Source: Hester Peirce and Benjamin Klutsey, eds., *Reframing Financial Regulation: Enhancing Stability and Protecting Consumers*. Arlington, VA: Mercatus Center at George Mason University, 2016.

CHAPTER 2
On Simpler, Higher Capital Requirements

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In the aftermath of the recent crisis, bank regulators in the United States and abroad have sought to increase bank capital requirements as a way to reduce the likelihood of a banking crisis. To understand why, one way to think about capital is that it reflects a bank's net worth, measuring the difference between bank assets and liabilities; greater net worth, as reflected by a larger value of the bank's equity, means the bank is farther from experiencing the risk of default. Elliott[1] points out, there are three key features of effective bank capital: (1) it requires no repayment to any party, (2) it requires no interest or dividend payment to any party, and (3) in the event of bankruptcy this group of claimants would be among the last to receive proceeds from a liquidation.

To better understand the role of bank capital, consider a bank operating in a hypothetical unregulated market for banking services that takes in deposits from customers and sells equity shares (or perhaps even long-term bonds) to investors. Bank staff use those funds to originate a variety of loans to businesses and households, or buy a variety of securities. Crouhy and Galai[2] point out that in such a market, no optimal capital structure reflecting the bank's funding mix between its deposits and equity would exist for the bank. In contrast, the US banking industry has historically been highly regulated and a key aspect of that regulation has concerned capital adequacy.

As Miller[3] suggests, regulatory capital requirements, including those discussed here, will not stop people in banks from misappropriating funds, but they can provide one way regulators might address two key problems that arise in regulated markets for banking services. First, bank deposits tend to have a shorter-term maturity than the assets on the balance sheet, and banks with more capital rely less on the shorter-term funding. Second, as Cochrane,[4] among many others, points out, bank deposit redemption occurs on a "first come, first served" basis. These features of deposits could invite bank runs if depositors catch on to default risks lurking on bank balance sheets. A well-capitalized bank, however, would be much less prone to bank runs because it would be farther from experiencing insolvency, as the most effective forms of capital need not be repaid in the event of an insolvency.

In addition, Black and others[5] discuss how by offering deposit insurance, the government essentially becomes a lender to the bank. Like a typical lender, the government then has concerns over the value of a bank's assets relative to deposits, as well as the riskiness of bank assets. Capital adequacy offers a low-cost method of controlling the risk of bank insolvency, as relatively higher bank capital means there would be relatively less for the government to insure. Of course, as Thomas Hogan and Kristine Johnson (in chapter 3 in this volume) point out, alternatives—such as private deposit insurance—exist too, which would change the story. In any case, any change in bank capital requirements could have benefits and costs that must be weighed against each other.

A full benefit-cost analysis remains beyond the scope here, but the benefit of higher capital might be measured as the reduction, or perhaps elimination, of the economic effects of banking crises. To see how capital might do that, Gornall and Strebulaev[6] developed a framework that explains why banking corporations have much higher leverage than nonbanking corporations and predicts that merely doubling bank equity capital requirements from 8 to 16 percent would reduce failure rates among banks by 92 percent. To the extent that banking crises adversely affect the formation of an economy's real capital stock (e.g., plant and equipment), increasing bank capital could reduce the loss of gross domestic product (GDP) arising from banking crises.

The cost might be measured as the reduction in GDP arising from the extent to which higher bank capital requirements translate into a higher cost of capital that gets passed on to borrowers, which in turn might lower formation

of the economy's real capital stock and GDP. Some view the costs, among other drawbacks, as important (see, for instance, Elliott[7]), while others claim that higher capital involves no increase in costs (see Admati et al.).

Miles and others[8] developed a framework linking the benefits of higher capital requirements to the costs of higher capital applied to the six largest banks in the United Kingdom. They show that higher capital requirements transmit only partially, rather than fully, to the return on equity, which in turn increases the cost of capital slightly, resulting in lower firm capital accumulation and output. Based on these costs and the benefits of eliminating crises, they find the optimal capital ratio for the United Kingdom lies in the range of 16 to 20 percent of risk-weighted assets, which as Hogan and Manish[9] explain, down-weights total assets according to any weighting factors used to calculate Basel-type regulatory capital. Cline[10] applies a similar exercise and finds that the optimal capital ratio for US banks to be roughly 12 to 14 percent of risk-weighted assets. The use of risk-weighted assets, which reduces the amount of assets for which banks have to have capital, may create other undesirable outcomes that I will discuss, but so far, the evidence does not suggest lowering capital requirements would be desirable.

In what follows, I discuss several proposals for simpler, higher bank capital requirements as a way to reduce the harmful economic effects of banking crises. Simpler capital requirements imply returning to a flat capital-to-asset or capital-to-liability ratio and limiting the definition of bank capital to equity and possibly long-term debt. Higher capital requirements mean increasing capital relative to total assets or liabilities, well above existing levels. To motivate the discussion of simpler, higher capital requirements for US banks, I explain how in a hypothetical unregulated market a bank's capital structure relates to the interest rates it offers, then contrast that with the US historical experience with regulatory capital, and then end with proposals going forward.

BANK CAPITAL STRUCTURE IN A HYPOTHETICAL UNREGULATED MARKET

Crouhy and Galai[11] observe that bank capital, in particular equity capital, functions in a much different way than regulatory capital measures, such as the book equity to book asset ratio constructed by accountants. In an unregulated world, the equity-to-asset ratio would be measured at market value and would be constant, since any reduction in asset values would result in a reduction in the value

of the bank's equity, at least until the bank became insolvent. In this sense, equity capital does not provide a buffer to protect depositors, but would reflect whether the bank is solvent.

The capital structure would be reflected by the interest rates offered by banks, though. Banks would pay interest rates to depositors that varied with the riskiness of the loans and securities on its balance sheet, as well as the fraction of assets funded with equity. For instance, banks that had riskier loans for a given equity-to-asset ratio would offer higher interest rates to depositors to compensate them for the risks. Similarly, banks that had a low equity-to-asset ratio, because they depended more on depositors to fund their loans and investment purchases, would also have to compensate depositors for the greater potential risk of insolvency. Here, just as bank assets reflect a risk-reward tradeoff, bank liabilities pay risk-adjusted rewards to investors and depositors. This discussion of bank capital structure in a hypothetical unregulated market for banking services contrasts sharply with how bank capital structure has been affected by the US bank regulatory framework over time.

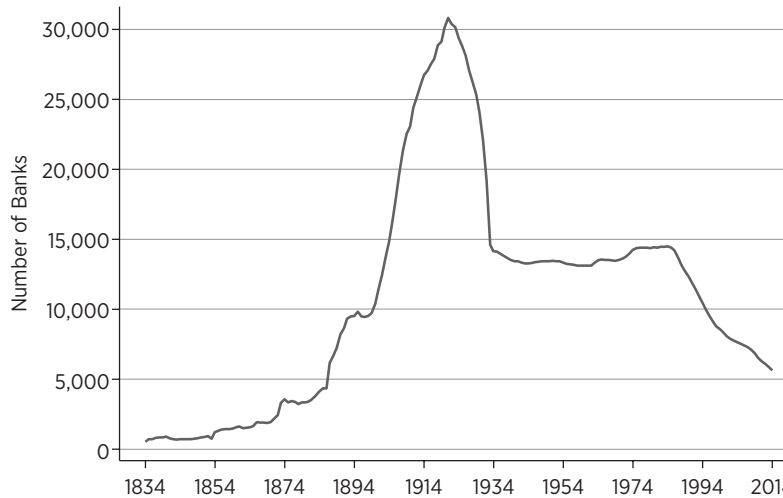
HISTORICAL PERSPECTIVES ON US BANK CAPITAL STRUCTURE AND REGULATION

The Very Long Road to Basel

Mengle[12] points out that banks in the United States have always been subject to a mix of primarily state but also federal regulation. Calomiris and Haber[13] and Bordo and others[14] observe that US banks historically were weakened by state-based, interstate banking and branching restrictions that made bank assets less diversified than they might be without those restrictions. In addition, Gorton[15] observes that banks sometimes had requirements to hold state bonds, which subjected banks to state default risk, as when nine states defaulted on their debt during the period between 1837 and 1843. Rather than fostering stability, bank regulations exposed US banks to regional shocks that could result in bank failures and runs, so the United States experienced frequent crises.

While challenges exist in identifying earlier crises, Jalil[16] finds that between 1825 and 1929, the United States experienced major banking crises in 1833, 1837, 1839, 1857, 1873, 1893, and 1907, in addition to twenty minor banking crises. After that, the United States experienced a major banking crisis during the Great Depression from 1930 to 1933, during the Savings and Loan (S&L)

Figure 1. Total Number of US Banks, 1834–2014



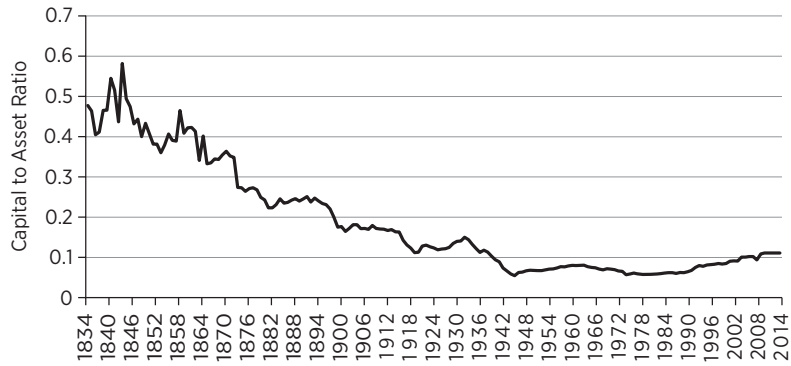
Note: Data from 1834 to 1933 are from the 1957 Historical Abstract of the United States, series N-19, 262–263, http://www2.census.gov/prod2/statcomp/documents/HistoricalStatisticsoftheUnitedStates1789-1945.pdf. Data after 1933 are from table CB01, https://www5.fdic.gov/hsob/SelectRpt.asp?EntryTyp=10&Header=1.

Crisis from 1987 to 1989, and then again during the most recent crisis from 2007 to 2009. That means the United States has experienced at least ten major crises and twenty minor crises since 1825 alone. A related and peculiar feature of the US banking landscape is the dramatic rise and subsequent decline in the number of banks.

Figure 1 shows the number of banks in the United States from 1834 to 2014. Changes in the number of banks reflect new entrants, bank failures, and mergers. The number of banks increased rapidly toward the end of the nineteenth century, surpassing 10,000 (10,382) in 1900 and peaking at 30,812 in 1921. The number of banks has fallen since 1921. Mengle[17] and Walter[18] suggest that one reason for the increase in the number of banks was the decline in minimum capital required to enter the industry, particularly after 1900 (which will become apparent in figure 3). A recent study by Adams and Gramlich shows that state-based capital requirements for new bank charters still exist.[19]

Walter also describes how the large number of small bank failures during the 1920s suggested to regulators that barriers to entry should protect

Figure 2. Total Bank Capital as a Fraction of Total Bank Assets, 1834–2014



Source: Graph shown is updated from Allen Berger, Richard Herring, and Giorgio Szego, "The Role of Capital in Financial Institutions," Journal of Banking and Finance *19 (June 1995), 393–430.*

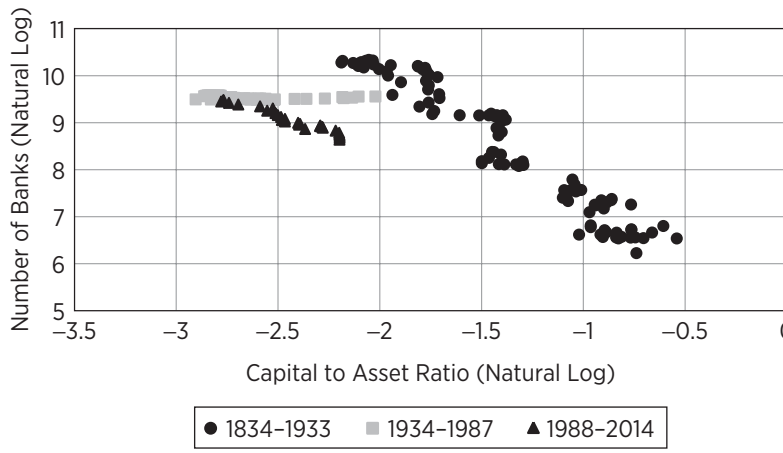
Note: Data from 1834 to1933 are computed by dividing series N-24 (Capital, Surplus, and Net Undivided Profit) by N-20 (Total Assets or Liabilities), as reported in the Historical Abstract of the United States 1789–1945, 262–263, http://www2.census.gov/prod2/statcomp/documents/HistoricalStatisticsoftheUnitedStates1789-1945.pdf. Data after 1933 are computed by dividing Total Equity Capital by Total Liabilities by Equity Capital from table CB14, https://www5.fdic.gov/hsob/SelectRpt.asp?EntryTyp=10&Header=1.

incumbents, since new entrants, rather than the small size and small number of branches, were seen to be the cause of the problem of bank failures. This seems consistent with the relatively flat trend in the number of banks after the establishment of the Federal Deposit Insurance Corporation (FDIC) in 1934.

Finally, during the last thirty years or so, much consolidation has taken hold in the US banking system, just as regulators have sought to increase bank capital requirements. Bank consolidation through interstate banking began to take hold, first at the state level in the 1970s.[20] Interstate banking at the federal level became official with the passage of the Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994.[21]

Figure 2 depicts the historical record of total bank capital to total bank assets for the US banking system. The ratio peaked in 1843 at just over 58 percent and declined steadily after that. Lowering the minimum capital requirement would expand the pool of potential entrants to the banking market. The steady decline through the 1920s captures observations about the reduction in minimum bank capital requirements, which both Mengle and Walter suggest[22] explains the dramatic growth in the number of banks between 1900 and 1921 (observed in figure 1).

Figure 3. Number of Banks Depicted against Total Bank Capital to Total Bank Assets, 1834–2014



Note: The source of the data for the number of banks is as reported in the note under figure 1, while source of the data for the capital ratio is as reported in the note under figure 2.

Figure 3 depicts the natural log of the number of banks against the natural log of the total bank capital to total bank asset ratio for all banks in the United States during three "regimes": (1) the pre-FDIC era from 1834 to 1933, when bank capital served as a barrier to entry;[23] (2) the FDIC era prior to Basel from 1934 to 1987, when regulators sought to limit entry by other means; and (3) the Basel era from 1988 to 2014, when capital adequacy has been viewed as a way to foster bank safety. The inverse relationship between the number of banks in the pre-FDIC era seems consistent with observations by Mengle and, later, Walter, about capital serving as a barrier to entry.[24] Figure 3 also helps understand the relationship between capital adequacy and banking crises, and in particular why so many banks failed throughout US history, even though capital requirements had been high.

For instance, the frequent crises observed during the pre-FDIC era may have occurred because banks were too small,[25] even though they had historically high levels of capital. In more recent times, just as the number of banks has been declining, bank capital has been relatively low by historical standards. One implication could be that bank capital alone cannot ensure stability of the banking system if regulations, such as interstate banking and branching

restrictions, interfere with bank size as driven by market demands for banking services. With no geographical limits on where banks can operate and with higher capital requirements, banks might diversify their risks while increasing their distance to default.

To elaborate, Bordo and others discuss how Canadian banks never experienced a major banking crisis since Confederation in 1867 because they could diversify their loan risks and pool deposits from across Canada.[26] Interestingly, some late-nineteenth-century US policymakers understood why Canadian banks were relatively more stable than US banks, but also understood that the political forces driving banking laws and regulations at the time would prevent change toward a more stable model.[27]

With the establishment of the FDIC, regulators moved away from minimum capital requirements as a way to limit entry.[28] This may be reflected by the fact that the inverse relationship between the number of banks and the capital ratio vanishes during the FDIC era from 1934 to 1987.

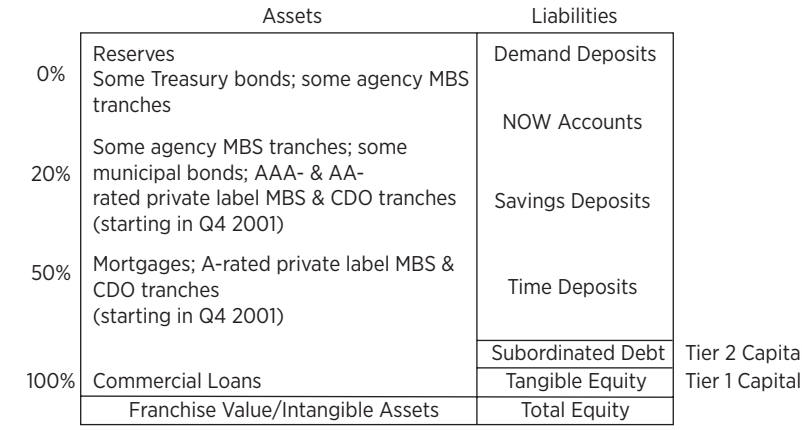
Finally, during the Basel era, a negative relationship again exists between the number of banks and the capital ratio. This finding likely reflects the fact that the number of banks in the United States has been declining for other reasons, including bank consolidation following the growth in interstate banking activity, while at the same time regulators sought to increase bank capital requirements.

The impetus for the increase in capital requirements was the International Lending Supervision Act of 1983 in the aftermath of the 1982 Latin American Debt Crisis.[29] The new legislation called on bank regulators to find a multilateral, rather than unilateral, way to raise bank capital requirements so that US banks would not find themselves at a competitive disadvantage with their foreign competitors. Ethan Kapstein[30] (1994) describes how those events culminated in the Basel capital adequacy standards.

Capital Adequacy Standards since Basel

US bank supervisors offered the finalized version of their Basel capital adequacy rulings in 1989.[31] Under the original "standard approach," banks would classify assets by simple risk buckets. After the Market Risk Amendment originally proposed in 1996, Basel guidelines would eventually suggest how banks could apply an "advanced approach" by measuring the credit risk on their

Figure 4. A Stylized Bank Balance Sheet under Precrisis Basel Guidelines



Source: Adapted from Suresh Sundaresan and Zhenyu Wang, "Bank Liability Structure," 2014 (unpublished manuscript).

balance sheet continuously, using internal risk-based models, instead of discretely as with the risk buckets.[32]

Figure 4 depicts a stylized bank balance sheet to help visualize capital requirements by asset class under the "standard approach" and how they link to the capital and liability side of the balance sheet. The balance sheet entries are measured at historical book value, rather than market value. As under the original Basel guidelines, on the asset side, I categorize assets according to 0 percent, 20 percent, 50 percent, and 100 percent risk-weight classifications, which incur capital requirements of 0 percent, 1.6 percent, 4 percent, and 8 percent. Hogan and Manish[33] discuss the components of these categories in more detail, but the stylized presentation serves to motivate the discussion that follows. On the liability side, I list a variety of deposits as classified by US bank regulators, as well as Tier 1 capital, including common equity and tangible common equity, and Tier 2 capital such as subordinated debt.

On the asset side of the balance sheet, a bank has reserves as required by law to cover *expected withdrawals* from depositors. In addition, some of the asset categories I include, such as tranches of private label mortgage-backed securities (MBS) and collateralized debt obligations (CDOs), lay at the heart of the recent crisis. Erel and others[34] point out that the Recourse Rule, finalized by banking regulators on November 29, 2001, reclassified the highly rated,

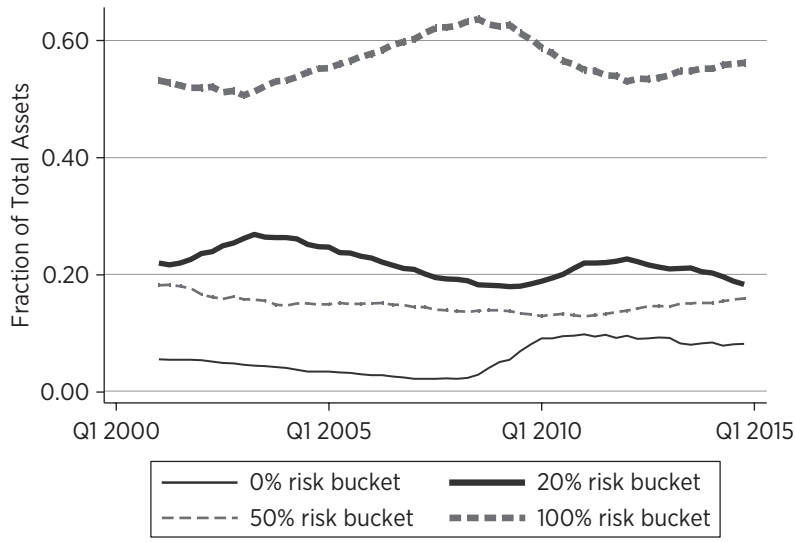
private label tranches from 50 percent risk bucket assets or higher to 20 percent if they were AAA- or AA-rated and 50 percent if they were A-rated.[35] While not depicted, even higher risk weights of 200 percent were applied to some assets with ratings of BB or lower after the Recourse Rule.

On the liability (and capital) side, the entries near the top reflect sources of bank funding. Along with the introduction of risk buckets, Basel capital adequacy standards also widened the scope for alternative forms of capital beyond common equity, such as preferred stock, disclosed reserves, and published retained earnings. For the capital entries near the bottom, Tier 1 capital includes tangible equity, while franchise value reflects the present value of the bank's future earnings. Tangible capital would go toward covering *unexpected losses* in asset values, as a result of nonperforming loans and defaults.[36] However, Miller observes that no financial intermediaries could expect to survive in a competitive banking system by relying on some components included in regulatory capital requirements.[37] For instance, as Elliott notes, the franchise value/intangible asset component of common equity would not easily convert to cash during a crisis.[38] The remaining types of capital fall under Tier 2, which includes subordinated debt and loan loss reserves.

To put this balance sheet in operational perspective, figure 5 depicts the average fraction of bank assets allocated to assets in each risk bucket across all US bank holding companies from Q1 2000 to Q1 2015, when the Federal Reserve collected the series. The figure shows that, on average, 100 percent risk bucket assets tend to dominate bank balance sheets, although this would tend to be true for smaller holding companies, not the largest. The 20 percent and 50 percent risk bucket asset categories make up the next largest balance sheet items, respectively. Lastly, the 0 percent risk bucket category makes up the smallest item on balance sheets, although larger banks tend to have a higher fraction allocated to this risk bucket. Holdings in this bucket would lower their risk-weighted assets, which could help make a bank's capital to risk-weighted assets ratio appear higher.

Figure 6 depicts the average ratio of demand deposits, savings accounts, negotiable orders of withdrawal (NOW) accounts, and time deposits to total assets for commercial bank subsidiaries across all bank holding companies in the United States from Q1 1985 through Q1 2015. Figure 6 also depicts the average book equity to total asset ratio for the holding company. The figure shows that both the fraction of bank funding coming from savings accounts

Figure 5. Average Fraction of Holding Company Assets by Risk Bucket across All Bank Holding Companies, Q1 2000–Q1 2015

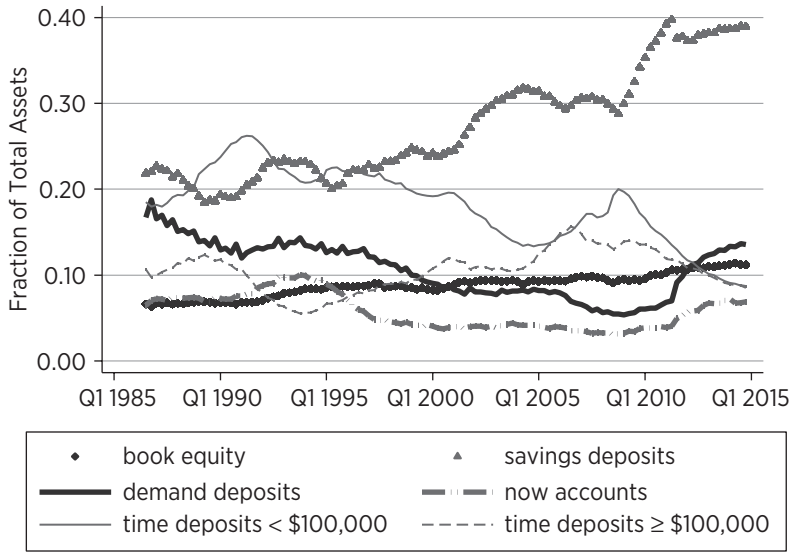


Note: The series measures the average across all reporting bank holding company corporations with total assets greater than $1 billion recorded in the Chicago Fed Call Report Y-9C forms, available from https://wrds-web.wharton.upenn.edu/wrds/. The Call Report variables are included in the following description to facilitate replication. To compute the 0% risk bucket asset share, I divide total assets in the 0% risk bucket, bhc02170, by total assets, bhck2170. To compute the 20% risk bucket asset share, I divide total assets in the 20% risk bucket, bhc22170, by total assets, bhck2170. To compute the 50% risk bucket asset share, I divide total assets in the 50% risk bucket, bhc52170, by total assets, bhck2170. Finally, to compute the 100% risk bucket asset share, I divide total assets in the 100% risk bucket, bhc92170, by total assets, bhck2170.

and equity capital increased throughout the sample. Time deposits of at least $100,000 increased slightly as a fraction of bank liabilities from 1994 through 2006. They have since fallen back to the 1980s level and now make up a share roughly equal to that for time deposits smaller than $100,000, which have fallen since the 1980s. Demand deposits fell throughout the sample period before reversing in 2009. NOW accounts provide a small fraction of funding.

I also depict book value of equity to book value of assets against other measures of regulatory capital in figure 7, including the key regulatory measures of Tier 1 to risk-weighted assets, Tier 1 and Tier 2 capital relative to risk-weighted assets, and the market value of bank equity relative to book value of assets. The data indicate that while book equity tends to be the lowest measure, it is fairly stable. In contrast, the market value of equity to book value of assets ratio can fluctuate significantly, reflecting a source of market discipline via falling share

Figure 6. Average Holding Company Book Equity Capital and Deposit Liabilities of Commercial Bank Subsidiaries as a Fraction of Total Holding Company Assets, Q1 1985–Q1 2015

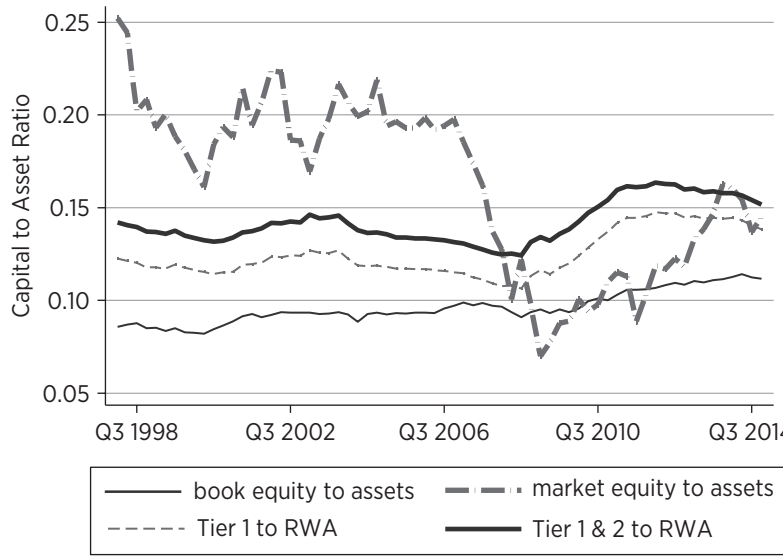


Note: The equity series measures the average across all reporting bank holding company corporations with total assets greater than $1 billion, while the deposit series are measured for the commercial bank subsidiaries of those bank holding companies recorded in the Chicago Fed Call Report Y-9C forms, available from https://wrds-web.wharton.upenn.edu/wrds/. The Call Report variables are included in the following description to facilitate replication. To compute book equity to assets, I divide total equity capital, bhck3210, by total assets, bhck2170. To compute total savings accounts to assets, I divide nontransaction savings deposits, bhcb2389, by total assets, bhck2170. To compute total demand deposits to assets, I divide total demand deposits, bhcb2210, by total assets, bhck2170. To compute total NOW accounts to assets, I divide total NOW accounts subject to Automatic Transfers from Savings (ATS), and other transaction accounts in domestic offices of commercial banks, bhcb3187, by total assets, bhck2170. To compute total time deposits less than $100,000 to assets, I divide total time deposits less than $100,000, bhcb6648, by total assets, bhck2170. To compute total time deposits of at least $100,000 to assets, I divide total time deposits of $100,000 or more, bhcb2604, by total assets, bhck2170.

prices. The volatility of the market value of equity to book value of assets ratio does not violate Crouhy and Galai's claim[39] that in an unregulated market the equity-to-asset ratio would remain fixed, since the ratio combines market values that can vary significantly with book values that may not. Finally, one drawback of using the Tier 1 and Tier 2 capital to risk-weighted asset ratios is that it creates incentives for banks to tilt their portfolios toward certain asset classes.

Arnold Kling (see chapter 1 in this volume) and Hogan and Manish[40] explain that regulatory arbitrage began in earnest following the adoption of Basel Accord capital adequacy standards after 1988. By 2001, federal regulators had finalized the Recourse Rule.

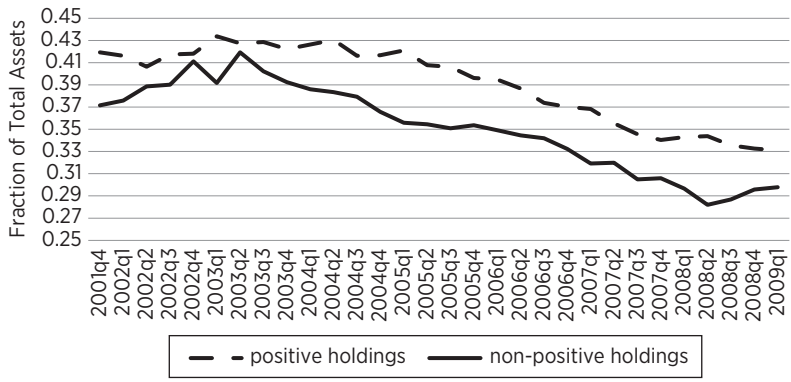
Figure 7. Alternative Measures of Capital, Q3 1998–Q3 2014



Note: The series measures the average across all reporting bank holding company corporations with total assets greater than $1 billion recorded in the Chicago Fed Call Report Y-9C forms, available from https://wrds-web.wharton.upenn.edu/wrds/. The Call Report variables are included in the following description to facilitate replication. To compute book equity to assets, I divide total equity capital, bhck3210, by total assets, bhck2170. To compute market equity to total assets, I divide the end of quarter market value of each bank holding company's shares (market price multiplied by number of shares), taken from the Center for Research in Securities Prices (CRSP) database, available from https://wrds-web.wharton.upenn.edu/wrds/, by total assets, bhck2170. To merge the CRSP data to the Call Report data, I use the Federal Reserve Bank of New York's 2014-3 "CRSP-FRB Link", available from https://www.newyorkfed.org /research/banking_research/datasets.html. To compute Tier 1 capital to risk-weighted assets, I divide Tier 1 capital allowable under risk-based capital guidelines, bhck8274, by risk-weighted assets (net of allowances and other deductions), bhck2170. To compute Tier 1 and 2 to risk-weighted assets, I divide the sum of Tier 1 capital allowable under risk-based capital guidelines, bhck8274, and Tier 2 capital allowable under risk-based capital guidelines, bhck8275, by risk-weighted assets (net of allowances and other deductions), bhck2170.

Determining the effects these rule changes had on bank balance sheets proves challenging, because bank regulators did not require holding companies to report much detail about private label MBS holdings and did not ask for CDO holdings until after the crisis began to unfold. That said, it is possible to infer some of that activity by comparing average bank holdings of 20 percent or 50 percent risk-weighted assets as a fraction of total assets, conditional on whether banks hold positive amounts of the private label MBS tranche holdings, as depicted in figure 8. The highly rated tranches can be estimated, using the method of Erel, Nadauld, and Stulz,[41] by computing the residual of 20 percent and 50 percent risk bucket balance sheet and trading assets that

Figure 8. Average Holdings of 20 Percent and 50 Percent Risk Bucket Assets as a Fraction of Total Assets Conditioned on Holdings of Highly Rated, Private Label Tranches, Q4 2001–Q1 2009



Note: The Call Report variables are included in the following description to facilitate replication. The graph depicts the average ratio of the quantity of the sum of 20 percent risk bucket assets, bhc22170, and 50 percent risk bucket assets, bhc52170, divided by total assets, bhck2170, for all reporting bank holding company corporations with total assets, bhck2170, greater than $1 billion recorded in the Chicago Fed Call Report Y-9C forms, available from https://wrds-web.wharton.upenn.edu/wrds/. The graph conditions on whether banks hold positive holdings of estimated highly rated, private label tranches after Q4 2001. To estimate these holdings, Erel et al. (2014) suggest adding held-to-maturity securities in the 20 percent and 50 percent risk buckets, bhc21754 and bhc51754, available-for-sale securities in the 20 percent and 50 percent risk buckets, bhc21773 and bhc51773, and trading assets—all other mortgage-backed securities, bhck3536. From this total, they subtract amortized cost of held-to-maturity US government agency and corporation obligations issued by US government-sponsored agencies, bhck1294; amortized cost of available-for-sale US government agency and corporation obligations issued by US government-sponsored agencies, bhck1297; amortized cost of held-to-maturity mortgage pass-through securities issued by Fannie Mae and Freddie Mac, bhck1703; amortized cost of available-for-sale mortgage pass-through securities issued by Fannie Mae and Freddie Mac, bhck1706; amortized cost of held-to-maturity mortgage-backed securities issued or guaranteed by Fannie Mae, Freddie Mac, or Ginnie Mae, bhck1714; amortized cost of available-for-sale mortgage-backed securities issued or guaranteed by Fannie Mae, Freddie Mac, or Ginnie Mae, bhck1716; amortized cost of other held-to-maturity mortgage-backed securities collateralized by MBS issued or guaranteed by Fannie Mae, Freddie Mace, or Ginnie Mae, bhck1718; amortized cost of other available-for-sale mortgage-backed securities collateralized by MBS issued or guaranteed by Fannie Mae, Freddie Mac, or Ginnie Mae, bhck1731; amortized cost of held-to-maturity securities issued by states and political subdivisions in the United States, bhck8496; and amortized cost of available-for-sale securities issued by states and political subdivisions in the US, bhck8498.

are neither US federal government, nor US agency securities, nor municipal securities. They show that the measure offers insights that are consistent with other measures that include CDOs, even though CDO holdings are not explicitly recorded in the data.

Figure 8 shows that after the rule change in Q4 2001, banks with positive holdings of highly rated tranches had more than 3 percent higher average holdings of 20 percent and 50 percent risk bucket assets. While not shown, these higher holdings initially came at the expense of fewer 0 percent risk bucket assets, and later at the expense of 100 percent risk bucket assets.

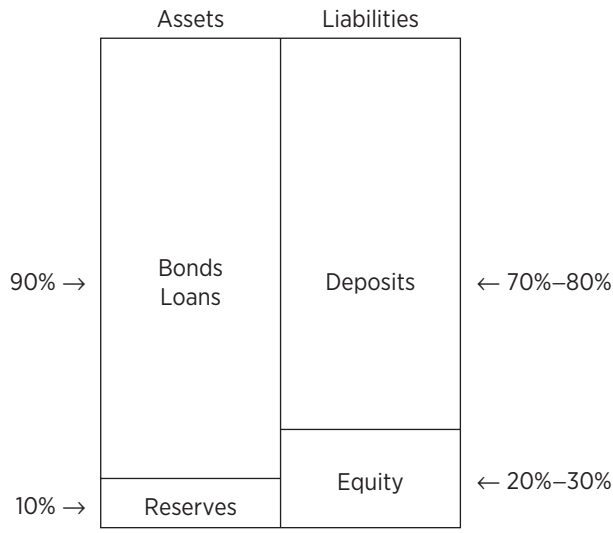
If the regulatory capital requirements created incentives for banks to tilt their portfolios toward some of the assets that experienced distress during the crisis, the question still remains: How could such small changes in holdings lead to bank distress? To see how, Erel and others[42] estimate that at the end of 2006 the average bank holding company had about 1 percent of its total assets allocated to the highly rated tranches. The largest trading banks had 5 percent of total assets allocated to the highly rated tranches, or 6.6 percent if off-balance-sheet items were included in the calculation. However, some banks had even larger exposures. For instance, Citigroup had 10.7 percent of total assets in the form of private label MBS and Structured Finance (SF) CDOs. At the same time Citigroup had only 6.3 percent common equity to cover its assets. With those values, write-downs of just under 60 percent would have wiped out common equity, exposing Citigroup to insolvency risk.

While 60 percent write-downs might seem extreme, Larry Cordell and others[43] estimate that SF CDO write-downs between 1999 and 2007 averaged 65 percent; write-downs on tranches originated in 2006 and 2007 were on average even higher. Losses of this magnitude help explain why a few large banks like Citigroup faced distress during the recent crisis. If the collapse of the SF CDO helps explain why there was a crisis, in principle, a simple way to address the problem is to introduce simpler, higher capital requirements.

DODD-FRANK AND SIMPLER, HIGHER CAPITAL REQUIREMENTS

In the aftermath of the crisis, Congress enacted the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 (Dodd-Frank).[44] Much of Dodd-Frank concerns issues far-removed from capital adequacy, but it does push capital adequacy in the same direction as the proposals I present here. For instance, Title VI Sections 606 and 607 call for changing the language in the US Code of Federal Regulations from "adequately capitalized" to "well capitalized." Also, Title IX Section 939 calls for removing statutory references to credit ratings. To the extent that Dodd-Frank calls for higher capital requirements that make no reference to credit ratings, the proposals that I discuss next are consistent with those legislative objectives.

Figure 9. Admati and Hellwig's Proposal



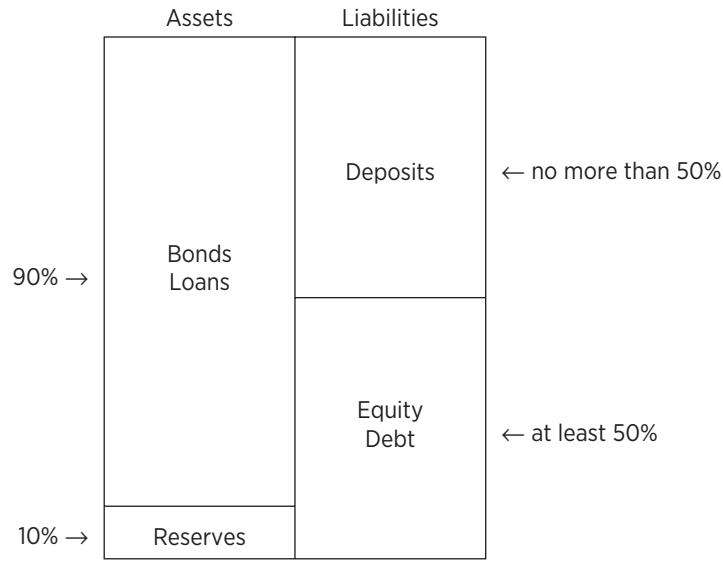
Source: Anat Admati and Martin Hellwig, The Bankers' New Clothes *(Princeton, NJ: Princeton University Press, 2013).*

Simpler capital requirements imply returning to pre-Basel capital adequacy standards by eliminating the risk-weighting of assets and using a flat leverage ratio and by limiting what capital consists of to equity and possibly long-term debt. *Higher* capital requirements imply increasing banks' distance to default. I begin by reviewing Admati and Hellwig's proposal for higher capital requirements using their stylized balance sheet, shown in figure 9.

They focus primarily on the liabilities side of the story, but assume here that loans and investments make up 90 percent of assets while reserves make up the remaining 10 percent. On the liabilities side, Admati and Hellwig[45] suggest having equity in the range of 20 to 30 percent of total assets, which means a bank might have to fund the remaining 70 to 80 percent of its asset purchases with deposits. The range of values draws from pre-FDIC evidence,[46] as depicted in figure 2.

Alternatively, while capital adequacy standards tend to focus on the asset side of the balance sheet, figure 10 depicts Black's suggestion, which is to have equity and/or long-term debt equal to at least 100 percent of deposits.[47] That

Figure 10. Black's Dollar-for-Dollar Proposal

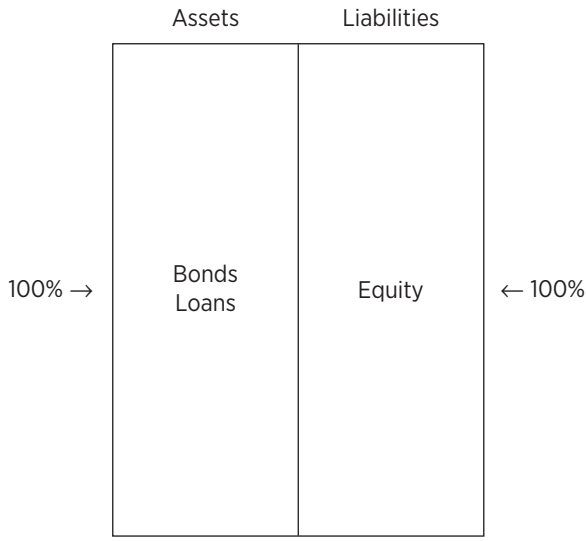


Source: Fischer Black, "Bank Funds Management in an Efficient Market," Journal of Financial Economics *2, no. 4 (1975): 323–39.*

implies a dollar-for-dollar rule whereby for every dollar of funds the bank obtains from depositors, the bank must find at least another dollar of equity or bond funding. While banks may not reduce capital when deposits decrease, they would have to increase capital when deposits increase. In such a world, any form of deposit insurance, public or private, might prove unnecessary, since investors would bear the loss of asset values.

In some ways, Cochrane[48] takes Black's proposal even further. Cochrane's solutions aim to eliminate all "run-prone" debt, including demand deposits. Among other proposals, he considers the possibility of eliminating deposits altogether by having banks fully fund their safe asset purchases, like US Treasury bonds, with floating value equity. Miller[49] had also suggested this possibility in passing and, like Cochrane, observed that it would stop runs. In essence, banks might look somewhat like US Treasury bond exchange-traded funds, whose liabilities (shares) float in line with the value of the underlying assets. In terms of a balance sheet, that might look something like figure 11.

Figure 11. Cochrane's Proposal without Deposits

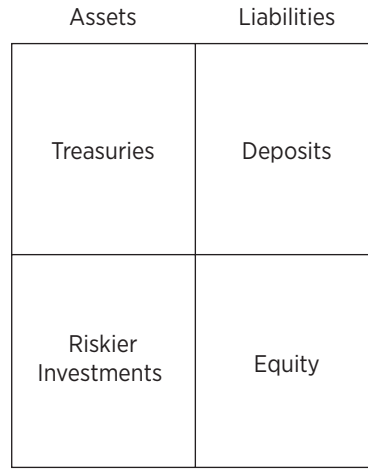


Alternatively, Cochrane[50] suggests that if deposits continue to exist, then they would be backed by US Treasuries, while riskier investments of any kind would be backed 100 percent by equity. I depict this stylized bank balance sheet in figure 12—which resembles the long-standing "Chicago" plan for banks following the Great Depression.

Cochrane proposes this solution because he argues that the current sentiment focusing regulation on bank assets is a hopeless enterprise. Interestingly, commenting about trends in the late 1970s, Black, Miller, and Posner reflect positively on the fact that banking regulation had turned its focus from "exclusive preoccupation with bank-asset safety and toward greater awareness of the benefits of competition."[51] In that sense, bank regulation unfortunately has come full circle.

Cochrane's suggestion[52] would require substantial changes in the way transactions get settled as well. He imagines individuals in this system would settle payments by exchanging their equity claims, thereby eliminating any incentives to run. In spite of the merits, the financial system in this world might prove problematic in less secure transaction environments, and many individuals would still choose to be unbanked. Unlike the proposals of Admati and

Figure 12. Cochrane's Proposal with Deposits and Equity



Source: John Cochrane, "Toward a Run-free Financial System," in Across the Great Divide, *ed. Martin Neil Baily and John B. Taylor (Stanford, CA, and Washington, DC: Hoover Institution Press and Brookings Institution, 2014), 197–249.*

Hellwig or Black,[53] this proposal would not only require rethinking financial intermediaries, but also the payments system, although innovations in financial technology may ultimately render this obstacle obsolete.

ADDITIONAL ISSUES CONCERNING IMPLEMENTATION

Additional issues arise if simpler, higher capital requirements like the proposals discussed here are applied at the bank holding company level. They include the treatment of off-balance-sheet items, whether to measure capital at book or market value, and whether capital requirements should vary by bank size or complexity.

Off-Balance-Sheet Items

Black[54] observes that while bank regulation imposes costs on banks, banks have every incentive to find ways to get around those regulations, and those that do will be more profitable than those that do not. Off-balance-sheet assets and liabilities may not ordinarily appear on a bank's balance sheet but would, under certain contingent events, be specified in the terms of the individual

transactions and thus have a chance to dramatically change a bank's balance sheet, for better or for worse. Off-balance-sheet items therefore create uncertainty about a bank's capital adequacy, whereas simpler, higher capital requirements are intended to reduce that uncertainty. Therefore, as Admati and Hellwig and Admati and others suggest,[55] simpler capital requirements would also mean giving off-balance-sheet items the same treatment as on-balance-sheet items.

Measuring Capital at Market or Book Value

A second issue concerns whether capital should be measured using book values or market values. Black[56] suggests that capital, whether debt or equity, should be measured at market value, since he imagines capital backing deposits rather than assets. In principle, bank stock and bond prices would reflect asset values, while the dollar-for-dollar funding constraint could induce bank staff to take less risk to eliminate the risk of not meeting the constraint.

In practice, in the United States, one difficulty arising from measuring capital at market value is that while holding company shares are traded, many banks' shares do not trade. This poses a challenge to the idea of using market values, since Kupiec[57] observes that 85 percent of all US banks are owned by holding companies. Moreover, Kupiec and Black and others[58] suggest that capital requirements of the bank subsidiary, rather than at the holding company level, make more sense for maintaining bank solvency.

In the current banking landscape dominated by the holding company, measuring capital at market value may not work. However, the fact that the holding company regulatory framework is becoming more onerous could eventually make the holding company an inefficient organizational form relative to a bank, especially since restrictions on branching and interstate banking have fallen.[59] A prerequisite for measuring capital at market value would entail having banks sell tradable bonds and shares of stock.

Bank-Size Adjustments

Finally, some debate has centered on whether larger or more complex banks should have higher capital requirements.[60] Focusing on size and complexity creates new reasons for banks to arbitrage around the regulation. For instance, with capital requirements differentiated according to whether a bank has

$250 billion in assets, banks may take otherwise unnecessary actions to avoid crossing the threshold. Similarly, the idea of applying different capital charges for more complex banks does not account for the fact that some banks may become complex to skirt the complex regulatory framework. In short, complex regulations breed complex banks. Therefore, no differentiation based on size or complexity seems necessary if all banks have higher capital requirements.

CONCLUSION

Discussions concerning the future of banking regulation tend to focus on whether the banking system should be regulated or deregulated, which detracts from the historical reality that the US market for banking services has always functioned within a highly regulated landscape. A more promising avenue for discussions concerning bank regulation may rest with comparing the costs and benefits of regulation. Bank capital adequacy regulations have relatively low enforcement costs and tie directly to bank solvency. To enable these regulations to serve their intended purpose, the key challenges are preventing capital adequacy regulations from being weakened by exemptions on assets through risk-weighting and ensuring that the definition of capital does not include sources of funding that cannot be used in a time of distress.

NOTES

1. Elliott, "Primer on Bank Capital."
2. Crouhy and Galai, "Economic Assessment of Capital Requirements."
3. Miller, "Do the M&M Propositions Apply to Banks?"
4. Cochrane, "Toward a Run-free Financial System."
5. Black, Miller, and Posner, "Approach to the Regulation of Bank Holding Companies."
6. Gornall and Strebulaev, "Financing as a Supply Chain."
7. Elliott, "Higher Bank Capital Requirements."
8. Miles, Yang, and Marcheggiano, "Optimal Bank Capital."
9. Hogan and Manish, "Banking Regulation and Knowledge Problems."
10. Cline, "Benefits and Costs."
11. Crouhy and Galai, "Economic Assessment of Capital Requirements."
12. Mengle, "Case for Interstate Banking."
13. Calomiris and Haber, *Fragile by Design*.

14. Bordo, Redish, and Rockoff, "Why Didn't Canada Have a Banking Crisis?"
15. Gorton, *Misunderstanding Financial Crises*.
16. Jalil, "New History of Banking Panics."
17. Mengle, "Case for Interstate Banking."
18. Walter, "3-6-3 Rule."
19. Adams and Gramlich, "Where Are All the New Banks?"
20. See Mengle, "Case for Interstate Banking"; Walter, "3-6-3 Rule"; Kroszner and Strahan, "What Drives Bank Deregulation?"; and Calomiris and Haber, *Fragile by Design*.
21. Pub. L. No. 103-328, 108 Stat. 2338 (1994).
22. Mengle, "Case for Interstate Banking"; and Walter, "3-6-3 Rule."
23. This is the argument made by Mengle, "Case for Interstate Banking," and by Walter, "3-6-3 Rule."
24. Ibid.
25. See Calomiris and Haber, *Fragile by Design*; Bordo, Redish, and Rockoff, "Why Didn't Canada Have a Banking Crisis?"
26. Bordo, Redish, and Rockoff, "Why Didn't Canada Have a Banking Crisis?"
27. Ibid.
28. Bank supervisors relied more on discretionary judgment than quantitative measures of capital adequacy. See FDIC, "Basel and the Evolution of Capital Regulation."
29. See International Lending Supervision Act of 1983, S. 695, 98th Cong. (1983); and Kapstein, *Governing the Global Economy*.
30. Kapstein, *Governing the Global Economy*.
31. Hogan and Manish, "Banking Regulation and Knowledge Problems."
32. See Basel Committee on Banking Supervision, "Amendment to the Capital Accord," for the original proposal, which took considerable time to finalize.
33. Hogan and Manish, "Banking Regulation and Knowledge Problems."
34. Erel, Nadauld, and Stulz, "Why Did Holdings?"
35. See 66 Fed. Reg. (November 29, 2001): 59614.
36. See Elliott, "Primer on Bank Capital"; Sundaresan and Wang, "Bank Liability Structure."
37. Miller, "Do the M&M Propositions Apply to Banks?"
38. Elliott, "Primer on Bank Capital."
39. Crouhy and Galai, "Economic Assessment of Capital Requirements."
40. Hogan and Manish, "Banking Regulation and Knowledge Problems."
41. Erel, Nadauld, and Stulz, "Why Did Holdings?"
42. Ibid.
43. Cordell, Huang, and Williams, "Collateral Damage."
44. Pub. L. 111-203; 124 Stat. 1376 (2010).
45. Admati and Hellwig, *Bankers' New Clothes*, 189.

46. Berger, Herring, and Szego, "Role of Capital in Financial Institutions."
47. Black, "Bank Funds Management."
48. Cochrane, "Toward a Run-free Financial System."
49. Miller, "Do the M&M Propositions Apply to Banks?"
50. Cochrane, "Toward a Run-free Financial System."
51. Black, Miller, and Posner, "Approach to the Regulation of Bank Holding Companies," 383.
52. Cochrane, "Toward a Run-free Financial System."
53. See Admati and Hellwig, *Bankers' New Clothes*; Black, "Bank Funds Management."
54. Black, "Bank Funds Management."
55. Admati and Hellwig, *Bankers' New Clothes*; and Admati, DeMarzo, Hellwig, and Pfleiderer, "Fallacies, Irrelevant Facts."
56. Black, "Bank Funds Management."
57. Kupiec, "Title II."
58. Black, Miller, and Posner, "Approach to the Regulation of Bank Holding Companies."
59. See Miller, "TLAC," for an elaboration on this point.
60. Banking politics aside, Black ("Bank Funds Management") suggests the opposite: requiring small banks the shares of which are not traded to have twice or three times as much capital as deposits, to reflect the difficulty of measuring market value.

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