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## Assessing Basel II as a Regulatory Model

The objective and outcome of the Basel II exercise was to produce the rules by which minimum capital requirements would be set under domestic bank regulatory policy in each Basel Committee country. This chapter assesses the effectiveness and efficiency of these rules as a model for domestic capital regulation. The focus is on the advanced internal ratings-based (A-IRB) approach, the fundamental innovation of Basel II that breaks with the Basel I method for setting capital requirements and that will be adopted by most large multinational banks. The chapter first examines the degree to which Basel II can be expected to lead to the improvements in capital regulation touted by its proponents: greater risk sensitivity of minimum capital requirements, the generation of a common “language” to assist supervisors and market actors in their evaluation of banks, and enhanced risk management in A-IRB banks. Next, two possible negative effects are considered—an amplification of the procyclicality inherent in all capital regulation and the distortion of competition between A-IRB banks and non-A-IRB banks.

The picture that emerges from this examination is at best a mixed one. There are good reasons to doubt the benefits of Basel II as a domestic regulatory model. The grounds for these doubts arise even at the conceptual level; they are considerably stronger when one takes into account the administrative and institutional factors that will shape the A-IRB approach in practice. Of course, the utter absence of experience with an A-IRB approach lends a speculative character to all arguments about its merits. Indeed, the various transition safeguards are justified by fears that the leap of faith by regulators in adopting A-IRB could take them over a cliff. Still, the analysis in this chapter—standing alone—cannot provide a final

answer on the policy desirability of Basel II, even though it should engender considerable skepticism over the viability of this regulatory model. Two additional steps will be needed to complete this evaluation.

First, an assessment of the international impact of Basel II is required. Even though this arrangement may not produce optimal prudential regulation in all countries or even in any one country, it may improve the safety and soundness of domestic banking systems by creating a more stable international banking system. Consideration of this possible trade-off will come in chapter 6, which examines the merits of Basel II as a specifically international arrangement. However, at this juncture we can note that the further a regulatory model strays from the optimal, the more offsetting international benefits would be required to make that arrangement a desirable one.

Second, regulatory models obviously cannot be judged in isolation. The ultimate question pertaining to any model will always be “compared to what?” While this chapter does, to some degree, use the existing Basel I model as a baseline for judging the A-IRB approach, a direct comparison of the merits of Basel I, Basel II, and other possible alternatives is left to chapter 7.

A related point is that a proponent of an IRB approach might respond to some of the criticisms of Basel II made in this chapter by asserting that the problems lie not in the concept of an IRB capital regulation model but in its specific embodiment in Basel II. Such a proponent might suggest improvements to remedy the particular infirmities of the Basel II version.<sup>1</sup> Since the merits of an IRB approach are of considerable importance, the analysis in this chapter straddles somewhat the broader concept and the particular Basel II version.<sup>2</sup> Ultimately, though, an assessment of the Basel II process must focus on the substance of the revised framework. So, for example, the argument that the Basel Committee might eventually embrace a full model approach cannot offset criticisms of the revised framework, which is intended to be the basis for capital regulation indefinitely. The very reason for the hybrid methodology is that the Basel Committee believes itself unable, on the basis of current knowledge and practice, to fashion and adopt a full model approach. There is neither a timetable for

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1. Indeed, Basel II itself has been something of a moving target. The lengthy proposal was substantially overhauled several times during the nearly six years of negotiation. Even since the revised framework was issued in June 2004, the Basel Committee has continued to issue supplemental guidance on its implementation. Some Basel Committee participants have even suggested that Basel II might prove to be a transitional regulatory standard and that qualifying banks will eventually be permitted to use a so-called full model approach to calculating risk-weighted assets.

2. Although this chapter implicitly considers the appropriateness of an A-IRB approach as a model for US banking regulation, much of the analysis would be relevant to its application in any Basel Committee country.

reaching this endpoint nor a well-articulated statement of what the endpoint would look like.

Additionally, it should be noted that *any* process for generating and implementing a regulatory model—whether purely domestic or international—will be shaped by a particular array of political and institutional interests. For example, as suggested in the preceding chapter, the dynamic of the Basel II process may have been such as to place downward pressure on the stringency of the A-IRB rules. Thus, while a proponent of an IRB approach might legitimately claim that a different set of choices could have yielded a better regulatory model, it seems unlikely that any idealized version would ever be implemented. Moreover, of course, Basel II is the only actual case of an IRB approach we have to consider.

Before turning to this analysis, though, it is necessary to ask the preliminary question whether, or at least how much, capital requirements matter.

## Do Regulatory Capital Requirements Matter?

The pillar 1 rules explicitly set requirements for *minimum* capital levels. Suppose that other domestic bank regulations or market forces require higher levels of capital than would be mandated by Basel II alone? In this eventuality, the practical impact of the new arrangement will be limited, whatever the intentions of the Basel Committee and the peculiarities of the A-IRB approach. The possibility that market forces will constrain capital reductions under Basel II was suggested by comments filed on the third consultative paper (CP-3) by Standard & Poor's (2003). Surveying the results of the third quantitative impact study (QIS-3), S&P expressed skepticism concerning the accuracy of the probability of default ratings by the participating banks, which the rating agency suspected of being generally too favorable. Further, S&P questioned some important premises behind the CP-3 formulas, such as the assumption that higher-risk corporate borrowers are less correlated to systemic factors affecting an entire loan portfolio. Of course, in light of subsequent changes, the specifics of the CP-3 formulas are no longer directly relevant. What is interesting for present purposes is S&P's comment that "banks that substantially reduce their capital on the basis of the accord, as a result of metrics with which Standard & Poor's does not agree, could be downgraded." To the extent that S&P, as an external rating agency, can be regarded as a surrogate for bank investors and counterparties, these comments could have significant implications for the practical effects of Basel II. If market actors demand higher levels of capital than are required by Basel II, then the impact of the new arrangement will be more limited than its terms might suggest.

Do market demands lead banks to hold capital well in excess of minimum regulatory requirements? Experience under Basel I clearly reveals that banks in Basel Committee countries have generally maintained risk-

weighted capital levels significantly above the 8 percent minimum. Since maintaining higher capital levels imposes costs on banks, this is a phenomenon in need of explanation. The two reasons most frequently suggested are market demands and self-imposition of a buffer to assure regulatory compliance in the face of unexpected strains on assets.

The evidence that banks, including the very largest banks, hold capital well above the regulatory minimum is very strong. Using Bankscope data, Peura and Jokivuolle (2004) examined the capital levels of 128 large banks (defined as holding tier 1 capital in excess of 3 billion euros) from G-10 countries during 1997–2001. They found that the median risk-weighted capital ratio for all 128 banks was 11.2 percent during this five-year period, with regional averages ranging from 11.9 percent for US banks to 10.8 percent for European banks (Peura and Jokivuolle 2004).<sup>3</sup> Generally speaking, the largest banks—those most likely to use the A-IRB approach—hold lower amounts of capital than regional or community banks. Yet risk-based capital levels of even the 10 largest US banks have, for the last decade, nearly always been above not only the Basel I 8 percent requirement but also the US regulatory requirement of 10 percent for banks to be “well capitalized” and thus permitted to affiliate with a broad range of nonbank financial institutions.<sup>4</sup> In fact, in any given year, most of the 10 largest banks have had risk-weighted capital levels above 11 percent (appendix table 5A.1).

As suggested by the S&P comments, one possible explanation for banks holding capital in amounts 30 percent or more above regulatory minimums is that markets demand these levels. More precisely, economic capital requirements may exceed regulatory capital requirements for most banks most of the time, in the sense that a bank’s maximum return can be realized only with higher capital levels. Counterparties and debt investors may demand very high external credit ratings that, in turn, are bestowed by credit rating agencies such as S&P only on banks with much higher capital levels than the regulatory minimum.<sup>5</sup> For counterparties in

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3. The limitations of reported data are also apparent from the Peura and Jokivuolle data, which report that the median capital level of large Japanese banks over 1997–2001 was 10.9 percent. This rather healthy ratio does not accord with the contemporaneous, well-known travails of the Japanese banking system. The 10.9 percent figure, based in significant part on the information reported by banks themselves, likely reflects a combination of overvalued assets on bank balance sheets and an overly generous calculation of qualifying capital.

4. The Gramm-Leach-Bliley Act of 1999 permitted banks to affiliate with a broader range of nonbanking financial companies—such as those underwriting insurance—and removed restrictions on other affiliates of banks, such as securities underwriters. In order to take advantage of the new rules, however, the banks must be “well capitalized.” The authors of some recent economic studies seem unaware that the 10 percent level is now meaningful under US law.

5. It is also possible that investors or counterparties will make their own assessment of a bank’s capital position, though the time and expense involved make this unlikely in most cases, even where the other party would have adequate access to relevant information on the bank’s assets.

certain transactions, such as swaps, these demands may be absolute, in the sense that they will simply not deal with banks that do not have the highest credit rating. For investors, these demands may be a manifestation of the usual risk/reward trade-off, whereby they are willing to receive a lower interest rate on their lending to a bank with larger amounts of capital. If this explanation is valid,<sup>6</sup> a reduction in regulatory capital minimums under Basel II could have little effect on actual capital levels, since large banks might conclude that the higher cost of their own borrowings, or the unwillingness of some counterparties to deal with them, might not be worth the extra lending flexibility provided by reduced capital requirements.

Another explanation for the pervasiveness of capital ratios substantially above regulatory minimums is that, in setting their capital levels, banks plan for the downside of business cycles and other negative contingencies. An economic or business shock that quickly depressed the value of a bank's assets (e.g., through above-average loan write-offs during a recession) could lead to a costly breach of regulatory requirements. As explained below, the consequences of falling below regulatory capital minimums can be quite serious. During an economic downturn, provisions for nonperforming loans and capital write-offs for defaulted loans may increase fairly quickly. Since capital may be difficult to increase in the short term, banks may be compelled to sell off assets with high risk weights in order to reduce the bank's total risk-weighted assets.<sup>7</sup> Lacking the originating bank's experience with the borrowers, potential purchasers of the loans may worry that the loans being sold are lemons. Banks would then be forced to sustain significant losses on these asset sales.

A good bit of theoretical research demonstrates the cost effectiveness of banks holding capital buffers above regulatory minimums to avoid forced dispositions of valued assets at distress prices.<sup>8</sup> The optimal size of this buffer is determined by factors such as the cost of recapitalization, the volatility of bank revenues, and the sanctions for noncompliance. Although the theoretical research has not been accompanied by what seems the logical adjunct of simply asking bank executives why they maintain the capital levels they do, there is some empirical support to complement the theoretical and commonsense foundations for this proposition. Milne (2002) points out that small banks that do not borrow on public markets also maintain

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6. The UK Financial Services Authority has observed that capital practices by British banks are consistent with the market demand hypothesis (Richardson and Stephenson 2000).

7. For example, under Basel I rules, by selling off 100 percent risk-weighted loans and holding the receipts from those sales in US government securities, which are zero risk-weighted, the bank will reduce its capital requirements by 8 percent of the book value of the assets sold.

8. See, for example, Estrella (2001), Furfine (1999), Milne and Whalley (2001), Barrios and Blanco (2003), and Perua and Jokivuolle (2004).

higher capital levels than required by law.<sup>9</sup> A study responding to Milne counters that banks with capital ratios above the minimum but with external credit ratings below a certain level (presumably based in part on the fact that capital is not *enough* above minimum) have only small holdings of swap liabilities compared with the average for banks of a similar size (Jackson, Perraudin, and Saporta 2002). The authors infer that market access for these banks is limited. They also admit that it is difficult to distinguish the regulatory buffer and market discipline explanations empirically.<sup>10</sup>

It may be that both explanations are right. Purchasers of publicly traded debt, swap counterparties, and external rating agencies may well insist that a bank have capital ratios significantly higher than regulatory minimum levels, but not because they have some absolute level of capital in mind. Instead, they may simply want to see ratios well above the minimum or, perhaps, average levels, whatever those levels might be.<sup>11</sup> This explanation is somewhat undermined, though maybe not completely, by the S&P's comments, which set forth a principle for determining the requisite capital cushion—namely, that capital be sufficient to permit the continued operation of the bank, not just to satisfy all obligations should the bank be liquidated.

National banking laws or supervision may also impose capital requirements that set minimum levels above those determined under the A-IRB approach. US banking authorities require that a bank have tier 1 capital of at least 6 percent of risk-weighted assets and total capital of at least 10 percent of risk-weighted assets in order to be classified as “well capitalized.” Significant bank activities, including the ability to affiliate with certain non-banking financial institutions such as insurance underwriters and merchant bankers, are contingent upon the bank being well capitalized. British banking authorities set target capital ratios for banks on an individual basis

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9. One effort to compare the results of some of the theoretical models with actual bank capital ratios suggests that bank capital ratios are higher than recapitalization costs would suggest they should be (Peura and Keppo 2006). Thus the phenomenon of high bank capital ratios under Basel I continues to elude a fully satisfactory explanation.

10. Ashcraft (2001) makes a provisional, but potentially weighty, empirical claim that the increase in bank capital ratios was not attributable to regulatory requirements. He finds that banks with low capital ratios tended to mean-revert before any changes in policy. The paper is, however, based on a limited sample and time frame.

11. In launching the Basel II process, William McDonough suggested something along these lines: “Banks also maintain high capital levels because the marketplace has learned the same lessons and demands those levels. But I don’t think the framers of the accord realized the powerful influence their thinking would have on the techniques used by market analysts and rating agencies to evaluate bank financial condition. Their analyses often build on the Basel capital standard and its risk-weighting scheme and their expectations are generally that banks’ actual capital ratios will exceed the Basel minimums.” See William McDonough, “Issues for the Basel Accord,” remarks at the Conference on Credit Risk Modeling and Regulatory Implications, London, September 22, 1998.

that are well above the regulatory minimum, and trigger ratios that are closer to, but still above, the Basel I minimum.<sup>12</sup> Both forms of national regulation help account for the higher capital ratios noted earlier, since the effective minimum regulatory level for “well-capitalized” US banks and most British banks will be above 8 percent. Pillar 2 of the revised framework establishes for all Basel Committee members the “principle” that supervisors “should expect banks to operate above the minimum regulatory capital ratios and should have the ability to require banks to hold capital in excess of the minimum” (Basel Committee 2006g, paragraph 757).

The US and UK regulatory policies should both lead to regulatory capital levels higher than the A-IRB approach minimum. Although the pillar 2 principle of an expectation of operation above minimum levels lacks specificity and a clear sense of obligation, it would by definition produce capital levels at about the A-IRB minimum were it to be faithfully implemented. However, each of these three policies contemplates that the additional increment of regulatory capital be added to a benchmark defined by the prevailing requirement for a risk-weighted capital ratio. Presumably, then, the amount of capital required under US and UK practice will decline in an amount roughly proportional to any decline in minimum capital requirement from Basel I to Basel II.

A more significant constraint on the effective decline in capital under Basel II formulas is found in another feature of US bank regulation. During the Basel II negotiations, the Federal Deposit Insurance Corporation (FDIC), which is responsible for overseeing federal capital requirements in state banks that are not members of the Federal Reserve System and has a broader interest in capital requirements because it insures all banks, released a study suggesting that Basel II was on a collision course with other elements of US law (FDIC 2003). Specifically, US law requires “prompt corrective action” whenever the capital of a bank falls below certain levels (12 USC. §1831o). Two distinct capital adequacy requirements must be met. First, risk-weighted capital must exceed certain specified levels (12 USC. §1831o(c) (2)). Second, the bank’s simple *leverage ratio*—that is to say, qualifying tier I capital divided by total, nonweighted assets—must exceed certain specified levels (12 USC. §1831o(c) (1)).

Generally, this ratio must be at least 4 percent, though it must be at least 5 percent to meet the “well capitalized” requirement for banks owned by financial holding companies, a category that includes all of the top 20 US banks. The rationale for a separate simple leverage ratio requirement is that it is less subject to manipulation or mistake in the risk-weighting process, precisely because it is not adjusted based on estimates

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12. As the terms imply, the “target” ratio is that which the UK Financial Services Authority believes the bank should aim for, and the “trigger” ratio is that whose breach will elicit a supervisory response of some sort. The latter is roughly analogous to the capital thresholds under US prompt corrective action rules.

of asset riskiness. Basel II does not include a simple leverage ratio requirement, and most countries do not impose one on their banks. The FDIC study anticipated, based on QIS-3 results, that the capital required by the A-IRB, risk-weighted approach could fall well below that which is required by the simple leverage ratio.

Following publication of the revised framework and analysis of the fourth quantitative impact study (QIS-4) results, the FDIC updated its study in an appendix to Chairman Donald Powell's November 2005 testimony. The FDIC used the QIS-4 results to calculate the risk-weighted capital levels that the 26 participating US banks would need to maintain in order to be "well capitalized" under the 6 percent tier 1 ratio requirement once A-IRB was in effect. Then it calculated the leverage ratio requirements for those same banks. It found that, with the levels of capital required under the A-IRB approach, 17 of the 26 banks would be undercapitalized to varying degrees on a leverage-ratio basis. Three of the banks would be "critically undercapitalized," a classification under US law that creates a presumption that the bank should be placed into receivership.<sup>13</sup>

The degree to which the leverage ratio is binding as a practical matter can be illustrated by examining the positions of the 10 largest US banks at the end of 2003, toward the end of the Basel II negotiations (table 5.1). The leverage ratios for all 10 were, as required, above the 5 percent minimum for the bank to be "well capitalized." Most banks have ratios well above that level. However, two banks were sufficiently close to the minimum to face a potentially binding effect, either from the literal application of the regulatory requirement or from market demands derivative from that requirement. Consider, for example, the position of JPMorgan Chase. With consolidated assets of \$628.6 billion, the bank needed at least \$31.4 billion in qualifying tier 1 capital to satisfy the 5 percent leverage ratio. At year-end 2003, JPMorgan Chase had \$34.9 billion in qualifying tier 1 capital, yielding the leverage ratio of 5.57 percent indicated in table 5.1. Thus there was a \$3.5 billion buffer. That \$3.5 billion is the maximum by which JPMorgan Chase could reduce its capital, no matter how advantageous Basel II turned out to be for its risk-weighted ratio requirement. Accordingly, with the then-prevailing (Basel I) risk-based capital requirement of \$34.7 billion (8 percent of the \$434.2 billion in risk-weighted assets), there is an effective limit of about a 10 percent reduction in the required risk-based capital ratio (3.5/34.7).

Of course, the existing buffer over the 5 percent leverage ratio requirement may itself be necessary for either or both the reasons discussed earlier. Debt investors and counterparties may demand that the bank maintain this higher-than-minimum level. The bank itself may hesitate to

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13. See appendix B to Donald Powell's prepared testimony on the "Development of the New Basel Capital Accords" before the Committee on Banking, Housing, and Urban Affairs, US Senate, November 10, 2005.

**Table 5.1 Capital ratios for 10 largest US banks as of December 31, 2003**

| <b>Bank</b>     | <b>Consolidated<br/>assets</b><br>(billions of<br>dollars) | <b>Leverage<br/>ratio</b><br>(percent) | <b>Risk-<br/>weighted<br/>assets<br/>(RWA)</b><br>(billions of<br>dollars) | <b>Tier 1<br/>RWA<br/>ratio</b><br>(percent) | <b>Total<br/>RWA<br/>ratio</b><br>(percent) |
|-----------------|--|--|--|--|---|
| JPMorgan Chase  | 628.6  | 5.57                                   | 434.2  | 8.05   | 10.43                                       |
| Bank of America | 617.9  | 6.88                                   | 481.2  | 8.73   | 11.31                                       |
| Citibank        | 528.1  | 6.57                                   | 427.2  | 8.40   | 12.56                                       |
| Wachovia        | 353.5  | 5.85                                   | 258.5  | 7.60   | 11.72                                       |
| Bank One        | 256.8  | 7.97                                   | 166.2  | 10.13  | 13.71                                       |
| Wells Fargo     | 250.5  | 6.24                                   | 202.3  | 7.57   | 11.24                                       |
| Fleet           | 192.3  | 8.30                                   | 178.5  | 8.49   | 11.30                                       |
| US Bank         | 189.1  | 6.31                                   | 156.6  | 6.60   | 10.84                                       |
| Suntrust        | 124.4  | 7.35                                   | 112.2  | 7.92   | 10.85                                       |
| HSBC Bank       | 92.9   | 6.22                                   | 62.0   | 8.99   | 11.82                                       |

Note: The figures for consolidated assets are subject to minor adjustments before calculation of leverage ratio.

Source: Call reports filed with Federal Financial Institutions Examination Council, Schedule RC-R.

reduce capital any further because it could lose its buffer against unexpected reversals that could otherwise take its capital below minimum regulatory levels and thereby force sales of desirable assets or trigger negative supervisory consequences.<sup>14</sup> Thus, assuming the leverage ratio requirement is retained in its present form, a bank in a position similar to that of JPMorgan Chase in 2003 may have even less room to reduce capital.

In short, whether directly or indirectly, the leverage ratio places a floor under the capital requirements for US banks no matter how much the A-IRB formula might permit risk-weighted capital ratios to decline. Although US banking agencies do have administrative discretion to reduce the simple leverage ratio requirements, at least down to the 2 percent statutory minimum, this is not the current stated intention of the federal supervisors. In their 2003 advance notice of proposed rule making, the agencies indicated they would retain the leverage ratio and prompt corrective action system in its present form. Significantly, they further “recognized that in some cases, under the proposed framework, the leverage ratio

14. At the least, these consequences would include increased scrutiny by the bank’s federal banking supervisor. Failure to expeditiously raise capital levels above the “well capitalized” threshold could, in theory, result in removal of a holding company’s status as a “financial holding company” and thus require divestiture of any nonbanking affiliates engaged in insurance underwriting, some forms of securities underwriting, merchant banking, and certain other activities.

would serve as the most binding regulatory capital constraint” (US Department of the Treasury Office of the Comptroller of the Currency et al. 2003, 45902). In their 2007 final rule implementing Basel II, the agencies confirmed that the current leverage and prompt corrective action requirements would remain in effect (US Department of the Treasury Office of the Comptroller of the Currency et al. 2006a, 55839).

Despite the apparent unanimity among the regulatory agencies, retention of the leverage ratio has been far from an uncontested position. The argument against it is that the bluntness of the leverage ratio is inconsistent with the risk-sensitive IRB approach. Susan Bies, then the Federal Reserve Board governor with principal responsibility for Basel II matters, stated publicly in March 2005 that “the leverage ratio down the road has got to disappear.”<sup>15</sup> Her remark set off a minor maelstrom in bank regulatory circles, and Bies publicly backed off this position, joining the other regulatory agencies in endorsing retention of the leverage ratio at subsequent congressional hearings. Large US banks unsuccessfully targeted the leverage ratio (and the other safeguards against declining capital levels) for removal from the proposed agency rule implementing Basel II before it became final.<sup>16</sup>

Indeed, the attitude of large banks is a good source of evidence about the likely impact of Basel II. Since the emphasis of the Basel II process began to shift toward IRB approaches, many banks worried that the final product would impose enormous compliance costs in the form of required changes to credit risk models and risk management practices. While the results of QIS-3 may have cheered those banks for which significant declines in capital requirements were predicted, they must only have increased concern at the less fortunate banks whose capital requirements were predicted to stay roughly the same, much less at those banks whose capital charges would rise materially. There were, for example, reports that Deutsche Bank’s required capital would increase by 20 percent.

As detailed in chapter 4, the direction of changes between release of QIS-3 and publication of the revised framework was largely toward reducing the capital charges yielded by the Basel II formulas. Many of these changes were in response to comments and complaints from banks and those who represent banking interests. The result has been a palpable shift in the prevailing attitude among banks. While recent attention to the potential for large declines in bank capital has apparently dissuaded banks from publicly celebrating anticipated capital declines, they were not so cautious earlier in the Basel II process. Citibank, for example, pub-

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15. See Michele Heller and Todd Davenport, “Congressional Pressure for Consensus on Basel II,” *American Banker*, March 15, 2005, 4.

16. See Steven Sloan, “Four Big Banks Detail Basel Objections,” *American Banker*, September 26, 2006, 1.

licly stated that its capital requirements would decline by \$5 billion under Basel II, a figure that would translate into a decline in minimum capital of approximately 15 percent,<sup>17</sup> coincidentally a percentage decline identical to that projected by QIS-4 for aggregate capital for US banks.<sup>18</sup>

The dynamic of the Basel II negotiating process described in chapter 4 made it likely that most large banks would welcome the final product. That indeed seems to be the case. Following publication of the revised framework, efforts of large US banks shifted to resisting the various safeguards proposed by the banking agencies to guard against significant capital declines once Basel II is implemented. Even though adequate empirical work may be lacking, it seems reasonable to conclude that large banks would acquiesce in the A-IRB approach only if they anticipated sizable net benefits from reduced capital requirements less the costs of qualifying and maintaining the requisite internal rating systems.<sup>19</sup> It is thus unlikely that banks anticipate that market considerations will prevent them from realizing these capital reductions. Their plea that the leverage ratio be eliminated, in turn, suggests that it would require higher levels of capital than under the A-IRB approach.

In sum, neither market forces nor complementary national regulation can be confidently expected to maintain capital levels at present levels once the A-IRB approach is implemented. Although there is some uncertainty on the point, market actors may judge bank capital positions based on the

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17. This calculation is based on a statement by the chief financial officer of Citigroup that it is \$15 billion “overcapitalized” and, under Basel II, would be \$20 billion “overcapitalized.” See Matthias Rieker, “Global Markets Strength Earns Citigroup Upgrade,” *American Banker*, March 30, 2004. 18. Although the news report of this statement was unclear as to whether this figure refers to the holding company or Citibank itself, the \$15 billion number comports with the amount of capital Citibank held above the Basel I 8 percent requirement, as computed from its call reports filed at the end of 2003. Given Citibank’s risk-weighted assets, the 8 percent threshold would require approximately \$34 billion in qualifying capital. Thus, the anticipated \$5 billion reduction would translate into an approximately 15 percent decline in Citibank’s minimum capital levels. (Actually, in order to remain a financial holding company, Citigroup would need to assure that Citibank meets the 10 percent risk-weighted capital level, but this fact does not affect the impact of the shift from Basel I to Basel II.) Citibank’s estimate of its position under Basel II preceded the May 2004 Basel Committee decision to impose a scaling factor on A-IRB capital ratios.

18. The banks’ benchmark was well summed up by the senior risk manager at a major US bank, who was quoted at about the time CP-3 was released as expecting a quid pro quo: “If we’re going to implement Basel II, we want to have lower capital” (Buerkle 2003, 32).

19. While it is possible that large banks contemplating a significant decrease in their capital requirements might become even more enthusiastic about Basel II if it promised to raise their competitors’ costs, the domestic political dynamic around Basel II does not seem to have included significant overt efforts by banks to disadvantage their competitors, as opposed to seeking advantages for themselves. This dynamic is consistent with a general tendency to relax capital requirements as the Basel II process progresses.

degree to which they exceed existing minimum regulatory requirements as much or more as on the basis of an independent calculation of the actual bank capital levels that will justify certain ratings, interest rates, or counterparty positions. As to other forms of national regulation, there is no basis whatever for knowing whether, or how, the pillar 2 principle of higher-than-minimum-capital expectations will be realized. Most national regulation that mandates higher capital levels builds off the minimum risk-weighted requirements. Where there is a capital requirement unrelated to the prevailing risk-weighted determination, notably the US leverage ratio requirement, it appears conceptually at odds with the A-IRB model.

## **Potential Benefits of the Advanced Internal Ratings–Based Model**

A shift toward a regulatory model based on banks' internal credit risk models holds the prospect for significant improvement in capital regulation, which in turn could enhance bank safety and soundness. Most importantly, this regulatory approach could align capital requirements for credit exposures much more closely with the actual risks entailed by those exposures. The greater part of this chapter addresses the central issue of whether the promise of greater risk sensitivity of capital requirements will be realized. Supervisors associated with the Basel Committee have identified two additional benefits that are in some sense derivative of this key claim for an improvement in bank safety and soundness. First, they anticipate that the implementation of A-IRB will facilitate monitoring of large, internationally active banks through creation of a "common language" of risk. This reasoning obviously applies to supervisors, since they should be better equipped to understand the risk profiles of foreign banks operating in their countries. But proponents have also touted the benefits of a common language, as complemented by Basel II's disclosure requirements, for investors and other bank counterparties. They have, accordingly, argued that Basel II will foster more effective market discipline on bank activities and performance. Second, supervisors contend that the unfolding of the Basel II process itself has encouraged banks to improve their own risk management processes.

### **Greater Risk Sensitivity**

The internal ratings approach to setting capital requirements looks to the bank's own estimate of the credit risk entailed by particular claims, rather than to a fixed risk category determined by the generic type of borrower (government, bank, corporation, etc.). This core feature of an IRB approach responds directly to the major criticism of Basel I. The

upshot should be that capital requirements are better calibrated to the actual risk entailed in a credit exposure and that the scope for regulatory arbitrage has been reduced. The credit risk estimate will generally be computed based on financial information specific to the borrower (e.g., cash flow, liquid assets, net worth) and experience with the borrower.<sup>20</sup> Extensions of credit may be rated solely on the basis of certain formulas used in the credit risk model. (These formulas are used to calculate probability of default; for example, they are distinct from the formulas used to derive the risk weighting of the claim once the probability of default and other inputs have been generated.) However, human judgment may also be brought to bear where large extensions of credit are under consideration, or where there are important business reasons other than those routinely fed into the risk model. Because large banks generally use seven or more risk categories, the risk presented by a particular claim would not only be determined by reference to the actual financial position of the borrower but would also be more precisely calibrated than under Basel I.

This new regulatory paradigm builds on the practice of large banks in generating their own credit risk estimates for internal risk management purposes. Of course, the detailed requirements of Basel II will require banks to use metrics established by supervisors, which will be different from those used in bank models solely for internal purposes. Still, an important assumption of this regulatory approach is that banks themselves possess a comparative advantage over supervisors in terms of the resources, expertise, and experience necessary for sophisticated assessment of credit risks. Moreover, if the Basel Committee were eventually to move toward using not just a bank's internal ratings, but its actual credit model, then this comparative advantage in risk sensitivity over Basel I should be even greater.

As discussed in chapter 3, the extent to which banks are intentionally arbitraging credit risks within the Basel I framework has not been established with any precision. But there is little question that, whatever the intentions of bank managers, the bluntness of the Basel I rules means that regulatory capital requirements are not well correlated with the actual risks presented by a bank's portfolio of credit exposures. Until the sub-prime crisis, the record of major bank stability under the Basel I rules was a very good one. However, while the significance of the Basel I capital rules in contributing to the crisis will likely be definitively established only after considerable study and debate, it is certainly possible that the relative risk insensitivity of the 1988 rules played a significant role. Moreover, the disincentive of banks to assume certain exposures because of

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20. Retail exposures will be weighted based on portfolio characteristics, rather than risk ratings of individual borrowers.

Basel I rules that penalize a creditworthy borrower creates an opportunity cost—admittedly hard to quantify—to the economy as a whole.<sup>21</sup>

In theory, then, greater risk sensitivity in capital requirements should be a major advance in bank regulation. The key policy question is whether it is likely that these theoretical benefits will be realized in practice. More precisely, the question is whether, in both conceptual and practical terms, an IRB approach to capital regulation is likely to realize these benefits. The nature of credit risk modeling, the difficulties encountered by regulators in calibrating these models, and the challenges posed by an IRB approach for supervision and monitoring combine to raise substantial doubt that this question will be answered affirmatively.

### ***Reliability of Credit Risk Models***

Issues pertaining to the reliability of credit risk modeling go to the heart of the entire A-IRB approach and thus, fundamentally, to the direction that Basel II has established for financial regulation. One concern is that the current state of the art does not support the reliance to be placed on these models for purposes of calculating regulatory capital levels. Sharing this concern, the Basel Committee has in effect created its own model, with certain standardizing assumptions. The committee seems convinced that any approach to capital regulation that builds on a bank's own risk systems can only be worked out satisfactorily through its actual implementation, while many of the committee's critics doubt that credit risk modeling (or the intermediate approach of Basel II, using the banks' internal ratings) will ever be viable as a basis for capital regulation. In any case, the committee's creation of its own model leads to a second concern—that the extensive, standardizing detail of the A-IRB model is at odds with the rationale of more closely grounding regulatory capital requirements in the most sophisticated and accurate risk assessment techniques. There is thus a risk that the A-IRB approach will yield the worst of both worlds—that is, the assumptions and limitations of the model will prove ill-founded, particularly in moments of stress, while not taking advantage of the sophistication and customization that large banks seek in their own risk management systems.

Basel II's embrace of credit risk modeling followed on the Basel Committee's 1996 amendment to Basel I, which prescribes value-at-risk (VaR) modeling to calculate the market risk attributable to securities on the trad-

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21. Of course, the Basel I rules are problematic for reasons beyond the insensitivity of the applicable risk categories. Two important examples are the failures to take due account of credit risk mitigation and of the risks that may be associated with retained interests or obligations in securitizations. Improvements in these features of Basel I are possible without a basic shift in the basis for calculating risk; indeed, the standardized approach of Basel I addresses these problems.

ing books of banks. For US commercial banks, at least, the trading book was traditionally relatively insignificant compared with the banking book, in part because of legal restrictions on bank ownership of equities. But VaR risk management is quite common among nonbank financial entities that engage in significant trading activity. Notwithstanding the widespread use of the technique for both business and regulatory purposes, the reliability of VaR modeling for market risk is still questioned on both theoretical and empirical grounds (Alexander and Baptista 2006, Herring and Schuermann 2005). These questions have become more pointed in the wake of the 2007 disruption in the market for securitized mortgages and other forms of securitized loans. Indeed, as noted in the previous chapter, one response of the Basel Committee to the subprime crisis was to announce its intention to strengthen capital requirements for assets held on the trading book. Still, the state of the art of VaR market risk modeling is, by any measure, substantially more advanced than for credit risk modeling. Credit risk modeling, which includes calculation of risk ratings, is a relatively new undertaking, at least in its comprehensive form.<sup>22</sup> There are numerous important questions about its reliability.

First, any model is obviously only as good as its assumptions and inputs. If the credit risk parameters supplied by banks are unreliable, even a well-constructed model will give a misleading picture of actual risk. In the vernacular of risk managers, “garbage in, garbage out.” One difficulty is the potential for intentional distortion of model inputs, which is discussed below. Even assuming good faith on the part of the banks, the relative dearth of useful historical data is cause for concern. There is generally less than a decade of historical data available on the basis of which to generate the values incorporated into the model. Importantly, most models are operating with data that do not reflect an entire business cycle (Jackson 2006). Each time a bank introduces an innovative or complex credit exposure, there will by definition be no historical data for use in the model. Risk managers will thus have to extrapolate from experience with existing credit products, which may or may not be sufficiently close in salient characteristics to approximate the credit risk associated with the new product. These concerns are not purely hypothetical, of course. The disaster that can befall firms when markets move in new ways, exemplified by the implosion of Long-Term Capital Management in 1998, has again been impressed upon market actors by the fallout from the collapse of markets for securitized subprime mortgages in 2007. While the losses in question were dominantly trading rather than banking losses in both instances, the origins of the subprime debacle lay in actual and anticipated

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22. A snapshot of the state of the art is provided in Martin (2003). A more complete explanation of key issues in the construction and use of credit models is included in Saidenberg and Schuermann (2004).

jumps in defaults by homeowners—in other words, credit risk. There were no useful data to input into models, because there had never been so much subprime lending before.

Second, a related difficulty is that it is considerably more difficult to backtest credit risk models than market risk models.<sup>23</sup> While the prices of traded securities change daily, defaults are relatively unusual events and tend to occur in clusters because of adverse macroeconomic conditions. Because there had been no serious recession during the period in which data used for development of Basel II had been gathered, there was little opportunity to stress test the models, a serious concern unless one believes heroically that severe recessions are a thing of the past. Remarkably, six months *after* the Basel Committee issued the revised framework, another committee housed within the Bank for International Settlements issued a report that the state of the art for stress testing involving loan portfolios badly lagged that for market risks (Committee on the Global Financial System 2005).

Third, although progress has been made in recent years, credit risk models have not yet fully captured correlations among the various relevant variables. For example, the designers of credit risk models have not yet determined how to determine reliably when the same circumstances that increase the probability of default also lead a borrower to draw down its existing lines of credit and diminish the value of the collateral securing the loan.

Fourth, as mentioned earlier, the extreme value tails of banks' credit risk models bear substantially more serious policy implications than those of market risk modeling, at least as it applies to commercial banks.<sup>24</sup> It is difficult to be comfortable in an environment in which a 500-year flood comes once a decade.<sup>25</sup>

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23. "Backtesting" refers to a process of ex post validation of a model by comparing its predictions of anticipated losses with actual experience. The difficulties are discussed in Lopez and Saidenberg (2000).

24. Even within well-established and highly liquid trading markets, the number of extreme events seems to be significantly higher than standard distribution analysis suggests. For example, the standard distribution of the S&P 500 daily return would suggest that an outlier change of five sigmas should occur only about once every 10,000 years. But the data from 1929 to 2003 reveal about 30 such events (Danielsson 2003). For this reason, Danielsson et al. (2001) have suggested turning to extreme value theory, which seeks to capture the risk in the tails of probability distribution functions. But if VaR-type credit risk modeling is not fully matured, extreme value theory is only in its infancy and thus cannot be considered a viable near-term basis for regulatory requirements. For a caution on using extreme value theory, see Lucas et al. (2002).

25. Rebonato (2007, 252) argues that a 99.9th percentile, one-year risk calculation is a "meaningless concept" because, among other things, there are simply too few relevant observations in the data set forming the basis for the calculation of a once-in-a-thousand-year event.

Fifth, models do not reflect the fact that risk can be endogenous in some circumstances. The conventional assumption that the uncertainty of asset values results from exogenous causes seems to hold in normal times. But this assumption is misplaced during times of stress. Numerous analysts have argued that, when widely adopted, VaR models for evaluating market risk create a kind of negative feedback loop that makes the sources of risk partly endogenous.<sup>26</sup> That is, where market actors are using similar models, an initial decline in market price of an asset can prompt many of these actors more or less simultaneously to sell their holdings of this asset in order to minimize their losses or improve their capital position. But sales by a significant number of actors will drive the price of the asset down further, possibly prompting another round of sell-offs. This self-reinforcing dynamic can magnify volatility and thus, on net, increase risk.<sup>27</sup> Credit risk models may have an analogous, though less dramatic, effect. As the creditworthiness of a particular type of asset declines, the internal risk rating of exposures associated with such assets will also deteriorate, requiring additional capital set-asides. Similar models in different banks could then provide a shared incentive to dispose of those assets in order to protect their capital ratios. As with the trading risk situation, the result could be a glut of similar assets on the market, driving down the price and thus placing the banks in a less favorable position. The circumstances that would drive significant numbers of banks simultaneously to attempt to sell off portions of their loan portfolios may occur precisely when capital ratios are already declining toward regulatory minimums.<sup>28</sup>

The Federal Reserve Board, which was consistently among the most enthusiastic proponent of the A-IRB approach among the Basel supervisors, acknowledged during the Basel II process that even the credit risk models used at the largest banks have not “attained the sophistication and robustness” that would be necessary to rely on them for regulatory purposes.<sup>29</sup> It is for this reason that the A-IRB approach is based not on the use of bank credit models as such but on the use of banks’ internal credit ratings, which are used as inputs into what is in effect a common credit risk model created by the committee itself. Banks may qualify for

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26. See Danielsson, Shin, and Zigrand (2004); Basak and Shapiro (2001); and Morris and Shin (1999). An illuminating first-person narrative of experiences with such negative feedback loops is provided by Bookstaber (2007).

27. Danielsson, Shin, and Zigrand (2004) point out the similarities between this dynamic and the observed impact of such practices as portfolio insurance and dynamic hedging techniques.

28. For an application to credit risk models, see Danielsson et al. (2001) and Blum (1999).

29. See Roger W. Ferguson, Jr., remarks at the ICBI Risk Management 2003 Conference, Geneva, December 2, 2003.

the A-IRB approach only after they have adopted best-practice operational requirements, although—as one commentator has observed—there may not be sufficient history to determine if best practices are good enough. In any case, each of the five questions on the use of credit risk models applies to a greater or lesser extent to this hybrid approach.

The committee's decision to create its own model raises a second set of concerns about the new regulatory regime. There is an inconsistency, at least at a conceptual level, between the Basel II proposal and the principle that supposedly informs the development of a regulatory paradigm based on internal bank models—that credit risk will be more accurately measured if capital requirements are aligned with the sophisticated risk assessment and management techniques available to financial institutions. The Basel Committee believes that it must specify rules because credit risk models are not sufficiently reliable, but each specification for a particular element of the risk assessment and management process is an actual or potential departure from state-of-the-art internal risk evaluation.

Many assumptions embedded in the Basel II formulas have been questioned by economists during and after negotiation of the revised framework.<sup>30</sup> For example, the correlation factors embedded in the Basel II formulas assume that assets with higher probabilities of default are likely to be more idiosyncratic in the factors affecting them and thus less influenced by economywide factors. Yet an analysis by FitchRatings revealed that the correlation factors in the revised framework—while generally and appropriately grounded in conservative assumptions—diverged from empirically derived correlations for certain asset classes. In these classes, correlations increased as a function of probability of default, a result directly contrary to the Basel II assumptions (FitchRatings 2008). The same study predicted that the correlations found during the subprime crisis will exceed those derived from longer-term data.

Similarly, an implicit assumption of major importance lies behind the apparent expectation of the revised framework that probability of default and loss given default will be calculated independently of one another and then inserted into the applicable formulas. In fact, both theoretical and empirical work suggests that the value of collateral is inversely related to the probability of default on the underlying loan (Thomas and Wang 2005). Other contestable assumptions in the Basel II formulas include the presumed greater need for maturity adjustments for high-quality exposures on the ground they are more likely to deteriorate than are exposures whose initial quality is lower and the relatively greater impor-

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30. These criticisms are reviewed and supplemented in Kupiec (2006), Thomas and Wang (2005), and Crouhy, Galai, and Mark (2005).

tance of idiosyncratic risk factors in loans to small and medium-sized enterprises than in loans to large businesses.<sup>31</sup>

The committee's own credit risk model thus includes numerous simplifying departures from existing credit risk models that reflect the current state of the art. The development and use of this model raises a broader problem, one that potentially undermines the very intention of the committee to draw on the expertise of the largest and, presumptively, most sophisticated banks. If, as with the risk-weighting formulas, the committee imposes rules because it believes even the best models to be insufficiently tested, then it will have substituted its own judgment for that of the most sophisticated market actors. Even if it imposes a rule that reflects current best practice, it is making a judgment that the practice is best for all banks. The rule may also quickly become yesterday's best practice, since models may evolve rapidly based on experience and technical advances.<sup>32</sup> In either event, the regulators are substituting their own judgment for that of the risk managers themselves. There are certainly times when regulators *should* substitute their judgment for that of the entities they regulate. But, with respect to the Basel II proposal, this inclination is at odds with the stated rationale for the new paradigm. It also creates new possibilities for regulatory arbitrage, as banks again see a divergence between their experience with actual credit risk and credit risk as defined for regulatory purposes.<sup>33</sup>

Two examples illustrate this point. First, the revised framework includes detailed specifications of the circumstances under which collateral will be recognized as reducing credit risk. Unlike risk-weighting formulas, the collateral practices of major banks seem relatively well developed and robust. It appears as though the desire for uniformity has, in this instance, trumped the customized risk management techniques of banks themselves. Second, it has been widely observed that the approach mandated in Basel II has already been superseded by the most sophisticated risk management techniques of large banks. In particular, some large

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31. This assumption was questioned by the US banking agencies in their advance notice of proposed rule making (US Department of the Treasury Office of the Comptroller of the Currency et al. 2003, 45, 914). However, this special formula for small and medium-sized enterprises, which was of great importance to Germany, was not changed in the final version of the revised framework.

32. The possibility that rules are imposed because the committee fears banks will game the system is discussed in the next section. This response is also inconsistent with the regulatory principle behind Basel II.

33. The possibility is nicely illustrated by Kaltofin, Paul, and Stein (2006), who explain how banks can segment their retail credit exposures to reduce their capital requirements under Basel II. They identify both how this can be done in accordance with the actual risks presented by the retail portfolios and how the discretion required in implementation opens up the possibility that "actions will be hidden from view by banks" (Kaltofin, Paul, and Stein 2006, 21).

banks argue that portfolio composition factors have now been successfully incorporated into their credit risk models. That is, the more advanced models recognize that the credit risk associated with the bank's assets as a whole is not the simple sum of the risks attached to each individual asset. Just as overall market risk may be reduced through portfolio diversification, so overall credit risk may be reduced or increased by certain compositions of banking book assets.

In failing to take account of portfolio correlation in credit risk models, Basel II is arguably departing from its stated aim of aligning actual risk and regulatory capital more closely. The US banking agencies responded to this criticism with a defense of the portfolio-invariant character of the A-IRB formulas (US Department of the Treasury Office of the Comptroller of the Currency et al. 2003, 45, 910–45, 911). Again, though, the agencies essentially declared that the experience of a particular bank, based on defensible modeling practice, is irrelevant for regulatory purposes. Moreover, many observers continue to question exclusion of this factor from the A-IRB model. Although banks have presumably argued for its inclusion in the expectation that it will reduce capital requirements still further, independent analysts such as Fitch raise the opposite concern—that concentration of a bank's credit portfolio in particular geographic markets may imply a higher correlation among those assets than assumed in Basel II, with a consequent understatement of appropriate minimum capital needs (FitchRatings 2004). A recent study by a task force of the Basel Committee itself concluded that there may be a significant impact on required capital of credit risk concentration, particularly sector concentration, which the task force defined to include both geographic and industry exposures (Basel Committee 2006e). The assumption in the A-IRB model that there is only a single systematic risk factor is not valid where there are significant imbalances in geographic and industry exposures, particularly where relevant geographic and industry risk factors are correlated with one another.

A glaring example that illustrates the Hobson's choice confronted by the Basel Committee in devising the A-IRB approach is the regimen applicable to securitization exposures. Some of these rules rely heavily on ratings provided by external agencies such as Moody's, Standard & Poor's, or Fitch, even for banks using an internal ratings approach. Thus the revised framework requires use of external ratings for any securitization exposure that is rated, or where a rating can be "inferred" based on the relationship between an unrated and rated exposure (Basel Committee 2006g, paragraph 609) Where a bank has an exposure—such as a liquidity facility or a credit enhancement—to a securitization entity issuing asset-backed commercial paper, the bank may use its internal assessments of risk, though even here the bank's ratings must be "mapped" to the external agency's ratings, which continue to apply to the commercial paper itself (Basel Committee 2006g, paragraph 619).

The related turmoil in both the commercial paper and securitized mortgage markets during the summer of 2007 suggests the inadequacy of either alternative. The external ratings of securitized mortgages proved grossly misleading. The internal assessments of risk exposure to conduits and other special-purpose securitization vehicles are of course not public, but the losses suffered throughout the industry suggest that those assessments fell well short of identifying the actual risks involved. The securitization example may be an indication that neither banks' internal risk assessment nor an external rating is reliable enough to serve as the foundation of a capital regulation system.<sup>34</sup> It thus raises questions about the entire Basel II enterprise.

As earlier noted, various Basel Committee officials have suggested that Basel II will eventually move toward acceptance of a full model approach, which would presumably incorporate portfolio risk diversification factors and any future improvements. A transitional regulatory method may be necessary as a practical matter, insofar as supervisors will want experience with the limited model approach before permitting even less well-established enhancements. One can argue, though, that the transitional arrangement is itself too much a shot in the dark, given the uncertainties just recounted. Basel II proponents might offer two rejoinders to this argument: First, there may never be enough certainty about the operation of an A-IRB approach until it is actually put into practice; and second, whatever the deficiencies of current credit risk modeling, it surely is an improvement on the blunt risk-weighting rules of Basel I.

There is obviously merit to these points. Still, these responses do not answer the key questions of whether the improvements in risk sensitivity of capital ratios to be gained by Basel II are worth the cost and likely to be realized in practice. Complex as the current proposal is, it entails many simplifying assumptions that do not comport with the actual practice of large banks using their own credit risk models. The vigorous and ongoing debate over credit risk modeling, particularly its difficulty in capturing the extreme tail events that are most worrisome in banking systems, suggests that a complete transition to a paradigm based on sophisticated industry practices is at best a good ways off and possibly something that will never be attained. Before reaching conclusions on the utility of the A-IRB model, however, it is important to examine in more detail the likely effects in practice of the specific Basel II rules.

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34. There are numerous other problems engendered by use of either internal, bank-generated, or external agency ratings. One good example of the latter is the potential for "ratings shopping" by banks or their customers. Because the major rating agencies apply different technical criteria in assessing companies (or securitizations), an issuer may be able to modify certain features in order to qualify for the requisite level of rating from one agency, thereby qualifying for more favorable capital treatment, even though the underlying creditworthiness of the issue is sufficiently debatable not to earn a similar rating from other external agencies.

## ***Impact on Capital Levels***

The starting point for examining the impact of the specific A-IRB approach of Basel II is determining how capital requirements will actually change with its implementation. A dramatic decrease would raise concerns as to whether the relatively untested IRB approach to capital adequacy was reasonably safeguarding the international financial system. On the other hand, if bottom-line capital requirements were to change little after Basel II, one might question whether the entire costly enterprise was worth undertaking. As it turns out, the seemingly basic question of how much impact the A-IRB approach would have on capital levels was actually quite difficult to answer during the negotiations. The uncertainty on this point not only calls into question the degree to which the Basel Committee understood the implications of its proposal. It also reveals considerable ambiguity in the regulatory purpose to be served by the pillar 1 capital adequacy requirements.

Uncertainty exists as to both the effect of the risk-weighting formulas on capital levels and the intentions of the Basel Committee in setting those formulas. As to intentions, the committee has identified two objectives—leaving minimum capital requirements “broadly unchanged” and offering an incentive for banks to adopt the IRB approaches.<sup>35</sup> The committee has not elaborated on how these potentially conflicting goals are to be reconciled. Obviously, the most potent incentive for banks to adopt A-IRB is a reduction in capital requirements that permits an increase in lending whose profitability more than compensates for the incremental costs of the A-IRB approach. Since those costs are significant and front-loaded, the necessary reduction in capital requirements may have to be significant to create an adequate incentive.

The emphasis on one or the other of these two intentions has differed in official statements made at different times and, it would seem, in some statements made at the same time by different officials. In its first consultative paper (CP-1) issued in June 1999, the Basel Committee stated unambiguously that “the new framework should at least maintain the overall level of capital currently in the banking system” (Basel Committee 1999b, paragraph 10). In an “explanatory note” accompanying release of its second consultative paper (CP-2) in January 2001, the Basel Committee said that its goal remained unchanged, but stated it in rather different terms—“to neither raise nor lower the aggregate regulatory capital . . . for internationally active banks using the standardized approach.” For banks using the IRB approach, the committee said its “ultimate goal is to ensure that the regulatory capital requirement is sufficient to address underlying risks and contains incentives for banks to migrate from the standardized

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35. The committee has juxtaposed these two aims in several of its pronouncements. See, for example, Basel Committee (2003c); and Bank for International Settlements, “Consensus Achieved on Basel II Proposals,” press release, May 11, 2004.

approach to this IRB approach” (Basel Committee 2001e, 5). While this shift in emphasis might have seemed quite natural given that the IRB approach had moved from a mere concept in CP-1 to a proposal in CP-2, the committee changed once again in 2002. In explaining its efforts at assessing the impact of the IRB proposal, the committee referred to its “goal of neither significantly decreasing nor increasing the aggregate level of regulatory capital in the banking system.”<sup>36</sup> Insofar as this statement dealt with the IRB approach, the omission of any reference to the differentiation between standardized and IRB approaches in CP-2 appears significant. The formulation was again modified and eventually articulated in the revised framework as “to broadly maintain the aggregate level of [minimum capital] requirements, while also providing incentives to adopt the more advanced risk-sensitive approaches of the revised framework” (Basel Committee 2004c, paragraph 15).

The variation in formulations of the basic goal by the committee is reflected in the disparate statements of US banking supervisors. Again, at first glance agency positions appear both simple and uniform. The joint-agency “Advanced Notice of Proposed Rulemaking” issued in August 2003 states unequivocally that the “agencies do not expect the implementation of the new accord to result in a significant decrease in aggregate capital requirements for the US banking system” (US Department of the Treasury Office of the Comptroller of the Currency et al. 2003, 459010). The proposed rule issued in 2006 quoted this language, asserted its consistency with the committee’s formulation as just quoted from the revised framework, and restated the commitment of the four federal banking agencies to these objectives (US Department of the Treasury Office of the Comptroller of the Currency et al. 2006a, 55839). Likewise, the final rule affirmed “the agencies’ intention to avoid a material reduction in overall risk-based capital requirements under the advanced approaches” (US Department of Treasury et al. 2007, 69295). However, as described in chapter 4, this final rule was itself a careful compromise among the banking agencies, reflecting the concerns of some that the A-IRB approach would in fact lead to significantly reduced capital requirements.

The tension between the Basel II objectives was evidenced in the differing emphases struck by the US banking agencies during the negotiations. Perhaps the most visible example was during a congressional hearing in June 2003, at the very time the “Advanced Notice of Proposed Rulemaking” was being drafted, Fed Vice-Chairman Roger Ferguson, who had assumed the Fed’s leadership role on Basel after William McDonough resigned, argued that it made little sense to implement a more risk-sensitive framework just to end up with Basel I capital levels. He

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36. Basel Committee on Banking Supervision, “Basel Committee Reaches Agreement on New Capital Accord Issues,” press release, July 10, 2002.

concluded that “some modest reduction in the minimum regulatory capital for sound, well managed banks could be tolerable if it is consistent with improved risk management.” He added that “if the evidence suggested that capital were declining too much, the Federal Reserve Board would insist that Basel II be adjusted or recalibrated,” though he did not specify the standard for judging whether capital declined “too much.”<sup>37</sup> Comptroller John D. Hawke, testifying immediately after Ferguson, offered a quite different perspective. His overall tone was one of caution, even skepticism, about the Basel II approach. With respect to the impact on overall capital amounts, he stated unequivocally that the “first objective of the Basel Committee in embarking on the Basel II effort was to calibrate minimum capital requirements to bring about a level of capital equal to the global requirements of the present Basel Accord.”<sup>38</sup>

The differences in Basel Committee and US banking agency statements might be dismissed as matters of nuance were the *actual*, as opposed to *intended*, impact of Basel II becoming clear. But the test runs of the Basel II formulas—the quantitative impact studies—raised as many questions as they have answered. The three more recent studies—QIS-3 (2003), QIS-4 (2005), and QIS-5 (2006)—together reveal that the Basel Committee supervisors cannot say with any credibility what minimum capital levels will be generated by the A-IRB model once it is implemented.

QIS-3 collected data from 74 banks, most though not all from Basel Committee countries (Basel Committee 2003b).<sup>39</sup> These banks used their internal ratings as the relevant variables in the risk-weighting formulas proposed by the committee. The results are now essentially meaningless as predictors of Basel II capital levels, because CP-3 and the final version of the framework made such extensive changes in the A-IRB formulas. Nonetheless, some of the experience with QIS-3 did raise an issue of continuing interest.

The results showed wide dispersion in the effects of the A-IRB approach on minimum capital requirements of individual banks, with increases of up to 46 percent and decreases of as much as 36 percent (Basel Committee 2003d). The breadth of this dispersion surprised many, even though everyone had expected some effects along these lines. Still, the

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37. See Roger W. Ferguson, Jr., 2003, testimony before the Subcommittee on Financial Institutions and Consumer Credit of the Committee on Financial Services, US House of Representatives, June 19, 2003.

38. See John D. Hawke, testimony before the Subcommittee on Financial Institutions and Consumer Credit of the Committee on Financial Services, US House of Representatives, June 19, 2003.

39. Fifty-seven of these banks were from Basel Committee countries. Although many results were aggregated, presumably in order to protect the information of individual banks, it seems likely that most of the banks running A-IRB simulations were among those designated in the study as “group 1” banks, meaning those with assets in excess of 3 billion euros.

weighted average change was reassuring—a decline of only 2 percent. However, closer inspection revealed a different picture. Although the *total* capital requirement for banks testing the A-IRB approach would have declined by only 2 percent, the capital requirement for credit risk alone would have declined by 13 percent.<sup>40</sup> The percentage point differential was attributable to the capital charge for operational risk. As noted in chapter 4, Basel II is, for the first time,<sup>41</sup> imposing a capital charge for operational risk, with three variants roughly parallel to the three variants for credit risk. The convenient compensatory role played by operational risk made some wonder whether the operational risk standard would end up being a kind of wild card to ensure that overall capital levels did not fall excessively. This potential wild card role for the operational risk requirement was largely foreclosed by the subsequent development of the advanced measurement approach (AMA), which is generally available to the very banks that will be using A-IRB. The AMA reduced the anticipated operational risk capital requirement for at least some, and probably most, of these banks.

The QIS-3 results and the subsequent changes in A-IRB formulas that would lead to lower capital levels prompted the Basel Committee to take additional steps to deal with the uncertainty regarding the minimum capital requirements associated with Basel II. First, CP-3 created a floor for a bank's capital requirements in the first and second years of the A-IRB regime of 90 percent and 80 percent of Basel I levels, respectively. It said nothing about the intended impact of Basel II on capital levels thereafter. Second, in its May 2004 release announcing consensus on the major outstanding issues, the committee reiterated its two objectives and essentially

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40. The QIS-3 results showed a 17 percent reduction in minimum credit risk capital requirements at US banks, a figure that the FDIC (2003) believes to reflect more rigorous credit loss assumptions than historical experience would suggest. The latter point is potentially at odds with the conclusion of Standard and Poor's (2003) that participating banks used too *generous* a set of credit loss assumptions. These observations could be consistent if non-US banks used particularly generous credit risk assumptions. Additional information on the impact on US bank capital levels is provided in the "Advance Notice of Proposed Rulemaking" issued by the US banking agencies, which provided information on the changes in capital requirements determined during QIS-3 for 20 large US banks. Required capital for corporate exposures would decline 26 percent (as opposed to a 14 percent decline for all the banks included in the A-IRB part of QIS-3); for small and medium-sized enterprise corporate exposures, it would decline 39 percent (compared with a 3 percent decline for all banks); for residential mortgages, it would decline 56 percent (compared with a 58 percent decline for all banks); for nonmortgage retail exposures, it would decline 25 percent (compared with a 41 percent decline for all banks); and for revolving retail exposures, it would increase 16 percent (compared with an 8 percent increase for all banks).

41. Basel Committee documents have stated that a charge for operational risk was "implicit" in Basel I. In fact, the 1988 accord does not refer at all to operational risk, even in passing. Insofar as it stated that it was directed "mainly" at capital risk, the committee's current characterization is arguable but no more than that.

admitted that it was uncertain as to the impact of its proposed pillar 1 rules on capital levels. Accordingly, the committee indicated that it was “prepared to take actions necessary to address the situation”—specifically, by introducing a “scaling factor” that would, in a single step at the end of the capital calculation process, adjust capital requirements. Thus, in place of the now-unavailable wild card of capital requirements for operational risk, the committee substituted the *deus ex machina* of an apparently arbitrary scaling factor. While the committee specified its “current best estimate” of the scaling factor, it did not explain the criterion for selection of that factor (e.g., maintaining capital at the 90 percent floor already set for the first year of A-IRB). Nor did it say whether a scaling factor would be a temporary or indefinite feature of the A-IRB approach.

Evaluations since the revised framework was issued have not resolved the uncertainty over the effects of the A-IRB model on minimum capital levels. QIS-4 was undertaken on a limited basis in the United States, Germany, and South Africa beginning in 2004. Then, beginning in 2005, QIS-5 was undertaken using data from banks in all Basel Committee countries except the United States, as well as in 19 noncommittee countries.<sup>42</sup> Although the Basel Committee aggregated the QIS-4 and QIS-5 results as best it could, much of the US data was not technically compatible with the QIS-5 approach and thus was not included in a number of the analyses. Fortunately, the US results from QIS-4 have been separately reported by the four federal banking agencies (US Department of the Treasury Office of the Comptroller of the Currency et al. 2006c).

The QIS-5 results for large banks under A-IRB showed a 7.1 percent decline in required minimum capital from Basel I levels. Tier 1 capital requirements would decline even further, by 11 percent.<sup>43</sup> This figure, as in the QIS-3 results, included capital requirements for operational as well as credit risk (although, as would have been expected in light of the availability of the AMA approach to operational risk, the contribution of operational risk requirements had declined). In addition, this figure reflected application of the 1.06 scaling factor. Without the scaling factor, then, the decline in minimum capital levels would have been 12.4 percent, a substantially larger decline than found by QIS-3.

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42. The combined QIS-4 and QIS-5 effort included data from 356 banks, of which 56 were large (tier 1 capital of over 3 billion euros), diversified, internationally active banks of the type most likely to operate under the A-IRB approach. A total of 84 banks, including some smaller Basel Committee country banks and 10 banks from noncommittee countries, ran data under the A-IRB approach (Basel Committee 2006d). The discussion of the consolidated results in the text focuses on the 56 “group 1” banks from Basel Committee countries.

43. This result is related to the fact that Basel II makes two changes that adjust the numerators in the tier 1 and total capital ratios differentially: first, the direct deduction of certain exposure types, and second, a new approach for determining the amount of reserves eligible for inclusion in tier 1 and tier 2 capital, based on the relationship of reserves to a bank’s expected losses.

Because the QIS-4 protocol was developed prior to the issuance of the revised framework, it does not include the scaling factor and certain other late changes to the A-IRB approach. Thus, the relevant point of comparison of the finding that the aggregate minimum risk-based capital of the 26 US banks would fall 15.5 percent is with the 12.4 percent unscaled figure for the QIS-5 group 1 banks. As with the results for QIS-5 banks as a whole, the US QIS-4 results showed a greater drop in tier 1 capital requirements, by 22 percent in the aggregate. The median drops in total capital and tier 1 capital requirements were 26 percent and 31 percent, respectively.

The reductions in capital levels generated under QIS-4 appeared to surprise US banking authorities. Citing the need for more time “to better assess” the QIS-4 results, in April 2005 they delayed their planned notice of proposed rule making on Basel II implementation.<sup>44</sup> Disconcerting as it may be to realize that, even after agreement on the revised framework, the supervisors still did not know what they would find when the A-IRB method was tested, the dip in absolute capital levels may be less troubling than the dispersion in results among banks. The QIS-4 results revealed variations of 30 or more percentage points in the reductions in capital requirements associated with similar portfolios. It seems highly unlikely that the actual risk associated with sizable portfolios of, for example, home mortgages held by large banks vary to that extent. This intuition is reinforced by the disclosure of large variations in the risk weights assigned by participating banks to identical specific exposures.<sup>45</sup>

Representatives of a number of the banks participating in the QIS-4 study suggested that the predicted declines in capital requirements were misleading, in significant part because the data used for QIS-4 were generated at the most favorable point of the business cycle, when credit risk appears at its lowest. This observation raises the issue of the potentially undesirable procyclicality of the A-IRB approach, to be discussed below. The banks also pointed out that the agencies did not provide detailed guidance on a number of important methodological points, and thus the QIS-4

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44. See “Banking Agencies to Perform Additional Analysis Before Issuing Notice of Proposed Rulemaking Related to Basel II,” Joint Press Release FDIC-PR-37-2005 of the Board of Governors of the Federal Reserve System, Federal Deposit Insurance Corporation, Office of the Comptroller of the Currency, and the Office of Thrift Supervision, April 29, 2005.

45. Examples were provided in testimony given by Donald Powell, then chairman of the FDIC. Using the results of one reporting institution for a sample of large corporate credits that had identical lending relationships with many of the participating banks, other banks reported minimum capital requirements for the identical credits from 30 percent below to 190 percent above those of the benchmark bank. For representative mortgage products, the participating banks reported risk weights from 5 to 80 percent on identical exposures. See Donald Powell, prepared testimony on the “Development of the New Basel Capital Accords” before the Committee on Banking, Housing, and Urban Affairs, US Senate, November 10, 2005.

results may not accord with those that would follow actual implementation. In a sense, the banks' suggestions reinforced doubts that anyone actually knows what the effect of Basel II would be. While the reactions of supervisors to the various QIS results varied, most coalesced around the position that the only way to resolve the uncertainty surrounding the operation of the A-IRB approach was to forge ahead with implementation. There is surely reason to believe that further work by both banks and supervisors will eliminate some of the anomalies discovered in the QIS processes. The point remains, however, that Basel Committee countries have already embarked on implementation, with no assurance that the supervisors understand the impact on aggregate or individual bank capital requirements of the regulatory model they are about to impose.

The picture that emerges from all this is not a reassuring one. The Basel supervisors say they do not want significant declines in capital requirements, other than a modest amount to serve as an incentive to adopt the IRB approach. Yet they are moving ahead with a regulatory model that would—but for transition floors, scaling factors, and other instruments outside of the model itself—apparently lead to substantial capital reductions. Because they claim not to intend these reductions, they do not provide a reasoned argument for why lower regulatory capital levels are desirable. Yet the large banks that would operate under the A-IRB approach clearly anticipate that these regulatory capital declines would be the result of the model's implementation. The supervisors have yet to demonstrate their own mastery of the rules they have created, so that they will at least know what the effects of the A-IRB approach on minimum capital levels will be. Yet they insist that they must move forward with implementation of the model, because that is the only way they can determine what they have actually wrought. All in all, despite the years of work on Basel II, the record is remarkably incomplete as a foundation for making a fundamental change in safety and soundness regulation in the Basel Committee countries and throughout the world.

### ***Difficulties in Implementation and Monitoring***

The preceding sections have shown how the theoretical promise of an internal ratings approach in aligning capital requirements more closely to bank risk must be qualified both by limitations in the state of the art of credit risk modeling and by the problems created when the regulators are, in effect, constructing the credit risk model. The earlier discussion of the surprising QIS results gave a taste of the broader administrative and institutional problems that will be encountered as an A-IRB paradigm is put into practice. There are four areas of concern: compliance costs for banks; the supervisory challenge in designing and evaluating credit risk models; the supervisory challenge in monitoring bank operation of the Basel II

risk assessment process; and difficulties in holding supervisors themselves accountable for their oversight of the capital adequacy regime.

Compliance with the A-IRB approach will be very expensive. Models and compliance systems must conform to the specific Basel Committee standards for this capital calculation method. At least five years of reliable historical data must be generated as the basis for risk ratings, and a bank must have been using a rating system based on this data for at least three years before being qualified by supervisors to use the A-IRB method. Once a conforming system is running, there are ongoing requirements for testing, data retention, and other validating procedures.

It is difficult to pin down exactly how much large banks must spend to put a qualifying A-IRB system in place. Although bank spending on regulatory compliance has been increasing steadily in recent years, Basel II is not the only major new requirement. Sarbanes-Oxley, the Bank Secrecy Act, and corporate governance scandals have also required increased investment in compliance. A study by Datamonitor, a British market analysis firm, estimated that banks likely to be covered by the A-IRB approach spent approximately \$2 billion in 2004 and another \$2 billion in 2005 in preparations. An October 2007 report by Aite, an American consulting firm, estimated that US banks alone would spend about \$800 million in 2007 and predicted that this spending would rise to more than \$1 billion in 2009 (Aite Consulting Group 2007).

While these amounts are large in absolute terms, they appear substantially more manageable when one considers the total assets of globally active banks from Basel Committee countries. Early estimates of \$50 million to \$100 million—which are in the range of 1 percent of assets for large banks—have been projected for individual bank startup costs. PriceWaterhouseCoopers, on commission from the UK Financial Services Authority, estimated that large British banks would on average spend 59 million pounds on implementing the new credit risk system, and 91 million pounds for Basel II as a whole (PriceWaterhouseCoopers 2005). Even with data provided by banks and the UK Financial Services Authority, the firm could not derive a reliable estimate for ongoing compliance costs. The US banking agencies polled the banks participating in QIS-4 and found that the banks' estimates of initial implementation costs were lower—approximately \$42 million per institution (US Department of the Treasury Office of the Comptroller of the Currency et al. 2006a, 55907).<sup>46</sup>

Of course, cost alone tells us little. If there are significant economic gains because credit is being more efficiently allocated or because large

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46. The responding banks told the agencies that they would have spent approximately 45 percent of this sum on risk management even without Basel II. Thus the agencies conclude that the incremental compliance costs are just over half the \$46 million figure. This contrasts with the PriceWaterhouseCoopers study, which found that about 80 percent of the Basel II costs would be incremental expenditures.

banks are sounder, even these large startup costs will seem a bargain. But the banks that are spending the resources on compliance may not, understandably, be satisfied with an evaluation of net social costs and benefits. As one senior risk officer at a major US bank has said, "there's a sense of quid pro quo. If we're going to implement Basel, we want to have lower capital" (quoted in Buerkle 2003). If the large banks get sizable regulatory capital reductions, the expenditure of tens of millions of dollars will, for them at least, be worth the price.

In a well-functioning administrative process, the total social costs of a particular regulatory approach should be weighed against the total social benefits. Where the former exceed the latter, then the approach should be implemented if it is politically feasible to do so. Indeed, the excess of social benefits over costs is a kind of surplus that can be distributed among relevant parties based on political strength or appeal (so long as the redistribution does not render the surplus negative). But here it appears that the desire of the Federal Reserve Board and some other Basel Committee members for a new arrangement and the insistence of banks that they receive a quid pro quo are the constants in the current political economy equation. Thus, capital levels, the major remaining variable, are subject to downward pressure, perhaps even below the point at which social benefits exceed costs. It would be difficult to establish that this equation in fact describes developments during the Basel II process. Yet the repeated adjustments to the Basel II proposals that reduced expected capital requirements give grounds for concern.

The second area of concern is one of supervisory expertise. With the risk ratings generated by banks' internal models poised to play a central role in capital regulation, supervisory oversight of the construction and adoption of the models becomes central to the regulatory system. Prior to the reorientation of the Basel II process following the scrapping of the 1999 proposals, banking supervisory agencies in the United States and elsewhere had relatively little expertise with credit risk models. It is fair to say that only a small proportion of banking examiners are trained to evaluate credit risk models. Supervisory agencies have, of course, acquired financial model expertise in the course of working on Basel II. But a modest number of financial economists in the research or policy groups of the agencies will hardly be adequate for the task of supervising A-IRB banks once Basel II takes effect. In the United States, the agencies are assembling special teams of experts to evaluate the internal models of A-IRB banks. The plan is for this special group to move around the country as needed for examination of the A-IRB banks.

How successful this mode of oversight will be remains to be seen. Three potential problems are already apparent. First, the teams are being assembled on the assumption that a limited number of banks will be applying A-IRB. Should the advantages (in lower capital requirements) of A-IRB become apparent quickly, 10 to 30 additional banks may rather

quickly attempt to qualify. At that point, the special teams will almost surely be stretched beyond their limit.

Second, the kind of expertise at issue here is much in demand throughout the financial services industry. The pay differential between government and private firms is very significant. Thus, the agencies may have some difficulty finding enough top-flight financial model experts with sufficient public service commitment that they will forego the higher salaries available in the regulated firms. If experience in other regulatory contexts is any indication, an even greater problem may be the early departures of those who have worked in a specialized regulatory area, as private firms snatch up government experts with inside regulatory experience.

Third, even a technically competent and experienced team of examiners may simply not be able to supervise an A-IRB bank without effectively ceding a good bit of discretion to the banks themselves. Telling in this regard is the published account of a manager from a large British bank, who describes his expectation of a decline in regulatory capital and his bank's consideration of how best to take advantage of this new regime. He goes on to recount how his bank "invested considerable effort in liaising with regulators," a process that "proved enormously valuable not only in obtaining guidance on interpretation but also in being able to shape the regulator's views on practical implementation issues" (Wilson 2004, 303).

Closely related to the supervisory challenge in evaluating and supplementing models is the need for ongoing monitoring of the banks' derivation of risk ratings. There are two distinct dangers. One is the possibility that the bank's employees or consultants will err in accumulating and analyzing the data that serves as the basis for the inputs (probability of default, loss given default, exposure at default, and maturity) to be plugged into the Basel II risk-weight formulas. These mistakes may be difficult for the nonexpert to spot, since they may involve the finance theory behind the models, as opposed to simple ministerial errors. They may also be difficult to identify because significant differences in risk weightings may be the result of discrete mistakes well up the computational line in classification or in an intermediate formula. The revised framework issued in June 2004 is 250 pages long,<sup>47</sup> much of which deals with the technical aspects of the formulas to be used in the various risk-weighting approaches. This "mind-numbing complexity" of the A-IRB approach, as former Comptroller of the Currency Hawke described it,<sup>48</sup> creates an extremely difficult supervisory job.

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47. The "comprehensive" version of the revised framework released in June 2006 is about 100 pages longer than the June 2004 release. It incorporates the July 2005 guidance on the application of Basel II to trading activities and the treatment of double-default effects, the 1996 market risk amendment, and the portions of Basel I that were not revised in the Basel II process.

48. See John D. Hawke, remarks to the American Academy in Berlin, December 15, 2003.

The other danger is that the centrality of the bank's risk management model to its capital requirements will create an incentive to manipulate the values of the relevant parameters so as to lower the banks' capital requirements. This manipulation need not be outright misrepresentation. Bank officials could, for instance, make aggressively favorable, though still arguable, assumptions in developing their model. As the analytic aftermath of the QIS-4 process shows, the bank supervisory agencies themselves may not agree on what lies behind unexpected results. The consensus agency statements on QIS-4 suggested that the capital requirements derived from the exercise may have been unusually low because the study was conducted in relatively benign economic conditions and most institutions failed to properly incorporate downturn conditions into their loss-given-default estimates (US Department of the Treasury Office of the Comptroller of the Currency et al. 2006c). However, an FDIC staff analysis included as an appendix to congressional testimony by then-Chairman Powell rejected these hypotheses. The analysis noted that the estimates of loss experience reported by banks in QIS-4 far exceeded any losses actually experienced by banks since 1992. Powell pointedly concluded: "The FDIC applauds conservatism by banks in computing their risk-based capital requirements. However, just as banks can hold more capital than regulatory minimums, they can make QIS-4 assumptions that are more conservative than what the Basel II framework would require and hence far overstate the minimum capital that would be required if the framework were up and running."<sup>49</sup>

The Basel Committee recognized this danger early in its development of the IRB approaches and included in the CP-2 quite detailed specifications of the role that the risk inputs used for regulatory purposes must play in a bank's business operations. The final version of the revised framework retained a requirement that the internal ratings "play an essential role in the credit approval, risk management, internal capital allocation and corporate governance functions of banks" (Basel Committee 2006g, paragraph 444). Rating systems "designed and implemented exclusively for the purpose of qualifying for the IRB approach and used only to provide IRB inputs are not acceptable." However, as the Basel Committee itself acknowledged, the revised framework set forth this obligation as a principle, rather than in "prescriptive language" (Basel Committee 2006f). The committee's guidance emphasized the need for flexibility and the exercise of "considerable judgment" by supervisors in deciding whether the IRB "use test" has been satisfied. Thus, one wonders whether, in the end, banks may be able to maintain a different set of books for regulatory pur-

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49. See appendix B to Powell's prepared testimony on the "Development of the New Basel Capital Accords" before the Committee on Banking, Housing, and Urban Affairs, US Senate, November 10, 2005.

poses than for most of their own business purposes, thereby reopening possibilities for bank manipulation of their own capital requirements.

The final institutional concern is that implementation of an IRB approach to capital adequacy regulation will increase the difficulty of holding supervisors accountable for their actions (or inaction). The problem of asymmetric information, pervasive in financial markets, extends to bank supervision. As noted earlier, financial institutions are among the most opaque of publicly traded firms. Relative to most other kinds of firms, the quality of a bank's assets is both more important and more difficult for outsiders to assess. Although the limited resources of examiners may leave them with less knowledge of a bank's assets than would be necessary to assess its condition accurately, they are privy to considerable information unavailable to investors, congressional oversight committees, academics, and other outsiders. It is thus difficult for these groups to judge the performance of bank supervisors. The 1980s savings and loan crisis revealed the potential damage to the financial system from "regulatory forbearance," whereby supervisors aware of a financial institution's precarious condition refrain from closing the institution or taking other robust remedial action in hopes that things will improve with time. The same opaqueness makes simple regulatory incompetence—an unawareness of problems, rather than a decision not to act after recognizing problems—difficult to identify.<sup>50</sup>

In an effort to discourage regulatory forbearance following the savings and loan debacle, Congress enacted legislation requiring prompt corrective action by supervisors whenever bank capital levels fall below the Basel I (and applicable simple leverage ratio) minimums (12 USC. §1831o). Progressively tougher action is required as bank capital falls below other thresholds. Although the prompt corrective action provisions are not in any strong sense enforceable by courts or other agents, they do establish expectations for supervisory action that will be applied *ex post* when a bank fails. The statute requires an investigation by the Inspector General (an office independent of the agency hierarchy) of a federal banking agency with supervisory responsibility for a bank whose failure results in a loss to the federal deposit insurance fund (12 USC. §1831o(k)). Congressional hearings tend to follow in any case in which supervisory ineptitude or bad judgment is suspected.

Capital adequacy ratios under Basel I have been far from foolproof indicators of looming bank difficulties. Since an asset remains at book value until management makes the unusual and significant decision to set aside reserves for possible losses or to write off the asset completely, a capital

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50. Of course, the same information asymmetry would make outside detection of excessively stringent bank supervision harder. However, in such an eventuality bank management would have knowledge of the supervisory excess and an incentive to bring that excess to the attention of others—the examiners' superiors in Washington or sympathetic members of Congress, for example.

ratio can appear quite reassuring only weeks before serious difficulties develop for a bank. In this sense, the A-IRB approach promises some improvement in the external monitoring of banks. The more accurate assignment of an initial probability of default should make the capital ratio a more meaningful indicator of the quality of a bank's assets. The regular re-assessment of probability of default generated by credit risk models could provide earlier indications of potential trouble for classes of a bank's assets. Thus, capital ratios should be less misleading than under Basel I. However, as noted earlier, the very complexity of the A-IRB approach gives banks more opportunities to manipulate, or make mistakes during, calculation of their capital ratios. The potential difficulties of supervisors in detecting such problems have also already been mentioned. Similar difficulties will make evaluation of supervisory performance more difficult. A post-insolvency inquiry into supervisory performance, for example, will have a harder time detecting forbearance. Under Basel I, a capital ratio is, precisely because of its relative bluntness and simplicity, more straightforward to determine. But under the A-IRB model, it may be extremely difficult for an independent entity such as the Government Accountability Office to reconstruct the series of decisions and judgments that went into the creation and supervisory assessment of the credit risk model.

## **Common Language for Credit Risk**

Basel Committee officials have stated that the A-IRB regulatory model "will allow banks, supervisors and markets to communicate about risks with a common language" (Himino 2004, 41). The idea is that Basel II has created a standardized approach to quantitative risk measurement, which looks to the potential for future developments as well as reflecting the impact of past occurrences. This potential benefit is, of course, substantially dependent on the success of the A-IRB approach in steering banks to an accurate assessment of the risks posed by their credit exposures. Assuming success in this effort, a common language or risk could enhance bank safety and soundness both directly and indirectly.

A common language could be a useful supervisory tool even if Basel II does not achieve socially optimal regulatory capital levels, since its methodology could still reveal the relative soundness of internationally active banks and thus help to identify problem banks. Even though supervisors today presumably have access to banks' internal information pertaining to credit risk, that information may be difficult to compare across banks. The standardized Basel II categories and formulas could provide the basis for making these comparisons. This standardized information may be particularly important for bank agencies' assessment of foreign banks operating in their countries and for cooperative supervisory activities by agencies from multiple countries.

A common language of risk may also increase relevant information available to market actors—both investors in, and counterparties with, banks. The increased information flow may, in turn, indirectly contribute to bank safety and soundness in several ways. Like the data provided under securities laws, a common template for credit risk information may enable investors to evaluate the performance and prospects of banks more thoroughly and efficiently. In that event, the cost of capital for sounder banks should decline relative to that for banks whose exposures and capital positions are more troubling.<sup>51</sup> Conceivably, investors might even take action within corporate governance mechanisms to change management practices they find unduly risky.<sup>52</sup>

Before considering how likely these benefits are to be realized, it is worth pausing to consider why any form of government action is necessary in the first place—whether it be the creation of information templates for voluntary use or mandatory disclosure. The starting point for this explanation is that financial institutions appear to be among the most opaque of firms, as suggested by the finding that bond rating agencies diverge more in their ratings of banks and insurance companies than for any other kind of company (Morgan 2002). Although one might think well-capitalized banks have an incentive to reveal information that would reassure investors, there may be both collective action and internal incentive hurdles to this outcome.

As to collective action, banks obviously do reveal some relevant information but in a form that is not compatible with similar information published by other banks. No bank has the incentive to conform its information on its credit risk assessments, for example, to the methods used by other banks. A bank may also fear that disclosure of certain information would advantage its competitors sufficiently that its profits would be reduced more than any decrease in its cost of nondeposit borrowing. There may also be internal disincentives to information disclosure and dissemination. Bank management may be inclined to reveal only favorable information. Bank employees in trading, lending, or other operating units may not want their own management to have complete information, much less bank investors and counterparties. If their compensation is based on the imputed profitability of their own divisions, or even if they simply wish

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51. One Federal Reserve official closely involved in the development of Basel II suggested that the common language will also benefit bank counterparties, and thus banks as well. Hendricks (2004) argued that the common tools and vocabulary created by Basel II would, by overcoming a collective action problem impeding development of a common measure of risk, significantly advance the development of more liquid markets for the trading of credit risk.

52. The potential for more robust forms of market discipline over banks is explored more thoroughly in chapter 7.

to avoid increased scrutiny from senior management, they have an incentive to mask losses or risks.

Thus, there may be good reasons for supervisors both to create a common framework for sophisticated credit risk assessment and to require public disclosure of some of the information generated by that framework. Basel Committee officials believe that the IRB approaches of pillar 1 create the appropriate framework and that the disclosures required by pillar 3 assure that this framework is properly disseminated. However, there is disagreement as to the likely effectiveness of these disclosure requirements in facilitating market discipline.

Herring (2005, 283–84) characterizes the pillar 3 approach as “feeble,” for three reasons. First, he criticizes its omission “of considerable risk related data such as foreign/domestic currency breakdowns of assets and liabilities.” Second, he suggests that banks are given so many rules and implementation choices under the A-IRB model that, even with disclosure of all relevant underlying data, capital ratios across banks will not really be comparable. This point is an implicit rebuttal to the potential benefit of Basel II in creating a common language about bank risk, whether for supervisors or market actors.<sup>53</sup> Third, Herring doubts that disclosure can produce real market discipline because of the belief in markets that more than 400 internationally active banks have an “extremely high” or “high” probability of receiving external support. Thus, the incentives of market participants to exercise discipline over banks are limited.

A different view emerges from the analysis of Basel II by FitchRatings (2004, 15), which characterizes the disclosure requirements as “robust.” Even this upbeat assessment is qualified, however, by acknowledgement of the different approaches to risk management that lie behind the capital numbers. Moreover, the FitchRatings report does identify some issues concerning which disclosure is not explicitly required under Basel II, such as a bank’s evaluation of stress scenarios and its management of capital levels based on that evaluation. Standard and Poor’s appears not to share Fitch’s endorsement, insofar as it has released a detailed set of recommendations for bank disclosures that goes well beyond what is required by Basel II (Standard & Poor’s RatingsDirect 2007).<sup>54</sup>

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53. When CP-3 was released in 2003, an official of the Risk Management Association questioned the utility of the requirement that banks disclose the percentage of their credits falling into each probability of default category, on the grounds that banks will use different methods to arrive at their probability of default decisions. See Rob Garver, “Basel II’s Other Issue: Disclosure,” *American Banker*, May 5, 2003, 1. However, as reflected in Herring’s critique, that observation could apply to virtually all the disclosures required under pillar 3.

54. While indicating that the information required under pillar 3 would, “if consistent, risk focused, and sufficiently detailed,” promote greater market discipline, S&P identified “best practice” with respect to disclosure that goes beyond pillar 3 requirements. Notably, S&P’s additional items in the area of credit risk center around the very kinds of quantitative

As noted in chapter 4, the requirements are sufficiently unelaborated that we must wait for experience with actual disclosures to determine the real, rather than intended, scope of disclosure. Insofar as the banks successfully beat back some forms of disclosures proposed in CP-3, despite the importance attached to them by regulators,<sup>55</sup> there is some basis for skepticism that national regulators will lend a strong interpretation to the pillar 3 requirements. The relative lack of attention to pillar 3 is replicated in the proposed rule issued by the US banking agencies, which largely track the lists of required disclosures included in Basel II itself.

## Incentive to Improve Risk Management

A third potential benefit of the A-IRB model is that it serves as an incentive for banks to adopt sophisticated risk management techniques. Supervisors were concerned that the senior management of commercial banks no longer understood the risks being assumed in many parts of their firms' increasingly complex business, a concern more than borne out by the subprime crisis. Gone were the days when a bank CEO had a hands-on sense of the risks entailed in even a large bank's significant operations—mortgage, consumer, corporate, etc. With the growth in off-balance-sheet activities, the explosion in creative securitization and other financial innovations, and the erosion of barriers between commercial banking and other financial activities, even the most diligent senior management was inevitably unaware of the nature and scope of at least some significant risks.

Of course, even without a regulatory inducement, the large banks had developed or adopted the internal credit risk models that they pushed on the Basel Committee in the early stages of the Basel II process. Senior management touted their investments in sophisticated risk management techniques. Yet when working-level people from the supervisory agencies met with their counterparts in the risk management divisions of the large banks, they were surprised at what they learned. While attention was surely being paid to new risk management techniques, progress toward implementing them was considerably less than had been advertised.

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information that banks reportedly resisted having included in pillar 3. For example, S&P identifies the "amount of exposures at default, before and after risk mitigation, with a breakdown per risk bucket, the weighted average loss given default, and the associated regulatory capital requirements" (Standard & Poor's RatingsDirect 2007, 3).

55. For example, the CP-3 proposed requirement for disclosure of the percentage of credits falling into each probability of default category (Basel Committee 2003a, paragraph 775), mentioned in the preceding footnote, was strongly and successfully resisted by the banks. It does not appear in the final revised framework. Some supervisors contend that this is a particularly useful piece of data for investors because, even if the basis for ratings may differ among banks, it is the sort of information that would give informed observers of the industry a window into the bank's overall risk profile.

At first glance, the account of bank sluggishness in adopting sophisticated risk management systems may seem surprising. After all, a bank with a sound and profitable franchise should have had strong business incentives to take the steps necessary to preserve that franchise. Part of the explanation may lie in the simple fact that senior management is usually beset with problems of an immediate nature, where some influential actor or constituency is demanding action. In these circumstances, the medium-term imperative of improving risk management systems can easily slip from a list of management priorities. Also, of course, every organization faces competing demands for funds; the creation of a trading unit to participate in a new, high-return activity can easily win out over the investment of tens of millions of dollars or euros in upgrading risk management capabilities. As noted earlier, there is a divergence between the interests of the bank as a whole and the interests of its employees. The managers of operating divisions may not *want* their risks to be accurately assessed and managed. If their compensation is tied to their divisions' revenues or imputed profitability, they will have an incentive to engage in higher-risk, higher-return lending. In these circumstances, the risk manager is a decidedly unwelcome intruder.

This background helps explain what might otherwise have seemed an unusual statement in 2003 by Roger Ferguson, then vice-chairman of the Federal Reserve Board, to the effect that "Basel II, at least in its advanced form, is as much a proposal for strengthening risk management as it is a proposal for improving capital standards."<sup>56</sup> The Basel Committee became, in effect, an ally of risk managers within the large banks. By setting in motion a revision of capital standards that depended on implementation of a validated internal model and associated risk management systems, the committee gave risk managers strong arguments for more resources and priority within their own financial institutions. Indeed, staff of supervisory agencies reported privately that they had been told by some bank risk managers that it was important to keep setting deadlines for progress in order to keep the pressure on.

Significant anecdotal information suggests that the anticipation of Basel II requirements has indeed been an important factor in the acceleration of bank investment in credit risk management and risk exposure systems.<sup>57</sup> The aim of prompting improvements in bank risk management

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56. See Roger W. Ferguson, Jr., remarks at the ICBI Risk Management 2003 Conference, Geneva, December 2, 2003.

57. A nonscientific survey of financial services companies by Ernst and Young found that more than 60 percent of the respondents said that Basel II was either a primary or significant driver of their recent investment. Of course, the usual caveats about self-selection of respondents to such surveys fully apply. The results of the survey are summarized in Peter Davis and Jorg Behrens, "Commercial Bankers See the Bright Side of Basel II," *American Banker*, April 2, 2004, 11. In the intervening years, following publication of the revised framework,

has taken its place alongside achieving better calibrated capital requirements in the standard justification for Basel II offered by central bankers and regulators.<sup>58</sup> Of course, the concomitant promise of lowered capital requirements for banks qualifying for the A-IRB approach provided an incentive that was presumably agreeable to bank management. As recounted in the previous chapter, the carrot appears to have grown ever larger during the Basel II process, while the stick remained the same size. Mindful of this trend and other criticisms of the A-IRB approach, some observers suggested only half-facetiously that the aim of Basel II to get banks to spend more on risk management had been achieved, and thus there was no need to implement the revised framework.

In sum, Basel II has generated increased attention to understanding bank risks and to techniques for managing them—at least among supervisors and senior bank management. With that attention has come increased investment in risk management systems. These developments are clear benefits flowing from the Basel II process. It is much less clear whether these benefits are worth the reduced levels of regulatory capital that will be required for many banks under the revised framework and the complexity inherent in the A-IRB approach. Nor is it clear whether such reductions are necessary to encourage a process of continual risk management improvement.

## **Potential Negative Effects of the Advanced Internal Ratings–Based Model**

In addition to questions about the effectiveness of the A-IRB model in achieving its promised benefits, interested parties and commentators have identified two potentially significant drawbacks—exacerbation of the inherently procyclical effects of capital regulation and competitive disadvantaging of non-IRB banks. The former is, of course, not intended by the committee. While the committee did not set out to advantage one group of banks over another, the very fact that it has devised three different methods of capital regulation opens that possibility. In any case, there is disagreement over the likely magnitude of both these effects. Moreover, because the criticisms were raised early in the Basel II process, the

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bank investments in risk management have presumably been driven by the need to prepare for the Basel II transition. The state of such preparation is generally regarded as somewhat slower than anticipated. The absence of certain relevant categories of data from recent trial runs of the Basel II standards in QIS-4 and QIS-5 lend credence to the inference that banks are not yet prepared to implement the A-IRB approach.

58. See Malcolm D. Knight, “Global Banking: Paradigm Shift—Managing Transition,” speech to the Federation of Indian Chambers of Commerce and Industry—Indian Banks’ Association Conference, Mumbai, September 12, 2007.

committee was able to respond so as to mitigate—though not eliminate—these unintended but foreseeable consequences of an IRB approach.

## Macroeconomic Consequences

The Basel II model has prompted considerable academic discussion of whether it will exacerbate the procyclical effects induced by capital adequacy regulation. Chapter 3 explained why capital adequacy requirements have long been suspected of increasing the procyclical tendencies that are inevitable in lending patterns. There has been an extended debate as to whether Basel I itself had such an effect, particularly in amplifying the severity of the 1990–91 recession that followed close on the heels of Basel I implementation. As noted earlier, capital requirements such as those of Basel I appear to have a measurable effect on certain categories of borrowers, but the extent of macroeconomic effects remains uncertain.

The worry about Basel II is that three features of the A-IRB approach may lead to more pronounced procyclical impacts.<sup>59</sup> First, the very use of internal models is intended to lead to greater sensitivity to changes in the credit risk of a bank's assets. The models required by A-IRB look out one year to determine the probability of default on a loan. The revised framework specifies that ratings be updated at least annually, with more frequent assessments for higher-risk borrowers or when relevant new information is received.<sup>60</sup> During a recession, ratings will reflect the increased probability of default in that relatively short time frame and thus lead to higher capital charges. This contrasts with both Basel I, which assigns a loan to a risk bucket and makes no further adjustment unless a significant adverse judgment or event occurs, and with the standardized approach of Basel II, which uses external credit agency ratings. The latter are assigned with some attention to the creditworthiness of the firm through an entire business cycle and thus are less sensitive to macroeconomic variations (although at the cost of being necessarily less sensitive to actual risk at any given moment).

A second concern is that the inclusion of loss given default as a key parameter may have an amplification effect, both because the condition of a defaulting borrower may be more dire during a recession and because the

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59. Goodhart, Hofmann, and Segoviano (2004) place Basel II in historical perspective in arguing that banking sector liberalization and capital adequacy requirements have already increased the procyclicality of bank lending and that Basel II will considerably accentuate these trends.

60. Basel Committee (2004c, paragraph 425). In their initial joint advance notice of proposed rule-making on Basel II, US banking agencies also mandated that banks have a policy that requires a dynamic ratings approval ensuring that obligor and loss severity ratings reflect current information (US Department of the Treasury Office of the Comptroller of the Currency et al. 2003, 45, 956).

value of collateral may have diminished owing to a general decline in the prices of certain assets. If internal models reflect an expectation that losses during economic downturns will not only occur more frequently but will be on average larger,<sup>61</sup> the result would be still greater capital charges.<sup>62</sup> Third, the disclosure requirements under pillar 3, modest though they may be, could themselves affect bank behavior, as management considers the impact on investors and counterparties of information about deteriorating capital ratios. Cumulatively, these factors might increase capital charges sufficiently that, when combined with reductions in capital caused by actual losses, capital ratios will decline close to (or, conceivably, below) the regulatory minimum. Bank management would then be constrained from lending even to some borrowers that appeared creditworthy.

The scenario just hypothesized should not be misunderstood to reflect unanimity that Basel II will appreciably increase the procyclicality of capital requirements. While Estrella (2004); Goodhart, Hofmann, and Segoviano (2004); Kashyap and Stein (2004); Pennacchi (2005); and Persaud (2008) all find reasons to believe that procyclicality may be considerably exacerbated, Gordy and Howells (2006) and Saurina (2008) are skeptical that Basel II will have significant marginal procyclical effects. Allen and Saunders (2004), though concluding that credit risk models are likely to have a procyclical bias, hypothesize that this effect may be offset to some degree at large financial institutions by the countercyclical bias of market risk models. Policymakers have also argued that, by inducing banks to have better risk assessment management systems, Basel II will have a dampening effect on the naturally procyclical behavior of banks.<sup>63</sup>

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61. In questioning whether the loss-given-default parameter will exacerbate procyclicality, Gordy and Howells (2006) cite two studies noting the tendency of banks to improve their collateral position on troubled loans. If these findings were generalized, they would suggest that the loss given default might decrease as probability of default increases, rather than the two variables moving in the same direction. However, a review of the literature by Allen and Saunders (2004) casts doubt on whether this is the case. They find a “growing consensus” that loss given defaults are correlated with probability of defaults, such that losses tend to increase as defaults do. Whether that consensus is well founded is another question—a more prudent position might be that the data are sufficient to draw only tentative conclusions.

62. The revised framework suggests that loss-given-default values will be calculated based on something approaching a through-the-business-cycle basis and thus be less susceptible to procyclical fluctuation (Basel Committee 2004c, paragraphs 472–473). However, adjustments to loss given default are clearly contemplated (Basel Committee 2004c, at paragraphs 485–487); depending on how these adjustments are made by banks, they could effectively weight recent experience more heavily. Here, as with so many things in Basel II, the outcome will depend on a combination of bank discretion and supervisory oversight.

63. See Saurina (2008); see also Jaime Caruana, “Basel II—A New Approach to Banking Supervision,” remarks at the Fourth Annual International Seminar on Policy Challenges for the Financial Sector, Washington, June 1, 2004; and José Viñals, “Procyclicality of the Financial System and Regulation,” speech at the Conference on Managing Procyclicality of the Financial System, Hong Kong, November 22, 2004.

Furthermore, in response to questions about procyclicality effects following the Basel Committee's new emphasis in CP-2 on the internal models approaches, the committee made several changes that were included in CP-3 and, ultimately, the revised framework.<sup>64</sup> Most importantly, the risk-weighting formulas were modified with an eye to procyclicality concerns. The asset correlation parameters decline with increases in probability of default, thereby reducing the speed with which capital requirements increase as the probability of default rises. Flattening the curve in this way should mitigate procyclicality effects. Second, Basel II includes as one of the many requirements to qualify for an IRB approach that a bank have sound stress-testing processes in place that, among other things, consider the impact of "economic or industry downturns" (Basel Committee 2006g, paragraph 434). In pillar 2, supervisors are enjoined to determine the capital level of each bank with an eye to external risk factors "such as business cycle effects and the macroeconomic environment" (Basel Committee 2006g, paragraph 752). The implication is that, in implementing the pillar 2 principle that supervisors should expect banks to generally operate above minimum capital levels, these supervisors will require additional capital where indicated by the results of these stress tests.<sup>65</sup> A third change, emphasized by policymakers such as Jaime Caruana,<sup>66</sup> was to prod—though not exactly require—banks to use a longer-term horizon in assigning risk ratings, so as to take into account the effects of economic downturns on creditworthiness.<sup>67</sup> That is, the committee has tried to incorporate into the IRB approaches an element of the through-the-cycle ratings practice reflected in the standardized approach because it relies on ratings from external agencies.

Of course, these changes are not without costs of their own. Flattening the risk curve makes capital requirements less sensitive to the actual risk assumed by a bank in extending credit at a particular point in time and

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64. To investigate this issue, the Bank for International Settlements (BIS) convened a conference in March 2002 on "Changes in Risk Through Time." The conference included central bankers, supervisors, academics, and market participants. It prompted several BIS studies such as Allen and Saunders (2003) and Amato and Furfine (2003), led to some of the recent published academic work on this question, and influenced the modifications in the IRB approaches described in the text.

65. The UK Financial Services Authority (2006) has proposed an approach for doing just that in appropriate circumstances.

66. See Jaime Caruana, "Monetary Policy and Basel II," speech at the 33rd Economics Conference, Vienna, May 13, 2005.

67. Paragraphs 414–416 of the revised framework state that "banks are expected to use a longer term horizon in assigning ratings" and give several alternative methods for banks to do so (Basel Committee 2006g). The extent to which this expectation is implemented is clearly a matter of national supervisory discretion. The committee had considered requiring through-the-cycle ratings but, prior to publication of the revised framework, softened this obligation.

thereby widens the gap between economic and regulatory capital. That is, experience tends to show that default correlation *increases* as the probability of default increases.<sup>68</sup> Using the results of bank stress-testing to raise capital requirements again lodges considerable importance in a process that has never been tested by a serious economic downturn. Gordy and Howells (2006) argue that through-the-business-cycle ratings destroy the cross-temporal comparability of the IRB capital requirement and, accordingly, prevent market participants from inferring changes in bank portfolio risks from capital ratios.

Disagreement as to the macroeconomic effects of capital ratio changes underscores the degree to which the A-IRB approach will be a real-world experiment whose consequences are uncertain. A staff paper for the UK Financial Services Authority (2004) concluded that the “worryingly high” degree of volatility inherent in the pillar 1 requirements will be reduced by a combination of rating approaches that produce less cyclical estimates of probability of default and loss given default and the fact that some parts of bank portfolios are likely to be considerably less procyclical. On the other hand, the staff paper acknowledged that the problem was potentially a very serious one, in part because banks themselves generally unable to measure the impact in their own ratings systems. Later, even as the UK Financial Services Authority issued a proposal on additional capital charges as a buffer against cyclical downturns, it noted that the debate over potential macroeconomic effects of Basel II remains “lively and unresolved” (UK Financial Services Authority 2006, 84). More light could be shed on the issue by supervisory simulation of how Basel II would have affected capital requirements had it been in place in 2007, as the subprime mortgage crisis hit, and thereafter, as economic growth slowed, particularly in the United States.

The fact that there is debate over the procyclicality issue is modestly reassuring. Although the strengthening of procyclical effects by Basel II would be an unintended consequence of a regulatory change, at least it would not be an unanticipated one. A key question is whether the procyclicality question is best understood as another example of the trade-off between prudential concerns and economic growth concerns that is implicated in capital requirements more generally. If so, the procyclicality concern resembles many issues that arise in economic regulation, where the optimal trade-off between two social desiderata is difficult to determine with any precision. On the other hand, events leading up to the subprime crisis raise the possibility that the amplification of procyclicality effects in the A-IRB approach in itself poses a problem for prudential policy, quite apart from macroeconomic concerns. If, for example, the relatively small

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68. Evidence for this proposition applied to retail lending is found in several papers included in a special issue of the *Journal of Banking and Finance*—Allen, DeLong, and Saunders (2004); Cowan and Cowan (2004); and Deitsch and Petey (2004).

risk associated with residential mortgages in a prolonged rising housing market results in low capital requirements for mortgages written over a number of years (and securities backed by such mortgages), then a sudden and sustained downturn in the market may not provide banks sufficient time to build capital in response to the substantially increased riskiness of their mortgage assets.

Supervisors will be watching the procyclicality effects of Basel II as the new regime is implemented. The Basel Committee has charged one of its subgroups with sharing information on the impact of cyclicalities on capital requirements<sup>69</sup> and, as part of the supervisory response to the subprime crisis, has indicated it will analyze the data that becomes available by the end of 2008 to determine if further calibration is needed (Financial Stability Forum 2008, 15). In fact, there has already been considerable thought given to mechanisms that could mitigate procyclical effects without sacrificing too much risk sensitivity. One suggestion is to use a different risk curve formula for capital requirements depending on the state of the economy (Kashyap and Stein 2004). Thus, for example, a negative GDP growth rate would automatically reduce capital requirements, which would rise during periods of robust GDP growth. Another, related idea is for an autoregressive rule that would directly smooth the output from the capital formula during a recession (Gordy and Howells 2006). A third suggestion is to rely more on risk-based deposit insurance premiums and less on capital requirements (Pennacchi 2005). A fourth is to use accounting rules to impose a countercyclical loan-loss provision (Jiménez and Saurina 2006).

These and other solutions are not without their own problems (e.g., the lag time before accurate indicators are available for applying a “recession” formula), but one can at least imagine solutions consistent with the basic paradigm. However, any such solution would at a minimum further complicate an already complicated set of capital rules. Additionally, as will be discussed in chapter 6, many of these possible modifications to the A-IRB approach seem ill-suited to the international features of Basel II.

## Competitive Equality

As soon as the Basel Committee proposed three methods for calculating regulatory capital, the question immediately arose whether different classes of banks within a national regulatory system would be competitively advantaged (or disadvantaged). As the IRB approaches were progressively modified so as to lower capital requirements, smaller banks became increasingly concerned that they would be disadvantaged relative to

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69. Benford and Nier (2007) describe the exercise initiated by the UK Financial Services Authority and the Bank of England to monitor changes in capital requirements associated with business-cycle fluctuations as Basel II is implemented by British banks.

banks using an IRB approach. Under Basel I, every bank must set aside the same amount of capital for a loan of a particular amount to a particular customer. Because the A-IRB approach requires less capital for many loans or classes of loans than required under Basel I and the standardized version of Basel II, the large banks using A-IRB will enjoy lower regulatory costs in making those loans.<sup>70</sup> Thus, for example, the capital requirements for many residential mortgages and for extensions of credit to many established commercial firms drop significantly under an A-IRB approach. Smaller banks that find it economically infeasible to spend the resources necessary to establish and qualify an internal model system of risk assessment fear their ability to compete on such products will be compromised.

Numerous consequences might ensue. First, and most obviously, non-A-IRB banks could suffer a drop in revenues and profits, as they are priced out of certain lines of business.

Second, non-IRB banks could become attractive takeover targets for A-IRB banks. The former could see their profitable business opportunities decline even as the latter enjoy increases in their unencumbered capital immediately following implementation of Basel II. QIS results to date suggest that the mere fact of acquisition by an A-IRB bank would significantly lower the capital requirements associated with a non-IRB bank's portfolio of assets, instantly making these assets more valuable in the hands on an A-IRB bank.<sup>71</sup> While a further decline in the number of banks in the United States seems inevitable,<sup>72</sup> it may not be desirable to promote this decline through regulatory factors unrelated to efficiency.

Third, non-IRB banks may adapt by taking on more high-risk assets. A larger concentration of low-quality assets in smaller banks need not inherently decrease the safety and soundness of those institutions. Adequate diversification within the higher-risk category and adequate premia to account for the higher credit risk would in theory contain any risk to bank solvency. Alternatively, the banks could accept greater degrees of

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70. As discussed below, the situation is further complicated by the fact that the foundational IRB approach yields significantly different capital requirements for some portfolios than does the A-IRB approach. This complication will not apply in the United States, which will not permit its banks to elect the foundational approach.

71. In Europe, there have been suggestions that banks adopting an IRB approach may also find themselves takeover targets. The reasoning behind this suggestion is that banks with substantial amounts of business in areas where capital requirements will decline most—such as mortgages—will find themselves with increased capital buffers that they are not able to draw down quickly through profitable lending opportunities. Because supervisors may discourage distributions to shareholders that appear directly tied to reduced regulatory capital requirements, these banks may become attractive targets for banks that could quickly take advantage of the capital buffer through additional lending.

72. In the last 20 years, the number of community banks in the United States has been halved from 14,000 to 7,000, while the proportion of deposits held by the 10 largest banks has more than doubled, from 16 to 40 percent.

interest rate risk by using short-term deposits to fund fixed-rate mortgages. However, history is sobering on these points. The notorious savings and loans problems of the 1980s developed in an environment in which the institutions were taking on higher-risk assets and greater interest rate risk, at least partly in response to the higher costs they encountered following the deregulation of depositor interest rates. Quite apart from any conscious strategy based on moral hazard (or outright fraud) by managers of these institutions, experience in managing a riskier portfolio appears to have come more slowly than the shift in the portfolio itself.

Fourth, it is possible that higher-risk lending will migrate not to Basel I banks but outside the regulated banking sector entirely. This may or may not be an appropriate outcome from the perspective of bank safety and soundness alone, though recent events give grounds for concern. In any case, such migration could well exacerbate problems in other areas such as consumer protection, a possibility illustrated by the widespread abuses in subprime lending that substantially predated the 2007 crisis.

Fifth, some regional and community banks express concern that non-IRB banks will be regarded as “second tier” by relevant investors, external credit-rating agencies, and sophisticated customers.<sup>73</sup>

These theoretical possibilities raise two questions. First, how likely are they to be realized in a significant way? Second, would such effects on net be undesirable?

As to the likelihood of significant effects, only the first two mentioned above have been the object of empirical work. The last three are obviously very difficult to quantify, in part because much depends on the reactions of supervisors, other governmental authorities, and market actors. A shift to higher-risk assets and consumer problems associated with the migration of lending to unregulated sectors could be prevented or contained with appropriate government responses, though perhaps not until significant harm has already been done. The fifth concern—the potential for second-class status for non-IRB banks—seems particularly speculative. Even with respect to the first two effects, which are susceptible to some quantitative analysis, there has been relatively little empirical work to date, perhaps because the A-IRB formulas changed repeatedly during the Basel II process and, as evidenced by the QIS exercises, the effects of the final formulas have been difficult to pin down. Still, as a rough starting point, the QIS-5 study reinforces expectations that the three approaches could yield very different

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73. There may also be competitive consequences among A-IRB banks. For example, a loan of the same terms and amount to the same customer could yield different risk weights depending on the model and experience ratings of two different A-IRB banks. This regulatory anomaly may need to be addressed in cases of syndicated loans, for example, and it may rankle IRB financial institutions. The QIS results discussed earlier revealed just such anomalies. Conceivably, though, a sufficiently refined IRB system might be able to limit pronounced, non-random competitive effects arising from the bank-specific character of A-IRB risk weighting.

capital requirements for similar portfolios (Basel Committee 2006d). For example, results for the large banks likely to adopt the A-IRB approach showed that they could hold nearly 20 percent less capital under the A-IRB model than would be required under the standardized approach.

The potential competitive inequities in most Basel Committee (and many noncommittee) countries are mitigated to some degree by the availability of the foundational internal ratings-based (F-IRB) approach. Mid-sized banks appear ready to adopt that approach in substantial numbers. Since the greater differences in capital requirements for certain classes of assets seem to be between the F-IRB and standardized approach, these banks can likely avoid too great a disadvantage with the largest banks in lending arenas in which they compete head-on. In the United States, where the only choice is between the A-IRB and a standardized approach, the competitive inequalities are potentially greater.

Such work as has been done on effects in the United States comes mostly from current or former researchers at the Federal Reserve Board.<sup>74</sup> The lending markets in which direct and significant competition between very large and smaller banks has been investigated are small and medium-sized enterprise lending and residential mortgage lending.<sup>75</sup> Berger (2006) concludes that smaller banks do not in general compete with very large banks for the same kinds of small and medium-sized enterprise lending but that larger non-A-IRB banks may indeed be disadvantaged vis-à-vis A-IRB banks.<sup>76</sup> This study finds that community banks tend to make loans to small and medium-sized enterprises based on

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74. This fact in itself is interesting. It may result from the greater institutional incentives of the Fed to address these questions in light of current policy controversies, notwithstanding the difficulties in projecting effects with so many remaining uncertainties. Specifically, Executive Order 12866 requires federal agencies to prepare a regulatory impact analysis for “significant regulatory actions.” The output from Fed researchers may also reflect their opportunity to gain access to the raw data in the QIS studies. Interestingly, there seems to have been significantly more research in Europe on the issue of differential capital treatment under the different Basel II methodologies. Most of that research has been directed at lending to small and medium-sized enterprises, rather than at mortgage lending, perhaps a reflection of the relatively lesser degree of importance of mortgage lending in many continental European countries relative to the United States. One recent paper attempts a cross-country comparison of the impact of Basel II on small and medium-sized enterprise lending in Australia, Italy, and the United States (Altman and Sabato 2005).

75. One study, also by Fed researchers, suggests that capital requirements for credit card lending could be *lower* under the standardized than under the A-IRB approach (Lang, Mester, and Vermilyea 2007). However, the study notes that few smaller banks do much credit card business. The difference could be significant for those regional banks that will use the standardized approach, although this advantage will likely be outweighed by the disadvantages in other forms of exposures.

76. Although the Berger paper on small and medium-sized enterprise credit markets was not published until 2006, an earlier version was released as a Federal Reserve Board working paper in 2004.

classic “relationship” criteria such as local information, familiarity with the firms’ executives, and the like. On the other hand, larger banks that will not adopt the A-IRB approach rely principally on financial information for such lending, just as the A-IRB banks do.

There is direct competition among banks of all sizes for mortgage lending. Here, again with a very limited amount of work in hand, the evidence is mixed. Two papers come to somewhat different conclusions. Calem and Follain (2005) project that the differential between A-IRB banks and other banks in capital requirements for high-quality mortgages will translate into a cost advantage of approximately 10 basis points for the A-IRB banks. They predict on this basis that A-IRB banks will gain between \$116 million and \$279 million in annual profits, while other banks will lose between \$655 million and \$880 million (the negative sum character of this outcome being attributable to increased consumer surplus from the greater competition). Hancock et al. (2005) question whether a 10 basis point differential will matter much in the mortgage market, where rates customarily are quoted in increments of one-eighth of a percentage point, or 12.5 basis points. More importantly, they assert that the effective capital rate for much of the US mortgage market is already lower than Basel I levels because of the huge presence in that market of government-sponsored enterprises such as Fannie Mae, which have considerably lower capital requirements.<sup>77</sup>

Reviewing both studies, Flannery (2006) cautions against drawing any firm conclusions, particularly if the leverage ratio remains in place. He inclines toward the view that the cost advantage of A-IRB banks will have some effect on the market. He hypothesizes that smaller banks able to do so may respond by shifting their mortgage portfolios to include some less creditworthy but higher-yielding mortgages. Because Basel I standards apply the same capital charge to all residential mortgages, no matter what their creditworthiness, this strategy would allow the smaller banks to lower their effective capital requirement for mortgages. Flannery notes both that some smaller banks may not be able to make these sorts of loans successfully and that there are supervisory implications for banks that *can* rebalance their portfolios. He also finds that the government-sponsored enterprises are likely to be net losers when large banks adopt the A-IRB approach.<sup>78</sup>

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77. Capital requirements for government-sponsored enterprises such as Fannie Mae will almost certainly increase in the wake of the subprime crisis and the remedial legislation passed by Congress in July 2008. However, they are currently so much lower than those of commercial banks that a gap is likely to remain.

78. Mortgage markets, including the role of the government-sponsored enterprises, will very likely look quite different after the subprime crisis is fully resolved than they did beforehand. These changes could themselves affect the relative importance of the factors discussed by the studies mentioned in the text.

As to the possibility that nonadopting banks will become takeover targets of A-IRB banks, a study by Federal Reserve Board staff concluded that the new capital standard was unlikely to accelerate the pace of bank takeovers (Hannon and Pilloff 2004). The authors note that capital regulation has rarely been cited as an incentive for bank acquisitions in the past and infer that it must not be considered significant by industry actors. Based on an examination of the acquisition propensities of highly capitalized banks in the past and the effects of binding leverage ratios imposed under the prompt corrective action legislation, they find no statistically significant correlation between capital standards and acquisitions. As noted by Flannery (2006), however, the Basel II delineation of fundamentally different capital standards for different banks is a substantially different circumstance than those studied by Hannon and Pilloff. Thus we are left much where we began—with intuitions but little hard evidence.

In the absence of convincing evidence pointing one way or the other on the ultimate question of whether smaller banks will be greatly disadvantaged in practice, it is reasonable to ask whether, if some of these effects on nonadopting banks do become apparent, they should be considered a serious problem with the A-IRB model. Competitive equality concerns have traditionally played an important role in US banking policy—as between state and national banks, banks and nonbanks, and US and foreign banks. Similar concerns exist in some other countries. In Germany, the impact of regulations on the *lander* banks is a matter of considerable political, as well as economic, importance. Of course, so long as there is a balkanized system of bank regulation, conditions of competition among different classes of banks can be made truly equal only by eliminating the discretion of chartering and supervisory authorities to modify their regulations independently of other authorities. The phenomenon of competition among chartering and supervisory authorities in the United States is well known, both between state and federal authorities and between the federal banking agencies.

With respect to regulatory differences that correlate with the size of banks today, there is something to be said for the proposition that certain differences are appropriate. A community bank and Citibank may both take insured deposits and make loans, but the similarity essentially ends there. While they may compete for deposits to some degree, their competition for assets—with the important exception of residential mortgages—is relatively circumscribed. They generally function in different product markets. Citibank's activities include foreign sovereign lending, large syndicated loans, writing swaps, and many other activities beyond the capability of even the best run and most profitable community bank.

There are regulatory differences as well. The failure of a very large bank would pose a threat of systemic effects. Smaller banks fail nearly

every year, sometimes creating losses for the federal deposit insurance fund but no risk to the financial system. Because of systemic risk concerns and the enormous complexity of a money-center bank's operations, the federal banking agencies have developed special systems for supervising the biggest banks. The Federal Reserve Board has, in conjunction with other federal regulators, developed a program for supervising "large, complex banking organizations" (DeFerrari and Palmer 2001). The Office of the Comptroller of the Currency divides its supervisory operations into two lines, one for the 24 largest national banks and another for all other national banks. Among other things, teams of supervisors are essentially permanently on site at the largest banks, whereas smaller banks are examined on site only once a year. The FDIC has considered reforms that would bifurcate the federal deposit insurance system. Large banks' premiums would reflect systemic risk factors but not the costs of closing small banks, whereas smaller banks' premiums would reflect the closure costs but not systemic risk premia. Thus, in keeping with the general norm that equal treatment means treating similarly situated actors equally, it is not at all clear that banking law should avoid all differentiation between large and small banks.

It would be a misguided public policy that declined to adopt an effective regulatory model for the largest banks only because it was not appropriate for smaller banks. But, as US regulators have found, it is politically misguided to ignore the potential for significant differences in capital requirements associated with particular forms of lending. Furthermore, with respect to the anticipated large reductions in capital requirements for mortgages under the A-IRB approach, for example, smaller banks rightly point out that the stakes are not abstract notions of competitive equality but a very real competitive advantage in a particular lending market. As a matter of policy, it seems difficult to justify imposing significant regulatory disadvantages on smaller banks in markets where they otherwise *could* compete with larger institutions.

It is perhaps a testament to the influence of community banks in Congress that their potential competitive disadvantages were addressed by the federal banking agencies before they even tried to move forward with implementation of the A-IRB approach. They first proposed a so-called Basel IA for nonadopting banks that would, among other things, reduce capital requirements for residential mortgages (US Department of the Treasury Office of the Comptroller of the Currency et al. 2006b). In 2007 they dropped this plan in favor of developing a revised standardized approach, which will presumably include lowered risk weightings for a number of asset classes, in part to avoid too much asymmetry in capital requirements for similar portfolios. Thus, the most contentious competitive equality point raised in domestic implementation of Basel II may eventually be resolved but at the cost of lowering the capital requirements for all banks, not just the A-IRB banks. This is one example of the down-

ward pressure on regulatory capital levels in general that has been created by the Basel II process.

## Conclusion

Two core aims of Basel II are unqualifiedly desirable: to align capital requirements more closely with the risks actually assumed by banks, and to continuously prompt banks to adopt the best-available risk management practices. However, the potential of the Basel II A-IRB proposal to achieve those aims is questionable. This approach entails a major change in the method for calculating capital requirements for the most systemically important banks. Yet the impact of this change on actual capital levels is not understood. Moreover, while most supervisors seem accepting of at least moderate declines in A-IRB bank capital levels, they have provided no analysis of why they believe current bank capital levels to be unnecessarily high.

Of equal concern, the A-IRB model is at the same time enormously complex, full of opportunities for bank and national supervisory discretion and only indirectly related to the state-of-the-art risk evaluation and management systems actually used by banks for business purposes. The latter feature may present an opportunity for a different form of regulatory arbitrage—one based on shaping the IRB process for regulatory purposes. Thus, there seems a disconcerting possibility that the Basel II approach has given us the worst of both worlds—a highly complicated and impenetrable process (except perhaps for a handful of people in the banks and regulatory agencies) for calculating capital but one that nonetheless fails to achieve high levels of actual risk sensitivity. Finally, the entire process raises serious problems of practical administration that must be overcome if the putative benefits of the A-IRB approach are to be realized. Financial innovations and experience with existing forms of exposure will require frequent parameter adjustment. The tasks of monitoring banks and supervisors are difficult enough in the unusually opaque world of financial intermediaries. The A-IRB model elevates these problems of technical adjustment, bank compliance, and supervisory accountability to new levels.

Basel Committee officials often respond to criticisms of Basel II by asserting that the pillar 1 capital calculations are only a part of the overall regulatory model. They point to the pillar 2 emphasis on supervision of bank risk management systems and, less frequently, to the pillar 3 disclosure requirements. One can agree that both these emphases are desirable without accepting the conclusion that the A-IRB approach as a whole is an appropriate regulatory model. Indeed, not only are the capital rules important in themselves, but the overwhelming amount of attention devoted to them in the last decade may have come at the expense of developing more innovative supervisory methods and market disciplines.

Ultimately, the most optimistic appraisal of the approach may be that it rests on an expectation that bank regulators will successfully adapt their supervisory techniques to make workable a scheme that is at once complex, ambiguous, and opaque. Whether that expectation is reasonable enough to justify what is in many respects a leap into the regulatory unknown is questionable. Given the emphasis on national competitive advantage that emerged during the Basel II negotiations, it is at least uncertain whether supervisors could—in normal times—muster the will and political insulation that would be necessary to vigorously exercise the supervisory authority referenced in pillars 2 and 3. The subprime crisis will, in the near term, likely create the conditions for strong supervisory action. As with the Latin American debt crisis that gave rise to Basel I and the savings and loan crisis that gave rise to prompt and corrective action requirements of US law, this most recent financial crisis will for a time give supervisors the political backing necessary to take strong positions on prudential issues. But, precisely because Basel II relies so heavily on continuous supervision rather than more traditional rule enforcement, the eventual dissipation of a sense of crisis could—unlike the earlier events—effectively preclude any lasting regulatory effect.

In sum, as a domestic regulatory model, the A-IRB approach as it emerged from the Basel II process may create as many problems as it solves. But to end this chapter where it began, this skepticism is only a partial rejoinder to the Basel Committee's conclusion that, on balance, Basel II is the best practically available approach to bank regulation. The next chapter addresses its merits as a critical part of an international arrangement, and the following chapter considers whether there is a more attractive alternative regulatory model.

## Appendix 5A

**Table 5A.1 Risk-weighted capital (RWC) ratios of 10 largest US banks, 1992–2006**

| 1992                    |       | 1993                    |       |
|-------------------------|-------|-------------------------|-------|
| Bank                    | Ratio | Bank                    | Ratio |
| Citibank                | 9.37  | Citibank                | 11.13 |
| Bank of America         | 10.83 | Bank of America         | 11.89 |
| Chemical Bank           | 10.67 | Chemical Bank           | 12.48 |
| Morgan Guaranty         | 12.68 | Morgan Guaranty + A25   | 11.85 |
| Chase Manhattan         | 10.66 | Chase Manhattan         | 12.24 |
| Bankers Trust           | 12.29 | Bankers Trust           | 13.47 |
| Wells Fargo             | 11.03 | Wells Fargo             | 14.14 |
| Home Savings of America | 12.99 | Home Savings of America | 12.52 |
| Bank of New York        | 11.39 | PNC Bank                | 10.91 |
| Great Western Bank      | 10.54 | NationsBank of Texas    | 8.82  |

  

| 1994                           |       | 1995                           |       |
|--------------------------------|-------|--------------------------------|-------|
| Bank                           | Ratio | Bank                           | Ratio |
| Citibank                       | 12.68 | Citibank                       | 12.24 |
| Bank of America                | 11.75 | Bank of America                | 11.28 |
| Chemical Bank                  | 11.86 | Chemical Bank                  | 11.49 |
| Morgan Guaranty Trust          | 12.78 | Morgan Guaranty Trust          | 11.24 |
| Chase Manhattan                | 12.23 | Chase Manhattan                | 11.74 |
| Bankers Trust                  | 13.31 | NationsBank                    | 10.20 |
| Home Savings of America        | 12.17 | Bankers Trust                  | 13.21 |
| Wells Fargo                    | 12.70 | Home Savings of America        | 12.42 |
| PNC Bank                       | 10.63 | First National Bank of Chicago | 11.28 |
| First National Bank of Chicago | 12.51 | Wells Fargo                    | 13.27 |

  

| 1996                           |       | 1997                  |       |
|--------------------------------|-------|-----------------------|-------|
| Bank                           | Ratio | Bank                  | Ratio |
| Chase Manhattan                | 11.36 | Chase Manhattan       | 10.75 |
| Citibank                       | 12.12 | Citibank              | 12.18 |
| Bank of America                | 10.98 | Bank of America       | 11.30 |
| Morgan Guaranty Trust          | 11.72 | NationsBank           | 10.98 |
| Wells Fargo                    | 11.72 | Morgan Guaranty Trust | 10.91 |
| Bankers Trust                  | 13.25 | First Union           | 10.20 |
| NationsBank                    | 10.41 | Bankers Trust         | 12.36 |
| PNC Bank                       | 10.39 | Wells Fargo           | 11.18 |
| Bank of New York               | 10.26 | PNC Bank              | 10.55 |
| First National Bank of Chicago | 11.18 | Keybank               | 11.00 |

*(table continues next page)*

## Appendix 5A

**Table 5A.1 Risk-weighted capital (RWC) ratios of 10 largest US banks, 1992–2006** *(continued)*

| 1998                  |       | 1999                  |       |
|-----------------------|-------|-----------------------|-------|
| Bank                  | Ratio | Bank                  | Ratio |
| NationsBank           | 10.27 | Bank of America       | 10.90 |
| Citibank              | 12.60 | Chase Manhattan       | 11.04 |
| Chase Manhattan       | 11.28 | Citibank              | 12.35 |
| Bank of America       | 10.81 | First Union           | 10.22 |
| First Union           | 10.43 | Morgan Guaranty Trust | 12.17 |
| Morgan Guaranty Trust | 12.14 | Washington Mutual     | 11.15 |
| Washington Mutual     | 12.11 | Wells Fargo           | 11.22 |
| Bankers Trust         | 13.38 | Bank One              | 11.48 |
| Wells Fargo           | 11.20 | Fleet                 | 10.38 |
| Fleet                 | 10.84 | HSBC                  | 18.08 |

  

| 2000                  |       | 2001              |       |
|-----------------------|-------|-------------------|-------|
| Bank                  | Ratio | Bank              | Ratio |
| Bank of America       | 10.85 | Bank of America   | 12.55 |
| Citibank              | 12.66 | JPMorgan Chase    | 11.20 |
| Chase Manhattan       | 10.88 | Citibank          | 13.60 |
| First Union           | 10.73 | First Union       | 11.68 |
| Morgan Guaranty Trust | 12.31 | Washington Mutual | 10.93 |
| Fleet                 | 11.49 | Fleet             | 10.57 |
| Washington Mutual     | 11.36 | U.S. Bank         | 12.65 |
| Wells Fargo           | 11.94 | Bank One          | 12.65 |
| Bank One              | 11.14 | Wells Fargo       | 11.79 |
| SunTrust              | 10.77 | SunTrust          | 11.00 |

  

| 2002              |       | 2003            |       |
|-------------------|-------|-----------------|-------|
| Bank              | Ratio | Bank            | Ratio |
| JPMorgan Chase    | 11.12 | JPMorgan Chase  | 10.43 |
| Bank of America   | 11.33 | Bank of America | 11.31 |
| Citibank          | 12.58 | Citibank        | 12.56 |
| Wachovia          | 11.80 | Wachovia        | 11.72 |
| Washington Mutual | 11.37 | Bank One        | 13.71 |
| Bank One          | 13.45 | Wells Fargo     | 11.24 |
| Wells Fargo       | 11.42 | Fleet           | 11.30 |
| Fleet             | 11.29 | U.S. Bank       | 10.84 |
| U.S. Bank         | 10.81 | SunTrust        | 10.85 |
| SunTrust          | 10.91 | HSBC            | 11.82 |

## Appendix 5A

**Table 5A.1 Risk-weighted capital (RWC) ratios of 10 largest US banks, 1992–2006** *(continued)*

| 2004             |       | 2005            |       |
|------------------|-------|-----------------|-------|
| Bank             | Ratio | Bank            | Ratio |
| JPMorgan Chase   | 10.27 | Bank of America | 10.90 |
| Bank of America  | 12.60 | JPMorgan Chase  | 11.04 |
| Citibank         | 11.28 | Citibank        | 12.35 |
| Wachovia         | 10.81 | Wachovia        | 10.22 |
| Wells Fargo      | 10.43 | Wells Fargo     | 12.17 |
| Fleet            | 12.14 | U.S. Bank       | 11.15 |
| U.S. Bank        | 12.11 | SunTrust        | 11.22 |
| HSBC             | 13.38 | HSBC            | 11.48 |
| SunTrust         | 11.20 | Keybank         | 10.38 |
| Bank of New York | 10.84 | State Street    | 18.08 |

  

| 2006              |       |
|-------------------|-------|
| Bank              | Ratio |
| Bank of America   | 10.85 |
| JPMorgan Chase    | 12.66 |
| Citibank          | 10.88 |
| Wachovia          | 10.73 |
| Wells Fargo       | 12.31 |
| U.S. Bank         | 11.49 |
| SunTrust          | 11.36 |
| HSBC              | 11.94 |
| FIA Card Services | 11.14 |
| Regions Bank      | 10.77 |

Source: Call reports filed with the Federal Financial Institutions Examination Council, Schedule RC-R.

