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Despite improvements over the years, capital regulation failed to ensure stability of the financial system in the crisis that flared in the summer of 2007.

Seeking Stability: What's Next for Banking Regulation?

by Simona E. Cociuba

Rules on bank capital have been a key element of banking regulation for many years. The Basel Capital Accord of 1988, known as Basel I, established a common framework to measure capital and set minimum standards for international banks. One of the main goals was to ensure the soundness and stability of the international banking system.¹

Currently, many countries are adopting a revised framework, known as Basel II.² The new accord refines Basel I's crude measure of bank capital and adds rules on bank supervision and transparency.

Despite improvements over the years, capital regulation failed to ensure stability of the financial system in the crisis that flared in the summer of 2007. The billions of dollars of write-downs on assets related to subprime mortgages raised fears of insolvency and led to lending freezes and liquidity problems at

Calculating Capital Requirements

Capital has two components. Tier 1—or core capital—consists of equity capital, such as common stock, and disclosed reserves, such as those from retained earnings. Tier 2—or supplementary capital—includes elements like perpetual cumulative preferred shares and subordinated debt with maturity greater than five years. Under the Basel accords, total capital must be at least 8 percent of risk-weighted assets. Core capital must be at least half of that.¹

Under Basel I ...

In computing risk-weighted assets, the assets and off-balance-sheet activities of a bank are grouped into four categories that reflect the degree of credit risk—zero, 20, 50 or 100 percent. Cash or claims on central banks denominated in national currency are considered virtually risk free and given a weight of zero. Loans fully secured by a mortgage on residential property have a weight of 50 percent. All business loans are given a weight of 100 percent, even though risk varies greatly depending on the borrower.

Off-balance-sheet items are first converted into on-balance-sheet items using credit conversion factors and then receive an appropriate risk weight.

Under Basel II ...

An asset's credit risk is calculated using one of two approaches. The standardized approach bases risk weights on ratings by external agencies. The internal-ratings-based (IRB) approach has two versions, both of which use several parameters to measure risk weights. Main parameters include the probability of default, the loss given default, the exposure at default and the maturity of the asset.

Banks that operate under the "foundation" version of the IRB approach compute their own estimate for the probability of default, while the other three parameters are set by the Basel committee. Banks that operate under the "advanced" version estimate the four parameters according to their own internal models.

Basel II introduces a more refined measure of credit risk. For example, risk weights for residential mortgages under the IRB approach vary greatly (see table).

IRB Risk Weights for Residential Mortgages

Probability of default (percent)	Risk weight (percent)
.03	4.15
.25	21.30
.50	35.08
1.00	56.40
2.50	100.64
5.00	148.22
10.00	204.41
20.00	253.12

NOTE: The risk weights are computed for loss given default of 45 percent.

SOURCE: Basel Committee on Banking Supervision, June 2006.

¹ Under Basel II, banks may also employ a third tier of capital at the discretion of their national authority, consisting of short-term subordinated debt. For details, see "International Convergence of Capital Measurement and Capital Standards: A Revised Framework, Comprehensive Version," Basel Committee on Banking Supervision, Bank for International Settlements, Basel, Switzerland, June 2006.

many institutions.

Some banks heavily reliant on short-term funding, such as Britain's Northern Rock, experienced runs. Others found themselves with a need to replenish rapidly deteriorating capital positions. All in all, the recent events underscore the need for further revisions in banking regulation.

The Two Basel Accords

The regulation of bank capital aims to ensure bank solvency and reduce costs associated with bank defaults. Bank failures have systemic costs that lead to financial system disruptions and losses not fully borne by failing institutions. Forcing banks to hold adequate capital reduces these losses. Of course, there's a tradeoff: Very high levels of regulatory capital diminish bank lending. Thus, capital regulation's goal is to protect the system against default costs while promoting healthy bank lending.

In practice, calculations of minimum regulatory capital are based on the credit risk of bank assets. The guidelines formulated by the Basel Committee on Banking Supervision call for a bank to hold capital of at least 8 percent of the total value of assets adjusted for individual risk.

One of Basel I's shortcomings was that assets were grouped in very coarse risk categories, so banks' regulatory measure of risk could differ substantially from their actual risk. For example, all business loans received the same weight, despite large differences in risk among borrowers. As a result, the Basel committee revised the accord in June 2004. The major change, introduced by Basel II, was a more risk-sensitive measure of capital (see box, "Calculating Capital Requirements").

While Basel II improves on some aspects of Basel I, it still raises some of the same concerns.

First, the potential to mismeasure risk remains. The new rules for credit risk work well only insofar as the estimates produced by banks' internal



models accurately reflect underlying risks. Problems may appear, for example, in evaluating new assets for which little reliable historical data exist.

A second concern is that capital requirements exacerbate macroeconomic fluctuations. In a downturn, a bank's capital is likely to deteriorate due to loan losses. At the same time, the bank's nondefaulting borrowers are likely to be downgraded, forcing the bank to hold more capital against its now riskier loan portfolio. If the bank is unable to raise more equity—as is often the case in a downturn—it will have to limit lending, worsening already adverse economic conditions.

Third and most important, risk-based capital regulation may be inadequate for protecting the financial system. Capital requirements may promote stability of individual institutions. However, ensuring each bank's stability doesn't necessarily guarantee the stability of the system as a whole.

A simple example shows how prudent action by one financial institution may undermine another.³ Suppose Bank 1 borrows from Bank 2. Bank 2 has other loans on its books and suffers losses on them. Its capital reduced, Bank 2 decides to curtail its lending to Bank 1, even though Bank 1 is a creditworthy borrower.

Bank 2's reduction in lending represents a prudent move that strengthens its capital position. From Bank 1's point of view, however, Bank 2's action amounts to a withdrawal of lending. Bank 1 will need to find an alternative source of funding or reduce its asset holdings. If Bank 1 holds illiquid assets and doesn't obtain new lending, Bank 2's reduction in lending will feel like a run for Bank 1 (see box, "Capital Regulation: A System Perspective, page 4).

This example illustrates that routine links between institutions create risks that aren't addressed by capital regulations. In the current financial crisis, the fate of a British bank made this quite clear.

The Run on Northern Rock

U.K. mortgage lender Northern Rock, the first bank to fail in the current crisis, faced a run similar to that of Bank 1 in the example.⁴ As the short-term and interbank lending markets froze in mid-2007, Northern Rock ran into funding problems, even though it had virtually no subprime lending.

On July 25, 2007, Northern Rock published its interim report for the year. The chief executive acknowledged that annual profits would be affected by recent sharp increases in money market borrowing rates but concluded that "the medium term outlook for the Company is very positive." On Sept. 14, the Bank of England granted emergency liquidity support to Northern Rock. This was the first run on a U.K. bank since 1866. Northern Rock was taken into public ownership in February 2008.

What went wrong during those two months in 2007, and why did it lead to Northern Rock's fall?⁵ In short, troubles with U.S. subprime mortgages led to sharp increases in spreads on asset-backed securities that summer, causing a worldwide liquidity freeze in short-term markets.

Entities that had relied on these markets for funding, such as structured investment vehicles, ended up tapping their bank lines of credit. In turn, banks began to hoard liquidity due to uncertainty about future liquidity needs, causing a freeze in the wholesale markets. Northern Rock was vulnerable because it had relied heavily on wholesale funds.⁶

Northern Rock engaged primarily in residential lending in the U.K. From 1998 until June 2007, the bank expanded its balance sheet aggressively and became Britain's fifth-largest mortgage lender. Total assets increased from £17.4 billion to £113.5 billion. This growth was accompanied by a reduction in retail deposits from 60 percent of total liabilities to 21 percent.

By June 2007, most of Northern Rock's funding came from securitized notes, wholesale markets and other

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Capital Regulation: A System Perspective

The balance sheets provide simple illustrations of the assets and liabilities of two banks (*right*). Both banks need to comply with a capital-requirement ratio of 8 percent and a reserve-requirement ratio of 10 percent.

If reserves carry a risk weight of zero and all loans carry a risk weight of 1, both banks have risk-weighted assets equal to \$91. Their capital ratios are \$10/\$91, about 11 percent. Moreover, the banks hold \$1 of reserves for each \$10 of deposits, so the reserve ratio is met as well.

Bank 1

Assets		Liabilities	
Reserves	\$9	Deposit from Bank 2	\$30
Loans	\$91	Other deposits	\$60
		Equity	\$10
Total	\$100	Total	\$100

Bank 2

Assets		Liabilities	
Reserves	\$9	Deposits	\$90
Loan to Bank 1	\$30	Equity	\$10
Other loans	\$61		
Total	\$100	Total	\$100

Suppose that Bank 2 suffers a credit loss of \$2.50 on its loans to customers other than Bank 1. Bank 2's equity capital is reduced to \$7.50 and total assets now equal \$97.50. If the risk weight for all nondefaulted loans remains unchanged, Bank 2's capital ratio declines to \$7.50/\$88.50, about 8.5 percent.

To strengthen its capital position, Bank 2 decides to renew only three-fourths of the loan it made to Bank 1 and to hold excess reserves. The new balance sheet of Bank 2 shows that the capital ratio is 9.3 percent and the reserve ratio is 18.3 percent (*right*).

Bank 2 took a cautious action and strengthened its books. From the perspective of Bank 1, however, the reduction in Bank 2's lending is a withdrawal of funds.

Bank 1 has a problem: Its reserves are depleted, and it has to either find funding elsewhere or reduce its assets (*right*). If Bank 1's loans are illiquid—for example, residential mortgages—and the bank can't find alternative sources of funds, the withdrawal of funds will feel like a run.

Bank 1

Assets		Liabilities	
Reserves	\$1.5	Deposit from Bank 2	\$22.5
Loans	\$91.0	Other deposits	\$60.0
		Equity	\$10.0
Total	\$92.5	Total	\$92.5

Bank 2

Assets		Liabilities	
Reserves	\$16.5	Deposits	\$90.0
Loan to Bank 1	\$22.5	Equity	\$7.5
Other loans	\$58.5		
Total	\$97.5	Total	\$97.5

Suppose that the central bank comes to Bank 1's rescue by extending a loan of \$7.50. Bank 1's new balance sheet is shown at right.

Bank 1

Assets		Liabilities	
Reserves	\$9	Deposit from Bank 2	\$22.5
Loans	\$91	Other deposits	\$60.0
		Loan from central bank	\$7.5
		Equity	\$10.0
Total	\$100	Total	\$100



sources (*Chart 1*). Accounting rules dictated that the securitized notes appear on Northern Rock's balance sheet.⁷ Unlike the short-term asset-backed commercial paper at the heart of the subprime crisis in the U.S., these notes had relatively long maturities, averaging about three and a half years.⁸

The Northern Rock run started with a nonrenewal of its short- and medium-term wholesale borrowing. When the Bank of England announced it would rescue Northern Rock, retail customers started withdrawing deposits as well. Some queued at branches to demand their deposits, while others struggled to access the bank's website to withdraw funds.⁹

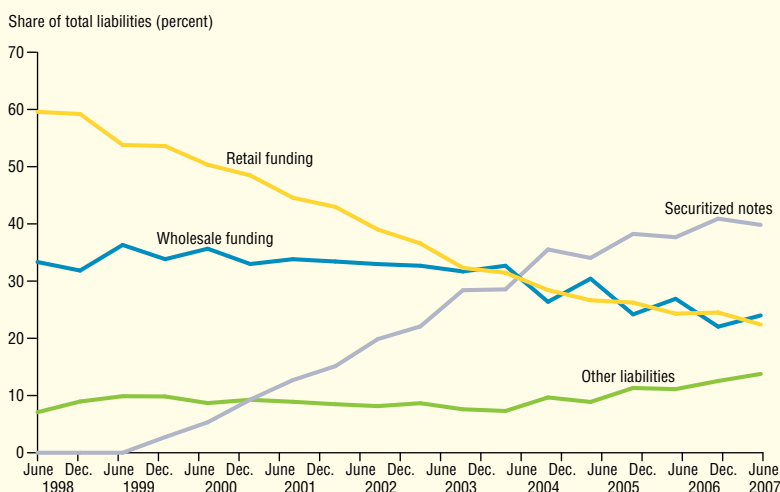
Snapshots of Northern Rock's liabilities before and after the run show one striking change—the loan from the Bank of England (*Chart 2*). The loan amounted to about a quarter of total liabilities in December 2007. Moreover, both wholesale and retail funding declined to less than half of what they were before the run.

In the first half of 2008, the composition of Northern Rock's liabilities saw little change. Retail deposits recovered a bit after the government guaranteed deposits, and the bank repaid part of the Bank of England loan.

Capital and Leverage at Northern Rock. On the eve of the crisis, Northern Rock was complying with its capital requirements. In fact, it had excess capital. On June 29, 2007, the mortgage lender received approval from its regulator, the Financial Services Authority, to switch to the Basel II advanced approach and calculate risk weights for its assets using the bank's internal models. This resulted in a 45 percent decline in total risk-weighted assets. According to the 2007 interim report, Northern Rock's risk weights for residential mortgages were reduced to the mid-teens.

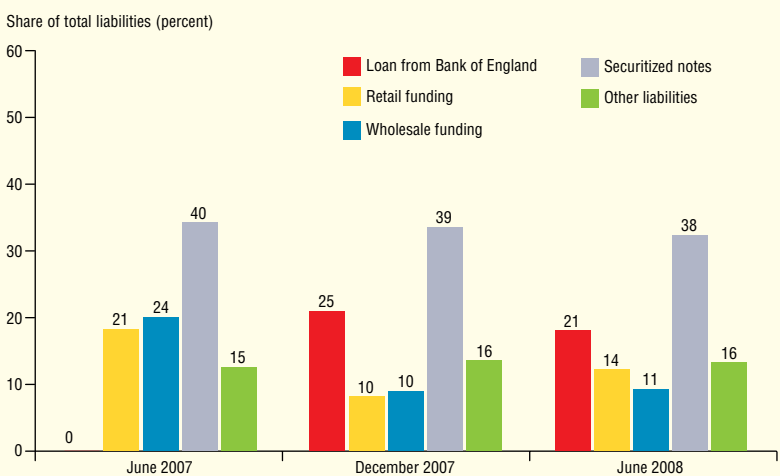
Northern Rock suddenly found itself with excess capital. In December 2006, the capital ratio was 11.6 percent under Basel I calculations, but it

Chart 1
Northern Rock Relied Increasingly on Nonretail Funding



NOTES: "Other liabilities" consists mostly of total equity and covered bonds. The slight rise in these liabilities after June 2004 comes from an increased issuance of covered bonds. These bonds were originally issued in the first half of 2004.
SOURCE: Northern Rock annual and interim reports, 1998–2007.

Chart 2
Wholesale Creditors and Retail Depositors Run on the Rock

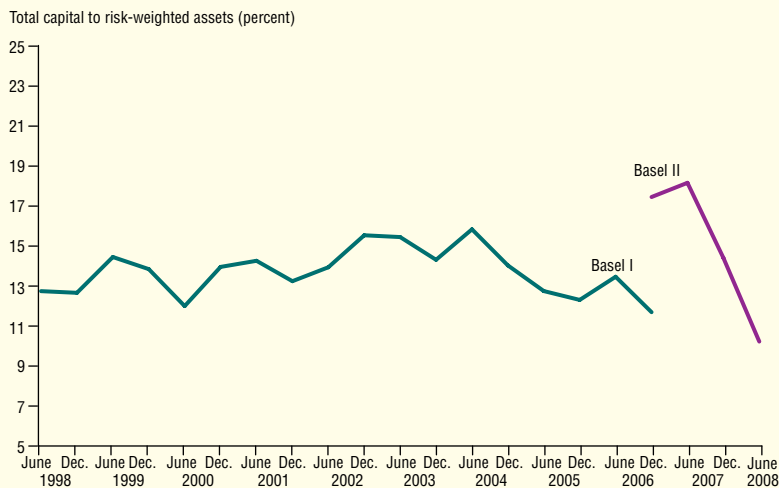


SOURCE: Northern Rock annual and interim reports, 2007–08.



Chart 3

Northern Rock's Capital Ratio Was Above the 8 Percent Regulatory Minimum



SOURCE: Northern Rock annual and interim reports, 1998–2008.

jumped to 17.5 percent under Basel II (*Chart 3*). By June 2007, the Basel II capital ratio had risen to 18.2 percent, well above the bank's regulatory and internal requirements.

Not foreseeing the storms on the horizon, Northern Rock announced a 30 percent increase in its interim dividend, scheduled to be paid in October 2007. However, losses incurred after June 2007 led to a deterioration of the bank's equity, and its capital ratio declined to a record low of 10.2 percent in mid-2008. The dividend was canceled.¹⁰

One problem with Northern Rock was its high leverage: It relied heavily on debt to finance its assets.

Leverage is procyclical—high in booms and low in downturns. In good times, investors are willing to lend more per dollar of bank equity, allowing banks to increase their leverage.

When economic and financial conditions turn sour, however, investors demand a larger equity cushion to protect themselves from losses. Banks find themselves needing to deleverage—that is, cut their debt. Some institutions adjust their balance sheets by raising new equity or selling assets to repay some debt. Northern Rock wasn't one of them.

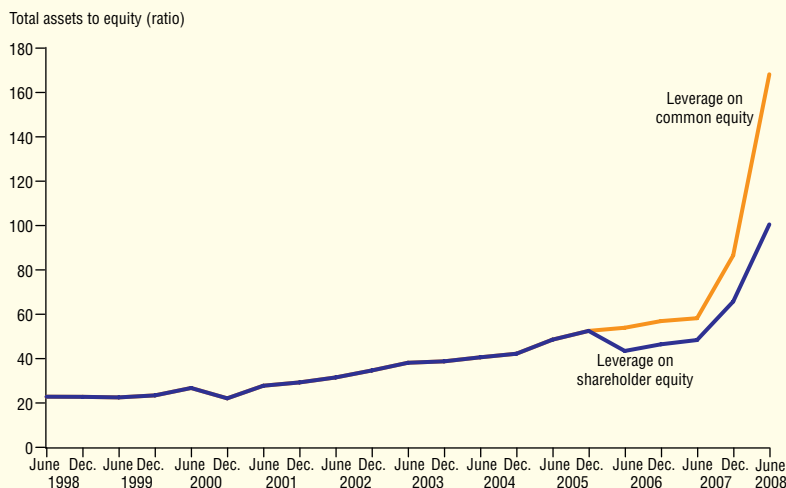
Leverage, the ratio of total assets to equity, can be calculated using alternative equity measures. Common equity is held by bank owners with voting power. Shareholder equity is common equity plus preferred shares. For Northern Rock, leverage on both common and shareholder equity were already high when they spiked after mid-2007 (*Chart 4*).

Financial experts favor common equity when computing banks' leverage.¹¹ By this measure, Northern Rock's leverage was 58.2 as of June 2007. It jumped to 86.5 by the end of the year in response to equity losses, and it was even higher in mid-2008. These figures are large by U.S. standards: Leverage of U.S. investment banks, for example, is around 25 or 30.¹²

Securitized notes are part of the

Chart 4

Leverage at Northern Rock Was Sky High



SOURCE: Northern Rock annual and interim reports, 1998–2008.



Northern Rock balance sheet, and this leads to higher measures of leverage. Even if the securitized notes were off the balance sheet, leverage on common equity would still have been high: about 35 in June 2007, 52 at the end of that year and about 100 in June 2008. The high leverage made Northern Rock vulnerable to reductions in funding—an unsettling position for a bank that complied with its capital requirements.

Strengthening Bank Regulation

The run on Northern Rock raises important questions about how to revise banking regulation. As it stands, the international standard embodied in Basel II has a few shortcomings. Among them is that capital regulation exacerbates economic downturns because banks choose to curtail lending when capital is scarce.¹³

Ideally, bank regulation seeks to balance two opposing objectives: reducing the cost of bank defaults and ensuring efficient lending. As a result, in a downturn, when banks are capital-constrained, it is desirable to adjust both. However, Basel standards require that the probability of bank defaults be fixed over time. When economic conditions turn sour, lending bears the brunt.

A proposed solution involves allowing slightly higher bank default probabilities in a downturn. This would mean that as the risk of an asset goes up, the capital the bank is required to hold against that asset won't rise as sharply as it does now.¹⁴

Recent events show that risk-based capital measures may be inadequate for promoting stability of the financial system. Proposals to mitigate this problem include complementing the rules on bank capital with rules on liquidity and leverage.¹⁵ The rationale for liquidity regulations is that banks with more liquid assets or stable, illiquid liabilities are less vulnerable in the face of a run. A leverage constraint would limit the amount of debt a bank can take on during booms and thus

reduce the need to deleverage in bad times.¹⁶

Under a different regulatory scheme, Northern Rock might not have experienced the run that led to its collapse. If future regulations limit spillover effects among banks, they could reduce the chances for financial crises and the resulting damage to economies.

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Notes

¹ For details, see "International Convergence of Capital Measurement and Capital Standards," Basel Committee on Banking Supervision, Bank for International Settlements, Basel, Switzerland, July 1988.

² The Basel accords are formulated by the Basel committee. As of March 2009, the committee's members are officials from 20 countries: Australia, Belgium, Brazil, Canada, China, France, Germany, India, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, Russia, Spain, Sweden, Switzerland, the U.K. and the U.S. However, other countries are voluntarily adopting similar rules. According to a 2008 survey by the Financial Stability Institute, about 105 countries (including 92 nonmember countries) had implemented or were planning to implement Basel II.

³ This example is discussed in "Financial Regulation in a System Context," by Stephen Morris and Hyun Song Shin, *Brookings Papers on Economic Activity*, no. 2, Fall 2008, pp. 229–74. For a detailed analysis of bank loss spillovers to the financial system via interbank linkages, see "Financial Contagion," by Franklin Allen and Douglas Gale, *Journal of Political Economy*, vol. 108, no. 1, 2000, pp. 1–33.

⁴ For a discussion of Lehman Brothers and Bear Stearns, see note 3, Morris and Shin.

⁵ This section draws on "Reflections on Northern Rock: The Bank Run that Heralded the Global Financial Crisis," by Hyun Song Shin, *Journal of Economic Perspectives*, vol. 23, no. 1, 2009, pp. 101–19. Also see note 3, Morris and Shin. For analysis of the impact of the Northern Rock experience on the U.K. banking system, see "Liquidity, Bank Runs and Bailouts: Spillover Effects During

If future regulations limit spillover effects among banks, they could reduce the chances for financial crises and the resulting damage to economies.

the Northern Rock Episode,” by Tanju Yorulmaz, Federal Reserve Bank of New York Working Paper, Feb. 1, 2009. The paper is available for download at <http://ssrn.com/abstract=1107570>.

⁶ Wholesale funds are obtained from nonfinancial corporations, money market mutual funds, foreign entities and other financial institutions. Typically, the funds are raised on a short-term basis through instruments such as certificates of deposit, commercial paper, repurchase agreements and federal funds. The “Financial Stability Report,” published in April 2007 by the Bank of England, highlights dangers of heavily relying on wholesale funding. Northern Rock was aware of these warnings and took some steps to change its lending and funding strategies. For details, see “The Run on the Rock,” House of Commons Treasury Committee, Fifth Report of Session 2007–08, vol. 1, January 2008, pp. 14–5. For more on wholesale funding, refer to “The Dark Side of Bank Wholesale Funding,” by Rocco Huang and Lev Ratnovski, Federal Reserve Bank of Philadelphia, Working Paper no. 3, 2009.

⁷ Northern Rock operates under the International Accounting Standards Board’s *International Financial Reporting Standards* (IFRS). The standards require that securitized vehicles be part of a bank’s consolidated balance sheet (for more on the consolidation of special-purpose entities, for example, see IFRS 2006, pp. 2227–34). For a detailed discussion of the securitization process and how it differs in the U.S., see note 5, Shin.

⁸ See note 6, House of Commons Treasury Committee, p. 13.

⁹ As of June 30, 2007, 23 percent of total retail deposits were traditional branch accounts. Postal accounts, Internet accounts and telephone accounts were about 60 percent of total retail deposits, and offshore accounts were about 16 percent. Withdrawals on postal accounts accounted for about 40 percent of the decline in retail deposits observed between June and December 2007. Withdrawals on Internet, offshore and branch accounts each accounted for about 19 percent of the decline.

¹⁰ See Northern Rock’s 2007 annual report, p. 36. The annual and interim reports can be downloaded from <http://companyinfo.northernrock.co.uk/investorRelations/results/>.

¹¹ Common equity grants control over the bank’s operation and thus assures the lender that its investments are protected from loss. For a formal analysis, see note 3, Morris and Shin, and note 5, Shin.

¹² For a plot of average leverage of U.S. investment banks since 1992, see Figure 3.10 in “Liquidity and Leverage,” by Tobias Adrian and Hyun Song Shin, Federal Reserve Bank of New York Staff Reports, no. 328, May 2008.

¹³ To mitigate this problem, Spain in 2000 introduced a regulation called dynamic provisioning, which forces banks to increase their capital in booms to be able to draw on these reserves in downturns, when the need for capital is larger.

¹⁴ For more detail on this subject, see “Cyclical Implications of the Basel II Capital Standards,” by Anil K. Kashyap and Jeremy C. Stein, Federal Reserve Bank of Chicago *Economic Perspectives*, vol. 28, 2004, pp. 18–31, and “Procyclicality in Basel II: Can We Treat the Disease Without Killing the Patient?” by Michael B. Gordy and Bradley Howells, *Journal of Financial Intermediation*, vol. 15, 2006, pp. 395–417.

¹⁵ The U.S. already has in effect a leverage ratio constraint. In 1991, Congress enacted the Federal Deposit Insurance Corporation Improvement Act, known as FDICIA, which requires that banks have equity capital of at least 2 percent of total assets. For details on FDICIA, see “Reforming Deposit Insurance and FDICIA,” by Robert A. Eisenbeis and Larry D. Wall, Federal Reserve Bank of Atlanta *Economic Review*, vol. 87, no. 1, 2002.

The idea of a leverage ratio constraint also gained support recently in Switzerland. For details, see “Is Basel II Enough? The Benefits of a Leverage Ratio” (Speech by Philipp M. Hildebrand of Swiss National Bank at the Financial Markets Group Lecture, London School of Economics, London, Dec. 15, 2008).

¹⁶ For more detail on liquidity and leverage constraints, see note 3, Morris and Shin.

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