as inputs to combine with other information. For SIFIs, risk-based capital assessments could be used to assess when SIFIs may be vulnerable to particular macroeconomic events. Regulators are better positioned to use these methods to identify troubling features of bank portfolios than to assess the entire portfolio. For example, regulators with a mandate to make risk assessments on this basis should have been able to identify SIFIs with large exposures to the housing sector at a time when it was well understood that housing prices were above their historical trend. These banks should then have been required to make additional capital provisions with respect to housing risk.

B. Off-Balance-Sheet Transactions

Off-balance-sheet transactions provide a way for a bank to earn income and take on portfolio positions without holding assets on its balance sheet.¹⁴⁶ These transactions can pose credit, market, and liquidity risk to a bank. If raising capital entails substantial private costs, then banks will increase their off-balance-sheet transactions if doing so reduces the amount of capital they need to hold.

These transactions played a prominent role in the recent financial crisis. They include the credit default swaps that were ruinous for AIG, as well as positions related to these swaps that have cost J.P. Morgan at least \$2 billion.¹⁴⁷ Off-balance sheet risks also intersect with the securitization process. By securitizing and selling loans, banks earn income from loan origination without assuming the risk of the underlying loan or holding capital against these assets.¹⁴⁸ Banks continue to retain exposure to these assets, however,

¹⁴⁶ Off balance sheet items include (1) financial services such as placing securities or servicing loans, (2) contingent loans such as loan commitments, letters of credit, and a sales of assets with recourse, and (3) the notional value of derivative contracts such as swaps, futures, forwards and options. See DEWATRIPONT & TIROLE, *supra* note 45, at 16–17. See also FED. DEPOSIT INS. CORP., *FDIC Risk Management Manual of Examination Policies* (2005), available at <http://www.fdic.gov/regulations/safety/manual/section3-8.html#introduction>.

¹⁴⁷ See Robert O'Harrow Jr. & Brady Dennis, *Downgrades and Downfall*, WASH. POST, Dec. 31, 2008, <http://www.washingtonpost.com/wp-dyn/content/article/2008/12/30/AR2008123003431.html?sid=ST2010062905395>. See also Ben Protess, Andrew Ross Sorkin, Mark Scott, & Nathaniel Popper, *In JPMorgan Chase Trading Bet, Its Confidence Yields to Loss*, N.Y. TIMES DEALBOOK (May 11, 2012, 9:49 PM), <http://dealbook.nytimes.com/2012/05/11/in-jpmorgan-chase-trading-bet-its-confidence-yields-to-loss/>.

¹⁴⁸ See Steven L. Schwarcz, *The Alchemy of Asset Securitization*, 1 STAN. J.L. BUS. & FIN. 133, 136 (1994).

by providing credit and liquidity guarantees to the special purpose vehicles that hold the assets.¹⁴⁹

Such exposures limit the regulatory usefulness of a capital to assets ratio, even if capital is appropriately adjusted for the risk of assets. A bank's balance sheet assets do not adequately represent its portfolio exposure. The credit conversion framework used in both U.S. regulation and the Basel Accords attempts to correct this oversight.¹⁵⁰ Off-balance-sheet items are brought "on-balance-sheet" through the use of "credit-conversion factors."¹⁵¹ First, a "credit equivalent amount" is determined by multiplying the off-balance-sheet item by the credit conversion factor. Second, the credit equivalent amount is assigned a risk category like any balance sheet asset. In the basic framework, credit conversion factors vary by the extent to which the arrangement in question substitutes for a loan.¹⁵² Arrangements that are closest to direct loans are assigned a factor of 100%, while those that entail no credit risk are assigned 0%. The design of these factors, however, creates the opportunity for further evasion. A bank can choose its off-balance-sheet liabilities to minimize the amount of capital it must hold. For example, part of the popularity of liquidity and credit enhancements in the securitization process is a result of their lower credit conversion factors.¹⁵³

Recent regulatory efforts attempt to address these shortcomings. The definition of "covered position" under the Market Risk Rule encompasses credit and liquidity risks from off-balance-sheet positions. The Advanced Market Risk NPR would introduce model-based risk assessments for issues such as counterparty credit risk and losses to collateral value. Nevertheless, the difficulties associated with risk weighting also apply to off-balance-sheet transactions. Off-balance-sheet items represent a substantial part of the activity of large, complex financial institutions.

Adopting a definition of the capital ratio based on market values is an imperfect, but plausible solution to this issue. The use of a minimal capital ratio that relies on the market value of equity will, in conjunction with better disclosures, reflect off-balance-sheet risks. Regulators need not abandon the task of computing separate risk-based capital charges for these items. Any substantial, off-balance-sheet risks that are detected through balance-sheet conversion, risk weighting, and stress-testing methods can be applied, perhaps with regulatory discretion, on top of the minimum charge.

¹⁴⁹ See Viral V. Acharya, Philipp Schnabl, & Gustavo Suarez, *Securitization Without Risk Transfer*, 107 J. FIN. ECON. 515, 519–520 (2013). Credit guarantees include promises to make up any shortfall on entities' securities up to a specified amount. Liquidity guarantees are agreements to provide funding an entity is temporarily unable to make payments on its securities.

¹⁵⁰ See generally Capital Adequacy Guidelines for Bank Holding Companies: Risk-Based Measure, 12 C.F.R. pt. 225, app. A (2012); Capital Adequacy Guidelines for Bank Holding Companies: Internal-Ratings-Based and Advanced Measurement Approaches, 12 C.F.R. pt. 225, app. G (2012).

¹⁵¹ See 12 C.F.R. pt. 225, app. A.

¹⁵² CARNELL ET AL., *supra* note 48, at 259–60.

¹⁵³ See Acharya, Schnabl, & Suarez, *supra* note 149, at 516.

IV. MARKET-BASED SOLUTIONS: A CRITIQUE

A variety of proposals to create market mechanisms exist that could potentially substitute for regulatory capital requirements.¹⁵⁴ These proposals involve creating a market for a security that would mitigate systemic risk. They rely on trade, monitoring, and market pricing to improve ex ante incentives to mitigate risk and ex post risk sharing. Part IV argues that the principles through which these securities might improve incentives and risk sharing do not, in general, apply to the market for large-scale risks to SIFIs.

Part IV first examines the feasibility of a market for capital insurance. Any contract that, in the event of a shock to its balance sheet, provides a bank with cash in exchange for equity can be described as capital insurance. Creating an insurance market in systemic financial risk would involve substantial regulatory difficulties. These difficulties make it unwise to pursue capital insurance as a substitute for capital regulation.¹⁵⁵ In particular, adopting regulations that make a system of capital insurance feasible would be equivalent to imposing a liquidity requirement. Part IV concludes that capital insurance should not be pursued as a substitute for capital requirements, but that it may be a feasible substitute for regulatory liquidity requirements.

Part IV then analyzes proposals to use convertible debt securities as a tool of capital regulation. These securities, which are referred to as “contingent capital,” are debt securities that convert into equity when a bank experiences financial distress. Contingent capital is distinct from capital insurance because it does not provide a bank with additional cash.¹⁵⁶ Part IV concludes that contingent capital is as likely to distort incentives for risk taking and to exacerbate financial distress as it is to enhance financial stability. Given this regulatory uncertainty, it would be premature to rely on contingent capital as a tool for the prudential regulation of SIFIs. It is not advisable for a system of prudential regulation to introduce uncertainty that increases with the size of the expected financial downturn.

¹⁵⁴ For some examples in the literature, see Acharya et al., *supra* note 13; Calomiris & Herring, *supra* note 14; Coffee, *supra* note 12; Flannery, *supra* note 13; French et al., *supra* note 12; Kashyap, Rajan, & Stein, *supra* note 13. Herring and Calomiris provide an extensive survey of this literature. See generally Calomiris & Herring, *supra* note 14.

¹⁵⁵ Two regulatory policies A and B are substitutes if an increase in cost of A results in an increase in the optimal use of B, and vice versa. Because advocates of such market mechanisms frequently point to the cost of capital regulation, it is fair to say that they are largely viewed as substitutes. By contrast, two regulatory policies A and B are complements if an increase in the cost of A results in a decrease in the optimal use of B, and vice versa.

¹⁵⁶ Section 165(b)(1)(B) of the Dodd-Frank Act authorizes the Federal Reserve Board of Governors to adopt a “contingent capital standard.” Dodd-Frank Act § 165. Section 115(c)(1) commissioned a study on the “feasibility, benefits, costs, and structure of a contingent capital requirement.” *Id.* § 115. The Financial Stability Oversight Council submitted its study to Congress in July 2012.

A. *Capital Insurance*

Consider the simple case of a security that acts as capital insurance.¹⁵⁷ It may be privately costly for a bank to maintain a larger capital buffer at all times. A bank would prefer instead to receive an infusion of equity to shore up its balance sheets after a large drop in asset values. Regulation could insist that banks purchase such an insurance policy. Banks can issue a security that pays the holder a premium. In return, the holder of the security would agree to provide the bank with cash after a systemic, triggering event. This systemic risk would then be traded in a market until it is allocated efficiently.

There are good reasons to doubt that this would be the likely outcome. In this insurance market, the moral hazard problem is two-sided. If provided insurance, equity holders have an incentive to increase their exposure to systemic risk. This will be difficult if not impossible for the insurer to monitor and price. Insurance markets work well when the distribution of losses is stable and precisely estimated, neither of which is true for systemic risk.

Second, the insurance providers have an incentive to increase their exposure to systemic risk and take little effort to monitor the insured. Suppose the largest banks rely on a few institutions to provide capital insurance in the event of a crisis. If so, the government cannot credibly commit to let these institutions fail if they cannot cover their insurance liabilities. Even if the securities were traded in the market, there would be strong incentives for large institutions to accumulate concentrated exposures to these risks.

The fate of American International Group (AIG) during the recent financial crisis provides a compelling example. The large financial institutions that held mortgage-backed securities on their balance sheets purchased insurance through credit default swaps. Relying on its AAA credit rating, AIG specialized in selling credit default swaps and acquired a concentrated position in these securities. When the underlying mortgages defaulted in large numbers, AIG could not cover its credit default swap (CDS) exposures. The U.S. government saved AIG from bankruptcy when it stepped in with an equity infusion.¹⁵⁸

A market for capital insurance would be susceptible to the same structural weaknesses as the market for credit default swaps. A seller of insurance holds a financial claim with a large negative payoff in the event of a financial sector downturn. As a result, financial institutions should be limited in their ability to sell such insurance. Such a market would in general require careful monitoring to prevent risks from becoming concentrated in particular institutions or even within the financial sector as a whole.

¹⁵⁷ See generally Kashyap et al., *supra* note 13, at 434–35 (describing the operation of capital insurance).

¹⁵⁸ Matthew Karnitschnig et al., *U.S. to Take Over AIG in \$85 Billion Bailout; Central Banks Inject Cash as Credit Dries Up*, WALL ST. J., Sept. 16, 2008, <http://online.wsj.com/news/articles/SB122156561931242905>.

Such limitations on the concentration of exposures would be difficult to monitor and enforce. Given the sophistication of financial engineering, it would be relatively easy for banks to design derivative securities that mimic the payoffs of selling capital insurance. Even if regulations could limit the sale of capital insurance to institutions outside the financial sector, other issues would arise. Sellers of capital insurance would seek to hedge their risk by taking a short position against the financial system. In the event of a downturn, the accumulation of such short positions by capital insurers could have a destabilizing effect on the system as a whole.

What would a well-regulated market for capital insurance look like? It would function similarly to the imposition of a liquidity requirement on banks. Consider a market for capital insurance that operates through monoline or specialized insurers with regulatory oversight. Restricting these insurers to only offer capital insurance prevents any cross-subsidy between insurance and other financial activities. Insurers are required to hold safe, liquid assets in sufficient amounts to cover the full liability of their capital insurance policies. Banks are required to take out insurance policies to provide them with cash in the event of a systemic downturn. In return, they pay a market-determined premium for this coverage.

Banks could provide this service for themselves. Instead of paying an insurance premium, a bank could hold liquid assets in a separate account up to the level of insurance specified by regulation. Self-insurance is therefore identical to a liquidity requirement, and capital insurance is almost identical to a liquidity requirement if the costs of self-insurance are close to the costs of third-party insurance.

These costs should be similar. If, through diversification, a third-party insurer could hold lower aggregate reserves against risks, then third-party insurance would be cheaper. For systemic risk in the financial sector, such (marginal) opportunities for diversification are minimal. A third-party insurer is unlikely to possess greater knowledge or opportunities to hedge or diversify this risk than a SIFI. The event to be insured will likely affect insured parties at the same point in time. A regulated capital insurance scheme would have a similar effect as a liquidity requirement. Where the two would differ is that under a simple liquidity requirement, or self-insurance, there would be no moral hazard effect. Therefore, a straightforward liquidity requirement would be superior to capital insurance. But capital regulation is a superior regulatory tool to a liquidity requirement because it does less to regulate the asset side of the balance sheet.¹⁵⁹

An oft-cited advantage of capital insurance is that it would spread systemic risk outside of the financial sector. Capital regulation places this risk on the equity holders of banks. These equity holders, however, represent a broad class of institutions, including mutual funds, pension funds, hedge funds, and foreign investors, both private and sovereign. In contrast, as the

¹⁵⁹ See *supra* Part I.

AIG example illustrates, trade in a lightly regulated market for capital insurance may lead to concentration as opposed to diversification.

Another seeming advantage of capital insurance is that it would provide a market-traded instrument to estimate and price the systemic component of financial sector risk. This advantage is also overstated. There are good reasons to believe that such estimation and pricing are fundamentally limited. If so, the capital insurance market creates a security whose payoffs depend on essentially unknown features of the distribution of financial sector returns. Moreover, to the extent that it is possible, the systemic risk component of bank equity could be priced through derivative securities such as out-of-the-money put options on financial sector equity indexes. This pricing does not require a separate regulatory scheme to capital insurance.

B. Contingent Capital

Commentators have proposed various forms of contingent capital as a substitute for increasing bank capital requirements.¹⁶⁰ Proponents of contingent capital argue that recent events illustrate the limitations of traditional capital requirements. In their view, regulatory measures that harness information in markets provide a superior way of improving systemic risk regulation. While there are a large number of proposals for such securities, they share a common structure and are intended to address a common set of concerns.

Contingent capital instruments are debt securities that convert into equity upon a triggering event. These instruments can serve at least three distinct regulatory aims. First, in the event of a financial loss to the bank, the conversion of debt into equity recapitalizes the bank. With a lower debt burden, a bank is better able to obtain new debt or equity financing. The conversion also allows the bank to conserve cash that would otherwise go to interest payments on the converted debt. Second, because the payoff on the contingent debt is triggered by a financial loss to the bank, the market yield of contingent debt conveys information to both market participants and regulators about the probability and magnitude of such a loss. Holders of contingent capital instruments have incentives to monitor and price this risk if they suffer substantial losses through a conversion event. Third, if either the conversion event would dilute the value of existing shares or, in anticipation of a conversion event, the yield demanded by contingent debt holders increases, then banks will have an incentive to raise capital or lower the risk of their portfolio.¹⁶¹

¹⁶⁰ See *supra* notes 12 & 13. For an extensive survey, see Calomiris & Herring, *supra* note 14, at 14. For an opposing view, see Charles Goodhart, *Are CoCos From Cloud Cuckoo Land?*, CENTRAL BANKING J., (Aug. 17 2010), <http://www.centralbanking.com/central-banking-journal/feature/2042912/cocos-cloud-cuckoo-land>.

¹⁶¹ See Calomiris & Herring, *supra* note 14, at 15.

These regulatory aims are similar to the reasons for imposing capital requirements on banks. The potential costs of contingent capital are, however, substantially higher than those of capital regulation. This argument proceeds in two steps. First, neither better risk pricing nor recapitalizing banks should be the primary objective of contingent capital. Contingent capital designed to achieve these objectives has the potential to increase uncertainty and volatility, both *ex ante* and in periods of financial stress. Therefore, the most plausible objective for contingent capital is to force banks to issue equity. Second, contingent capital with the latter aim would be inferior to capital regulation.

Better risk pricing should not be considered a primary objective of contingent capital. Designing contracts to price bank risk requires contingent capital owners to experience losses through conversion. Imposing losses on creditors through conversion, however, entails substantial regulatory risks. Such contracts will induce moral hazard on the part of banks. Banks can take on extra risk in good times, knowing they can recapitalize at the expense of contingent capital holders if things go badly. This exacerbates the asset substitution problem that debt holders already have a difficult time solving.

A defender of imposing losses on contingent capital owners can argue that they have better incentives to monitor banks than other bank creditors. Unlike creditors whose losses would force a bank into insolvency, contingent capital holders will be credibly exposed to losses. Nevertheless, there are good reasons to doubt this monitoring will take place. First, it may not be possible to reliably estimate and price the tail risk for which contingent capital is designed to absorb. Second, the threat of financial loss to contingent capital holders may not be credible. Conversion could make it costly for a bank to access subsequent debt financing. Moreover, the conversion of one bank's debt could set off a fire sale in the market for contingent capital. If losses to contingent capital holders threaten banks, then contingent capital holders may be bailed out.

Relying on contingent capital to recapitalize banks during periods of financial distress is likely to create as many problems as it will solve. Designing a security for this purpose poses considerable challenges. Under what circumstances should conversion occur? Given these circumstances, should conversion be mandatory or discretionary? If discretionary, who should have the power? This analysis first considers proposals that base conversion exclusively on an exogenous set of events and assess possible definitions of these events and their consequences. It then considers to what extent allowing a conversion option can ameliorate regulatory concerns.

Conversion based on an aggregate event could create or exacerbate conditions of financial distress rather than ameliorate them. The previous paragraphs highlighted the issues with imposing losses on contingent capital holders. Conversion can also precipitate market distress when losses fall on bank equity holders. A conversion event that leads to a large, discrete fall in a bank's share price can trigger a market response to sell off financial sector

equity. Falling bank equity values can in turn lead to a withdrawal of debt funding.

Triggering events that affect many institutions simultaneously for regulatory reasons can also exacerbate financial market distress. For example, during the recent financial crisis, the downgrading of AAA securities triggered large sell-offs from institutions that, due to regulation, could no longer hold these securities. A large-scale conversion event could similarly set off a market panic as institutions simultaneously adjust their portfolios for regulatory reasons.

The discrete nature of a conversion event poses the additional risk that conversion can be a self-fulfilling prophecy. This phenomenon is due to the role of expectations and multiple equilibria in financial markets. For example, suppose that the underlying distress conditions that trigger a contingent capital conversion have moved from a remote to a nontrivial probability in the minds of market participants. If market participants believe that everyone else believes that conversion is likely, then these beliefs can become a reality. We understand too little about financial market behavior in conditions of distress and in conditions bordering on distress to rule out these possibilities.

In general, we do not know whether the panic effect or the recapitalizing effect will dominate when conversion occurs under different market conditions. It is reasonable to believe that the destabilizing effect will dominate if the financial distress that triggers conversion is widespread or systemic. But this is precisely the kind of event for which contingent capital is supposed to play a stabilizing role. A system of prudential regulation should not introduce uncertainty that increases with the size of the expected financial downturn.

The possibility of conversion during a period of distress may increase *ex ante* risk taking by banks. It was argued above that conversion should not impose losses on contingent capital holders because this is likely to exacerbate moral hazard by banks. Imposing additional losses on equity holders could also increase bank risk taking. If contingent capital holders are protected from conversion, then they should reduce their level of monitoring and demand a lower yield. This exacerbates the asset substitution problem on the part of bank equity holders. It is true that bank equity will suffer losses in the event of conversion. But this may not have a large effect on investment behavior at the margin. After all, equity holders suffered large losses during the financial crisis. The net result of marginally cheaper funding through contingent capital and marginally greater losses in the event of a downturn may be to increase the overall riskiness of investments.

Defining an appropriately exogenous standard for financial distress presents difficulties. Dual triggers have been proposed that combine a fall in a bank's equity price with a fall in a broad index of financial sector asset worth. This helps to ensure that the triggering event only takes place when there are genuinely systemic concerns that require recapitalizing banks. But

it is precisely in these situations when relying on contingent capital is likely to have perverse, unintended consequences.

Turning to a discretionary standard for conversion does not ameliorate the concerns that arise with automatic conversion. Giving a party the option to convert bank debt into equity can increase uncertainty in times of financial distress. Some early versions of contingent capital suggested that banks be given the option to exercise conversion. If banks possess this option, then the effect of conversion should be to impose losses on contingent capital holders without diluting the value of bank equity. However, as argued above conversion should not impose losses on contingent capital holders. Moreover, an individual bank would not adequately take into account the systemic consequences of its decision to exercise its conversion option. Banks may find themselves facing a coordination problem where it is in their collective interest to refrain from converting but in their individual interest to convert if all others refrain.

Assigning this option to a regulator also presents difficulties. A regulator may be less likely than an individual bank to exercise its conversion option in a way that leads to systemic instability. But even with the best of intentions, such lines are exceedingly difficult to draw. Bank regulators faced these issues when contending with the possible failure of Bear Stearns and Lehman Brothers. The Federal Reserve had to decide whether to exercise its option to lend to these investment banks against their collateral. Would the failure to extend credit to Bear Stearns have triggered a market panic? Did the extension of credit to Bear Stearns increase moral hazard on the part of Lehman and its debt holders?

Even with hindsight, these questions are difficult if not impossible to answer. Nevertheless, some lessons are clear. The lesson from Bear Stearns is that regulators face a powerful commitment problem. Confronted with the possibility of a market panic, regulators will be very reluctant to take an action for which they can later be blamed. The lesson from Lehman Brothers is that even when regulators are willing to take a decision that can cause large losses in the market, this resolve may come too late. The markets may have wrongly anticipated forbearance when resolve finally arrives. A regulator would face identical choices in deciding whether to impose additional losses on either contingent capital holders or bank equity holders in the aftermath of a financial shock.

Taken together, these considerations advise against relying on contingent capital to recapitalize banks during periods of severe financial distress. The current understanding of how these securities would function in such an environment remains quite limited. It therefore makes little sense to treat the next financial crisis as a test case.

The most plausible purpose of contingent capital is to force banks to issue equity preemptively and stay well capitalized.¹⁶² Proponents of contin-

¹⁶² See *id.* at 4.

gent capital reason as follows. Contingent capital will force banks to issue equity preemptively if (i) conversion dilutes equity values and (ii) conversion takes place long before the bank is in serious financial distress.¹⁶³ Because managers will be held accountable by shareholders for any dilution of value, conversion will occur rarely. If conversion does occur, shareholders will exert substantial pressure on management for its lack of oversight. *Ceteris paribus*, the threat of conversion would make bank equity slightly more risky, and raise the compensating return premium demanded by investors. The net effect of the threat of dilution, however, would be to lower bank risk because managers would choose less risky projects. These conversions, unlike conversions designed to recapitalize banks in time of distress, would have a limited effect on the broader market. Conversion would occur for events that do not threaten serious financial distress.¹⁶⁴

It is likely that contingent capital of this variety would create largely unnecessary market activity to anticipate the discontinuous movement of prices that would accompany a conversion. Moreover, it presents no advantages over the framework for capital requirements described in this Article. Proponents of contingent capital argue that, unlike traditional regulation, it extracts information from market prices. But a capital requirement based on market values also relies on the market price of equity. The demands on regulatory sophistication are similar if not identical. For example, John Coffee's proposal requires 25% of contingent capital to convert to preferred shares upon a 25% fall in equity prices.¹⁶⁵ Instead regulations could stipulate that upon a 25% fall in equity prices, banks would be required to issue equity to pay down a given fraction of debt. Banks can be prohibited from paying out dividends until they have done so. The regulation would not suffer from many of the same infirmities as the equivalent, contingent capital setup. Regulation can minimize the effects of such a discontinuous event on the price of a bank's securities. Adjustments to the bank's capital structure could be phased in gradually through agreement between the bank and regulator.

While the goals of contingent capital—recapitalizing banks during distress, pricing bank risk, and forcing banks to stay well-capitalized—are laudable, their implementation involves substantial operational risks. These risks are too substantial to justify using contingent capital as a core tool of

¹⁶³ In general, for the design of contingent capital instruments, early conversions serve the purpose of forcing preemptive equity issues while distress conversions serve the purpose of recapitalization. *See id.* at 11.

¹⁶⁴ John Coffee's proposal, for example, calls for a sequence of escalating conversions. He considers a case where 25% of outstanding contingent capital would convert to preferred shares with voting rights upon a 25% stock price decline from the date of issue. Another 25% percent would convert after a subsequent 25% percent decline. Given the average volatility of stock prices, these changes in stock price are not so large as to constitute extraordinary events. *See Coffee, supra* note 12, at 833. Such a proposal would create a needlessly complex set of discontinuous effects as a result of changes in a bank's share price.

¹⁶⁵ *Id.* at 830.

prudential regulation for SIFIs. Regulators should not rule out experimenting with contingent capital for institutions that have a history of failing without systemic impacts—for example, mid-sized depository institutions that also issue tradable debt. Even there, regulators should exercise caution in using contingent capital as a substitute for capital regulation system. These circumscribed banks could be permitted to issue contingent capital to contract *ex ante* for equity if their capital positions erode. Regulators should be wary, however, of contingent capital's destabilizing possibilities. Contingent capital should be used with caution until regulators and market participants come to a better understanding of how it would function during conditions of financial stress.

CONCLUSION

Limiting the systemic risk posed by large, complex financial institutions is one of the most pressing regulatory issues of our time. Almost all observers agree that the leverage of these institutions exacerbates the effects of financial shocks on the rest of the economy. There is no disagreement that the human costs of such systemic fragility are enormous and unacceptable. Yet there is substantial disagreement over how to limit this leverage and mitigate its effects.

This Article deploys theoretical insight and empirical evidence from the economics and finance literature to describe a coherent approach to regulatory design and implementation in this area. There is a strong case that regulation can substantially increase the capital that banks hold in a way that would lower the both risk of bank failure and the externalities associated with these failures. This Article suggests ways to structure this increase in capital so as not to produce an inefficient reduction in lending. These suggestions include adjusting the required capital ratio over the business cycle, giving regulators some discretion to waive requirements during downturns, building up capital gradually over time, and both mandating and enabling regular equity issues. This Article also suggests changes to regulatory practice—including the measurement of risk—to better reflect institutional competence and to limit manipulation by financial institutions armed with superior information.

It cannot be known with certainty whether capital regulation along the lines proposed in this Article can mitigate large-scale financial risks without substantially restricting economic activity. There is, however, a strong case for trying such an approach. Regulation can be structured so that most of the accumulation of capital takes place during periods of credit and asset growth. If the phase-in of capital requirements seriously affected trend levels of economic activity, then the regulatory approach could be abandoned and rethought. Unlike market-based proposals such as contingent capital, capital regulation along these lines would not involve any radical institutional innovation and would make use of many current regulatory inputs. Most importantly, unlike current regulatory reforms, it has the potential to substantially improve the present system.