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Policy implications of the Federal Reserve study of credit risk models at major US banking institutions

John J. Mingo *

Board of Governors of the Federal Reserve System, Washington, DC 20551, USA

Abstract

The current regulatory capital standard for banks – the Basle Accord – is a lose/lose proposition. Regulators cannot conclude that a bank with a nominally high regulatory capital ratio has a correspondingly low probability of insolvency. On the other hand, because the Accord often levies a capital charge out of proportion to the true economic risk of a position, banks *must* engage in “regulatory capital arbitrage” (or exit their low risk business lines). Since such arbitrage is costly, the capital regulations keep banks from maximizing the value of the financial firm. Regulators need to answer three questions: (1) What are the goals of prudential regulation and supervision? (2) How should bank “soundness” be defined and quantified? (3) At what level should a minimum “soundness” standard be set in order to meet the (perhaps conflicting) goals of prudential regulation and supervision? Possible answers to these questions are attempted, then the paper analyzes the two leading proposals for rationalizing the Accord – a “modified-Basle” (or ratings-based) approach and a “full-models” approach. © 2000 Elsevier Science B.V. All rights reserved.

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* Present address: Mingo & Co., 6013 Valerian Lane, N. Bethesda, MD 20852, USA. Tel.: +1-301-881-9540; fax: +1-301-881-7189.

E-mail address: john@johnmingo.com (J.J. Mingo).

1. Introduction: Regulatory capital arbitrage and internal credit risk models

The rapid pace of financial innovation in recent years has focused regulatory attention on potential shortcomings in the Basle Accord, the international capital standard for banks. As detailed in the paper by David Jones (2000, this issue), large US and foreign banks engage in what is termed regulatory capital arbitrage (RCA) – these banks attempt to drive down the regulatory capital requirement for a set of risk positions relative to the underlying “economic capital” for those positions (that is, relative to the capital an unregulated financial firm might wish to hold to protect against the economic risks associated with the positions). The problem as perceived by regulators is that, through RCA, a bank may achieve an overall regulatory capital ratio (a “risk-based” capital ratio, or “RBC” ratio) that is nominally high yet may mask capital weakness; that is, despite a high RBC ratio the bank may have an unacceptably high probability of insolvency.¹

The phenomenon of RCA has been accelerated during the 1990s by improvements in the credit risk measurement practices of large banks. At these institutions, highly skilled risk analytic teams measure in rigorous fashion the credit risk of various positions and express these risks in terms of economic capital allocated to the risks (see Federal Reserve, 1998).² It is in a bank’s interests to use RCA to reduce its regulatory capital requirement to at least equality with (or lower than) the economic capital called for by the riskiness of its portfolio. Maximization of shareholder value, for example, presumably would not occur if the bank had to incur additional capital costs, because of a regulatory requirement, over and above those called for by the internal risk measurement process. In addition, there are market benefits that can be said to accrue to regulated banks that achieve “adequately capitalized” regulatory status (in the US, achievement of “well-capitalized” status arguably confers additional benefit), and banks want to achieve these benefits at least possible

¹ The following few paragraphs are, to some extent, a repetition of points made in the Jones paper, but are necessary to the understanding of the policy implications associated with banks’ internal capital allocation models.

² In general terms, and at the risk of substantial oversimplification, the process can be described as consisting of two steps. First, the banks typically measure a loss probability density function (PDF) associated with a set of risk positions (i.e., for a sub-portfolio of the bank). Next, each PDF is used within a specific economic capital allocation paradigm. For example, allocated economic capital may be defined, and measured, as the amount of capital that would reduce to $x\%$ (usually around 0.05%) the probability that, over the time horizon associated with the estimated PDF, capital would be exhausted. In other words, most large banks can be said to employ an internal capital allocation paradigm that meets a particular *insolvency probability* standard (probability that capital would be exhausted).

cost of capital.³ What are the market benefits of being “well-capitalized”? Because the bank maintains a particular RBC ratio, it is in effect “certified” by the regulator as being a “safe and sound” institution. Such certification, all other things equal, may improve market demand for the bank as a counterparty in a wide range of financial contracts (when compared to other, unregulated financial firms).⁴

In order to drive down the regulatory capital requirement relative to the economic capital requirement implied by its internal risk models,⁵ large banks engage in two broad types of RCA activity: (a) they can restructure traditional balance-sheet positions (through the use, for example, of securitization and credit derivatives) so as to effectively place the positions within lower regulatory “risk-weight buckets” (including the zero risk-weight bucket), or (b) they can originate and hold loans or other risk positions for which the economic capital allocations are higher than the regulatory capital requirement. The Jones paper goes into significant detail with regard to exactly how such RCA is achieved.

It is tempting for regulators to respond to the existence of RCA by simply “shutting down the game” – formally forbidding procedures now used by banks to effectively reduce regulatory capital requirements. But such regulatory maneuvers on any significant scale would be ill-advised for at least two reasons. First, the pace of financial innovation is such that simply recognizing the act of RCA is often quite difficult. For example, some of the special features of securitization facilities that accommodate RCA, as detailed in Jones (2000, this issue), are complex, non-transparent, and exceedingly difficult to evaluate from a capital adequacy perspective. The sheer complexity and diversity of RCA,

³ In the US, all banking organizations must meet the Basle standard (8.0% total risk-based capital ratio) in order to be “adequately capitalized”. Furthermore, the Federal Deposit Insurance Corporation Improvement Act of 1991 confers certain regulatory benefits for those institutions with total RBC ratios of 10.0% or higher. Conversely, “prompt corrective action” measures are mandated by the 1991 legislation if the institution fails to meet the regulatory definition of “adequately capitalized” and forced closure is required if the bank’s leverage ratio falls below 2.0%.

⁴ In the US, the importance of being “well-capitalized” is demonstrated by observing the RBC ratios of the top 50 banking organizations. None of these institutions has a total risk-based capital ratio of less than 10%, the mean total risk-based capital ratio is slightly over 12.0%, and the standard deviation is approximately 0.8%. In other words, all of the large US banks have about the same regulatory capital ratio. The “certification” effect associated with prudential regulation has received little attention in the literature on the costs and benefits of regulation (see Kwast and Passmore, 1998).

⁵ Even if the regulatory requirement is not “binding” (i.e., is not above that implied by the internal capital allocation process), the bank still may have incentive to engage in RCA in order to generate “excess” regulatory capital that may serve as a cushion against a regulator-required capital issuance immediately after a future bad event.

coupled with the limited budgets of supervisory agencies, make rapid discovery of RCA impractical, if not impossible.

Second, and more importantly, RCA is not uniformly “bad” from a social perspective. It has been widely recognized that RCA serves a valuable function as a “safety-valve” in mitigating possible adverse effects of arbitrary regulatory capital requirements that may, in some instances, significantly exceed the capital that would be called for by appropriate economic analysis of the risks involved in a particular activity.⁶ For example, suppose a bank were quite good at measuring, pricing, and managing the risks of lending to highly rated counterparties. Margins on such business are low, because the risks are so very low. But the Basle standard, which assesses the same 8.0% capital requirement against low risk transactions as it does against high risk transactions, serves to drive down the rate of return on allocated (regulatory) capital to unacceptable levels for the low risk deals. Absent effective regulatory arbitrage, the bank must exit the low risk business. Exiting a low risk business in which it has a comparative advantage constitutes, by definition, a sub-optimal allocation of social resources, and at the same time generates a result (retaining only the high risk business) that is the opposite of that intended by prudential regulation.⁷

I have belabored these points regarding RCA and the development of internal risk measurement systems to paint the larger picture. That is, to a very significant extent, the current Basle Accord is very much a lose/lose proposition. As indicated earlier, from the regulators’ perspective, a bank may achieve a high RBC ratio, but the regulator still cannot know whether it has achieved any particular degree of “soundness”. Banks, meanwhile, must engage in regulatory capital arbitrage to avoid uneconomic capital standards, but such RCA is *costly* – therefore deflecting banks from achieving *their* goal of maximizing the value of the financial firm.

At the Federal Reserve, as at other agencies in the US and abroad, significant new work is being undertaken by both research and supervisory personnel to help resolve this dilemma. The focus of this work is on crafting prudential regulation and supervision in a manner that actually achieves a specific set of regulatory objectives and, at the same time, permits banks to perform their essential social functions and meet the objectives of their shareholders. In the discussion that follows, I make a strong distinction between *regulatory* policy and *supervisory* policy. Regulations consist of a set of

⁶ See, for example, Greenspan (1998).

⁷ This example is by no means purely theoretical. One can argue that the rapid growth in asset-backed commercial paper facilities of commercial banks is a direct reaction to the Accord’s uneconomically high capital requirement placed on collateralized short-term business loans to highly-rated businesses. The CP facilities permit banks, through appropriately structured credit enhancements, to take on the risks associated with such lending, but without having to incur the onerous capital charges.

rules, such as minimum capital requirements, that apply to all regulated entities. Prudential supervision is the process of seeing that individual banking organizations adhere to the prudential regulations and, furthermore, that each banking organization, on an individual basis, is operating at a level of soundness that appropriately exceeds whatever is the stated (or implied) level of minimum soundness.⁸

2. The goals of prudential regulation and supervision

As you are well aware by now, the Basle Accord does not flow from any explicitly stated goal or goals for prudential regulation. A decade ago, the framers of the Accord did not say, for example, “we are trying to set capital standards so as to limit the probability of insolvency at banks to no more than $x\%$ ”. Rather, a capital ratio was defined, and a number chosen (8.0%) that made policy-makers comfortable.

But in 1998 it has become clear that risk measurement can be, and is being, done with great rigor at some institutions. Policy-makers therefore should face, and answer with similar rigor, some hard questions if they are to craft a successor to the Accord that is sufficiently robust and meaningful. There are basically three questions:

1. What are the goals of prudential regulation and supervision?
2. How should bank “soundness” be defined and quantified?
3. At what level should a minimum “soundness” standard be set in order to meet the (perhaps conflicting) goals of prudential regulation and supervision?

It is beyond the scope of this paper to provide answers to these questions, but it is my intention to provide some guidance on how, perhaps, the search for answers should proceed.

⁸ The supervisory tradition differs markedly across countries that are party to the Accord. In some countries, for example, there is no in-bank examination process, and the supervisory determination of “capital adequacy” is limited to the inspection of publicly available financial documents such as quarterly reports. By contrast, in the US, there is a permanent on-site supervisory presence at many of the largest banking organizations, all institutions are subject to periodic on-site examination, and significant emphasis is placed on reviewing internal risk measurement and management *processes*, quite apart from the determination that the Basle minimum capital standards are being met. The evolution of internal risk measurement models, and the inherent complexity and diversity within such models, suggests that future prudential regimes will almost certainly have a larger, more complex, supervisory component than is presently the case in many countries.

Let us start with the possible goals of prudential regulation and supervision. While the list below is by no means exhaustive, it identifies perhaps the most commonly expressed reasons for having prudential regulation:

1. To limit the real costs associated with bank failures, while at the same time permitting banks to carry out their socially critical functions, including the provision of credit to risky counterparties.
2. To limit the losses to the government (i.e., the taxpayers) associated with providing a safety net to regulated entities.
3. To limit the resource misallocation that might result from banks taking advantage of the “heads I win, tails you lose” nature of moral hazard (i.e., to limit the chances that banks would engage in riskier investments than those chosen in an unregulated system with no safety net).
4. To promote macro-economic stability, in particular by limiting the chance of a “systemic” event that, for example, might cause a bottleneck in the large dollar payments system or a general collapse of confidence in the macro-economy.

Other reasons for having prudential rules for banks have been put forward (see, for example, Berger et al., 1995) but, for the moment, focus on how to craft a minimum soundness standard that might help to meet one or more of these four goals.⁹

One might start by positing a simple definition of soundness, the one in fact that is used within the preponderance of internal bank models for computing “economic” capital allocations. In these models, soundness is defined as the probability of insolvency over a particular time horizon. Now, it is obvious that we could not set our maximum insolvency probability at zero; we could not require that no banks fail. For if we were to do that, our soundness standard would not meet our first objective – that is, banks could not continue to perform their critical social function of lending to risky counterparties. More to the point, if we installed such a stringent soundness standard, unregulated nonbank intermediaries would take over the bulk of the lending business from banks (who could not generate sufficiently high rates of return on capital in risky lending), and the main result of our prudential regulation would be to reduce the number of entities that are actually subject to the regulation. The paradoxical result of such a stringent requirement would be to lower systemic prudential standards, not increase them.

If we cannot set our insolvency probability maximum at zero, where *do* we set it? As a suggestion, and to provide a specific example, let us begin by setting

⁹ A true risk-based scheme for deposit insurance premiums is often mentioned as an alternative to bank prudential regulation as a way to meet these goals, but there exist significant political and practical reasons why the effectiveness of risk-based deposit premiums is likely to be greatly limited (see, for example, Mingo, 1998).

our insolvency standard at 0.12% probability over a one-year horizon. I have not chosen this number arbitrarily (or rather, I have chosen it somewhat less arbitrarily than our forefathers chose the number 8.0%). In fact, 0.12% is the average default frequency for BBB-rated corporations in the US, over a one-year horizon, during the period (1970–1997) covered by the Moody's database on corporate failures (Moody's, 1998). An international soundness standard, of course, might be constructed using a broader sample of default events. But, in effect, we would be saying that we want our banks to hold enough capital so that they operate at least at an "investment grade" level of soundness. Almost every bank in the Federal Reserve sample said it sets internal capital so as to meet a AA level of insolvency probability (around 0.03% over a one-year horizon), implying that the economic capital these banks choose to hold would be higher than called for by the aforementioned regulatory standard. Thus, our hypothetical BBB standard would likely be generally non-binding, giving us some comfort that our banks are safe and sound, but not causing resource misallocation problems by requiring banks to hold so much capital that the rate of return on regulatory capital fell below that called for by the market (a critical concern for some observers, see, for example, Estrella (1998) or Shephard-Walwyn and Litterman (1998)). And, of course, individual institutions could choose to operate at higher insolvency probabilities (lower capital) than the AA level, so long as they did not operate above the maximum insolvency probability set by the regulators.

Sounds simple enough, but at least two important questions arise. First, would setting a maximum regulatory insolvency probability standard achieve each of the four goals specified above? Second, how would regulators determine that any particular bank is actually meeting such a regulatory insolvency probability standard?¹⁰

To the first question, the answer is an unfortunate "no". Limiting the probability of bank insolvency *would* help reduce the real resource costs associated with bank failure by limiting the number of banks that, in the absence of any insolvency probability rule, would choose to operate at junk-bond soundness levels (or, more generally, at any level of insolvency probability above the regulatory standard (lower capital than the standard)). Also,

¹⁰ The answer to this second question, see below, becomes especially critical given that the market itself appears to disagree with banks' own assessment of the insolvency probability standard they are now meeting. Although many of the large US banks say they are holding at least enough capital (according to their internal credit, market, and operating risk models) to meet an AA standard of insolvency probability) only 8 of the top 50 bank holding companies in the US have AA ratings (S&P) on their senior subordinated debt. None have AAA ratings (at the parent company level) and none have below-investment-grade level ratings. Six of the 50 have BBB ratings (all data as of year-end, 1997). Moreover, depending on the rating agency, the ratings may take into account the lender-of-last-resort benefits bestowed upon regulated entities.

systemic risk and the potential for macro-economic instability would be contained if *large* banks (those whose failures might constitute a “systemic event”) were subjected to a maximum insolvency probability standard. But resource misallocation might still occur with a maximum insolvency probability standard, so long as there are any regulated entities that, in the absence of prudential regulation, would have chosen to operate at higher insolvency probabilities than the regulatory maximum. In the long run, of course, a financial institution that believed it could maximize shareholder value by operating at a junk-bond level of soundness would exit the regulated sector (if we introduced an “investment-grade” soundness requirement) – and regulators might say “good riddance.”

Unfortunately, one of our most important objectives – that of protecting the taxpayers who provide the backstop for the safety net – would clearly *not* be met by instituting a maximum insolvency probability. Default probability for a bank is equivalent to the probability that the insurance fund (the taxpayer in some regimes) will incur *some* “hit”. But the *size* of the hit in the event of bankruptcy is also important in calculating the exposure of the insurance fund. Thus, even though our banks might be required to hold enough capital to assure a low probability of insolvency, it still would be possible for an institution to assume positions that, while subjecting the bank to a low risk of default, would cause the bank (or rather its insurer) to incur extremely high losses-in-the-event-of-default (LIED).¹¹

To deal with this problem, we might craft an alternative soundness rule. For example, regulators could require that all banks hold sufficient capital so that *expected losses* to the insurer are no greater than $x\%$ of insured deposits at the bank (see McAllister and Mingo, 1996)¹². Deposit premiums, of course, could

¹¹ This possibility is especially germane in the modern era of off-balance-sheet activities, including credit derivatives. Written options, for example, might entail significant downside risk. Bank-sponsored securitization facilities might, through direct and indirect credit enhancements, expose the bank to losses that are many times the bank’s balance sheet size (i.e., many times the dollar amount of the deposit base that funds balance sheet assets). In the limit, the insurance fund (taxpayer) can lose no more than the dollar value of insured deposits. Nevertheless, to use the US as an example, the current size of the FDIC fund is US\$28.9 billion, a value that is exceeded by insured deposits at 19 major US commercial banks – banks whose off-balance-sheet positions might be (or could become) large relative to insured deposits.

¹² A difference in soundness rules may result in a substantial difference in how capital requirements are crafted to implement a soundness rule. For example, if we are worried only about the probability of insolvency, not the *loss* to the insurer in the event of insolvency, banks would receive no regulatory capital benefit for engaging in contracts that limit their credit risks beyond a certain loss level (i.e., a credit derivative contract that limited “second-dollar” losses to a bank would be of no benefit to the regulator if it covered losses only after the level that was likely to cause bankruptcy).

be set so as to at least cover these expected loss values. But, in order to fully meet the four objectives defined above, it is probably necessary to define *multiple* soundness standards. For example, requiring all banks to have enough capital to limit the expected loss to the insurer, per dollar of deposits, would protect the taxpayer and help limit the social costs of bank failure. But the *event* of failure, in the case of one or more very large banks, might constitute a systemic event in and of itself, even though the insurance funds incurred no significant losses as the result of such a failure. To protect against systemic risk, therefore, we might want very large banks to adhere to a maximum insolvency probability. Thus, we might want to have a *dual rule* prudential standard – all banks meet a basic taxpayer-protection standard (a maximum expected loss rate per dollar of insured deposits), while large banks *also* meet a maximum insolvency probability rule as well.¹³

3. How do we know if our soundness standard is being met?

To simplify the discussion, let us assume that we have a single-rule soundness standard – banks must hold enough capital, given their portfolio choices, to reduce to no more than $x\%$ the probability of insolvency over a given (regulator specified) time horizon.¹⁴ How will we know if a particular bank's insolvency probability is greater than or less than our specified maximum? In the current ratio-based regime, we do *not* know whether any bank is meeting a particular insolvency probability standard, both because there is no such standard and because (per the Jones paper) we have learned that capital ratios are often misleading indicators of insolvency probability.

¹³ Of course, at any particular institution, only one of the requirements may be binding at any point in time. Moreover, the form of “capital” that may be used to meet the two requirements might differ – equity being used to meet the insolvency probability test, and equity plus subordinated debt being used to meet the expected-loss-to-insurer test.

¹⁴ The choice of a particular insolvency probability standard is sure to be a contentious issue. Even fairly “small” decreases in the maximum insolvency probability may translate into significant increases in required capital, depending critically on the estimated shape of the loss distributions associated with various business lines. For example, in distributional estimates with one-year horizons made by Gordy (2000, this issue), the index of kurtosis is two to three times that for a normal distribution. This degree of fat-tailedness implies that required capital might as much as double, as the regulator varies the insolvency probability standard over a range from 1.0% (99.0% “coverage” of the loss distribution) to 0.03% (99.97% “coverage”). Carey (1998) finds empirical loss distributions to be somewhat similarly fat-tailed, using a data set on losses on private placements. In short, depending on where within the range of roughly BB to roughly AA the regulators set the soundness standard, capital requirements for some business lines could be affected dramatically.

In recent months several proposals have been put forth to redress the deficiencies of the current Basle standard. Two of the leading proposals can be specified in such a way as to perform, at least theoretically, better than the current Basle standard in meeting particular definitions of soundness. The two proposals are (a) to modify the Basle “risk-bucket” approach by adding more buckets and/or by more finely tuning the capital requirements for each of the buckets, and (b) a “full-models” (FM) approach in which banks’ internal risk measurement models, once “approved” by supervisors, would be used to explicitly measure insolvency probability (or some other soundness standard). These are not the only proposals that have been made (see Estrella, 1998; Shephard-Walwyn and Litterman, 1998) and to which careful consideration should be given. However, in the space allotted for this paper, some useful points regarding the construction of a post-Basle capital regime may be demonstrated by comparing a “modified Basle” approach with an FM approach.

To begin, note that it is *not necessary* – initially or even in the foreseeable future – that a specific quantifiable soundness standard be implemented by using a rigorous full-models approach. That is, if regulators were to reach agreement on a measurable standard (such as “a maximum insolvency probability of x over a one-year horizon”) such a standard could be implemented by using reasonably *subjective* measuring techniques. Indeed, that is precisely what is done by the rating agencies that assign ratings for banks’ subordinated debt. That is, so far as I am aware, the rating agencies do not typically reach a conclusion regarding ratings (i.e., regarding expected default frequency or expected loss rates on bank debt) by actually estimating a loss probability distribution. In some cases, for example, the rating agency analyzes the adequacy of capital for each of the bank’s business lines by applying stress tests or peer group analyses. Nevertheless, the rating agencies apply their tests in significantly more rigorous fashion, generally, than do the supervisors who oversee the implementation of the current Basle standard. For example, when considering the capital appropriate to protect against the bank’s securitization activities, the rating agencies often treat securitized assets as if they remained on the books of the bank. That is, a rating agency sometimes concludes that the direct and indirect credit enhancements provided to the securitization facility by the sponsoring bank are, in sum, so significant that the bank retains essentially the bulk of the credit risk on the underlying assets. Adequate capital for the underlying assets (sufficient to reduce the bank’s insolvency probability to any particular level) is then approximated by analyzing historical data (such as loss experience on pools of assets with similar risk characteristics) and applying an appropriate stress test based on those historical data. In no circumstance of which I am aware is the capital to be allocated to the bank’s risk positions assigned simply according to the “type” of underlying asset, as is done within the current Basle Accord.

How might a “modified Basle” approach to capital standards be constructed in a way that helps regulators meet their expressed soundness standard? In my view, several types of changes to the current Accord would be necessary, in order to make a modified Basle approach feasible (and, even then, an FM approach might be more desirable, at least on theoretical grounds). First, many more risk-buckets would be needed. As indicated in the Federal Reserve (1998) study, and in Robert Morris Associates (1997), many of the largest US banks have instituted internal risk rating systems that have 8 or more risk buckets or “grades”. In a 10-grade system, grade 1 usually refers to the highest quality assets, while grade 10 refers to “loss” assets. Furthermore, most large banks’ internal capital allocation systems are based on their internal grading systems. That is, although the internal capital allocation calculation for each grade might be recomputed every so often (as the bank’s portfolio changes or as new data or new modeling assumptions are incorporated into the bank’s capital allocation models), the *grade* of any new risk position is sufficient to determine its marginal capital allocation. Therefore, *if the new regulatory risk-bucketing scheme does not bear some resemblance to most banks’ internal rating systems*, the incentive for regulatory capital arbitrage would not be diminished (because regulatory capital would significantly differ from economic capital in most cases), and the new Basle standard would suffer from essentially the same problems as the current standard.

Basing a new Basle standard on internal rating systems, however, is fraught with practical difficulties. At a minimum, the regulator would need to “translate” each bank’s rating system into a common system for regulatory capital allocation purposes. In principle this is not impossible, because banks tend to base their internal rating systems on internal estimates of default frequency or expected loss rate (i.e., a grade 3 might be defined as implying a default probability within a certain range), and, furthermore, individual banks often “tie” their internal ratings to Moody’s or Standard & Poor’s rating schemes (e.g., a grade 3 might be equivalent to BBB). However, in practice, the banks’ internal rating architectures exhibit great diversity (see Carey and Treacy, 1998). Indeed, even assuming two banks used the same rating scale, their ratings for a particular credit might differ somewhat because of differences in the rating process. Thus, an internal-ratings-based Basle standard would require that supervisors first “approve” a particular bank’s rating procedures; second, supervisors would have to concoct a “concordance schedule” that, for regulatory capital purposes, translated each bank’s rating scheme into a common framework. Also, over time, internal rating procedures can be expected to improve, as has every other technical aspect of banking. Therefore, the ratings “approval” process would need to be a continuing process, and one in which supervisors “keep up” with best practices in ratings procedures. Finally, a ratings-based modified Basle approach could not, any time soon, be applied to all banks, because many medium-size and smaller banks do not yet

have internal ratings systems (for “pass” credits), or may have insufficiently differentiated rating systems. Thus, a ratings-based Basle approach would suggest a new, bifurcated standard – one in which most banks continue to adhere to the old standard, while more sophisticated (generally larger) institutions adhere to a new, multi-bucket approach.¹⁵

In order for a modified Basle approach to work (i.e., be effective in meeting our regulatory goals), not only should risk positions be assigned to capital-buckets based on internal risk ratings, but so should the regulatory capital requirement per bucket be related to *best-practice* internal capital allocations! As indicated earlier, whenever there is a significant difference between the regulatory capital requirement and the internal (economically based) capital calculation, capital arbitrage will take place, which results in net benefits neither to the regulator nor the bank.

Thus, in a modified Basle scheme the capital allocated to each bucket should *not* be based on the current Basle risk-weights (not even one of the buckets should be assigned the heretofore “magical” number of 8.0). While we might continue to have capital *ratio* requirements for each bucket, the required capital would be estimated by regulators to be that amount necessary to meet a particular soundness standard. For example, regulators might use industry data to independently estimate PDFs for a particular type and grade of loan. Capital would be assessed against such a sub-portfolio in the amount necessary to reduce to, say, 0.12% the probability that losses over a one-year horizon would exceed allocated capital. Alternatively, the regulators could survey *best-practice* large banks to obtain internal capital allocation estimates for loans of a particular type and grade, computed using the regulatory insolvency probability standard. The regulatory capital ratio for each bucket might then be set as an average, or some percentile, of the results generated by the large banks’ estimation processes.

¹⁵ This brings up the question of competitive equity associated with a bifurcated approach. In fact, one can argue that the large banks are not now subject to an effective regulatory soundness standard, because of the prevalence of regulatory capital arbitrage. If a new Basle standard were initiated only for the large banks, the small banks could therefore be said to enjoy a competitive advantage, not a disadvantage. That is, as regulatory capital arbitrage techniques (such as securitization and the use of credit derivatives) work themselves down to smaller institutions, these banks might be able to effectively avoid the intent of the current Basle standard (by operating at insolvency probability levels higher than that desired by regulators), thus taking advantage of the “heads-I-win, tails you lose” nature of moral hazard associated with the safety net. This danger is especially acute for private banks that are not exposed to the discipline of having publicly traded equity or debt. Of course, the danger that smaller banks would “take advantage” of the current Basle standard exists right now, whether or not the standard is improved only for large banks. Thus, a bifurcated approach (which, in any event, would exist only for so long as ratings-based procedures had not yet trickled down to smaller banks) might make good sense in the short to intermediate-term.

Furthermore, if a modified Basle approach were intended to mimic “best-practice” embodied in internal capital allocation schemes, some thought would need to be given to the definition of capital within the numerator of the capital ratio requirement for each bucket. This is because, within most large banks’ internal capital systems, “economic capital” is defined simply as tangible equity (see Fed study). Thus, comparing the arbitrary 8.0% standard (which is for “total capital” including both a portion of loss reserves and qualifying subordinated debt) to economic capital is to overstate the degree to which the current regulatory requirements exceed economic capital in some of the buckets.¹⁶

The Federal Reserve study also makes it clear that current practice among large banks, with respect to internal capital allocations, is not always “best practice”. Thus, it may not be wise to relate the new capital weights, in simple fashion, to the actual capital allocations at *all* large institutions. Some banks’ internal capital weights should be discounted, in my view, because of significant deficiencies in their internal capital allocation procedures that result in an understatement of economic capital. One type of deficiency relates to the process of estimating PDFs (such as when inappropriate data are used to estimate model parameters). Another type of deficiency relates to a bank’s chosen capital-allocation paradigm. To give an example, one of the banks in the Federal Reserve sample calculates internal capital using a capital allocation rule that “covers” 95% of the loss distribution. This is tantamount to holding sufficient capital to reduce insolvency probability to 5% – but a 5% insolvency probability over a one-year horizon is equivalent to approximately a single-B + debt rating. This is too high an insolvency probability standard (too low a “soundness” standard), in my opinion, for any institution subject to the safety net, even assuming that the shape of the loss distribution is estimated appropriately.

It is also clear from the Jones paper that a new Basle standard should apply capital allocations in cases where no capital at all is now levied. For

¹⁶ This does not mean that a properly constructed “bucket” approach would have no room for types of “capital” other than pure equity. For example, suppose the regulators set the capital level in each risk bucket so as to approximate achieving a particular expected loss rate per dollar of insured deposits. Then, for a given portfolio, increasing the percentage of liabilities consisting of subordinated debt would serve to drive down the estimated expected loss rate on deposits. Thus, some amount of subordinated debt should be permitted to be included when meeting the capital ratio requirement for a particular bucket. In a dual-standard regime, moreover, only equity might be required in the numerator for purposes of the insolvency probability standard (since substituting debt for deposits does not change insolvency probability), while equity plus subordinated debt might be permitted in the numerator for purposes of the second (expected-loss-rate-to-insurer) standard. Moreover, no matter the approach taken in the new Basle standard, it is important to “get the loan loss reserve right”. That is, if the reported loss reserve is too low (too high), the reported regulatory capital will be too high (too low).

example, the new standard should find a way to allocate capital to indirect credit enhancements that effectively transfer risk of securitized assets to the bank sponsoring the securitization facility (early amortization features with fast-payout provisions, common on securitization of revolving credit facilities, are one example of such indirect credit enhancements). In addition, the new standard should, in assigning regulatory capital to a risk rating category, take into consideration deficiencies in internal rating and capital allocation procedures as applied to some bank activities. For example, the Federal Reserve study documents the common practice of assigning a risk rating to a subordinated tranche of a securitization based solely on the estimated default probability, or estimated expected loss rate, for the tranche. Internal capital allocation procedures then assign the same capital to the subordinated tranche as for a whole loan of the same risk rating (i.e., the same expected loss rate). However, subordinated tranches exhibit significantly greater LIED volatility than do whole loans (because a small increase in the realized loss rate on the underlying pool results in a correspondingly greater percentage increase in losses on the tranche), thus implying the need for a significantly higher percentage capital allocation for the subordinated tranche.

A new risk-rating-based Basle standard can also be constructed to explicitly treat hedging, including partial hedging of credit risks, especially in the context of the nascent market for credit derivatives. For example, under the current standard, if a bank purchases first-dollar credit loss protection on a pool of loans up to, say, 5% of the pool, the protection-purchasing bank will still have full regulatory capital requirements assessed against 95% of the pool. Yet, in economic terms, first-dollar protection covering losses up to 5% of the pool might result in effectively “covering” more than, say, 99.9% of the loss distribution of the pool, especially if the underlying assets are inherently low risk. Thus, although partial credit hedges can effectively eliminate the bulk of credit risk, in the current system a bank might obtain almost no regulatory benefit from purchasing such a hedge. In a ratings-based regulatory system, however, the bank could *rate* the underlying asset pool in conjunction with the hedge—that is, the bank could estimate the loss distribution for the pool and derive from it the distribution of losses it faces after the credit hedge is in place. Through such a process, the bank can establish an estimate of the expected loss rate associated with residual (tail) losses.

While each of these implementational issues can, at least in principle, be surmounted, the ratings-based approach suffers from a major theoretical flaw. Because capital requirements for each rating bucket would be the same for all banks, the system could not take into account the diversity of portfolio construction across banks. Issues such as granularity, or concentration of industrial sectors (or of country exposures, etc.) within the bank’s portfolio, would need to be handled outside the formal capital regulations (as is currently done

within the supervisory process in some countries).¹⁷ Indeed, the essential difference between a modified-Basle approach to capital regulations and the FMs approach is that the FM approach can be configured to explicitly consider portfolio construction in a straight-forward manner, by utilizing the internal models that banks have already developed to measure *portfolio-wide* loss distributions.

A full-models approach might be constructed to consist of two broad components:

(1) A bank qualifying for the approach would formally measure its credit, market, and operating risks by developing estimates of probability density functions for losses stemming from each of these three broad categories of risk (either independently or in joint fashion). The estimates of loss distributions would be made for all business (or product) lines within the bank, whether housed within the banking or trading books. In order not to stifle the evolution of best practices within the risk modeling arena, a diversity of risk modeling practice would be permitted, thereby requiring supervisors to make an institution-by-institution determination of whether the risk modeling systems were acceptable. There would be no “partial acceptability”. Until such time as the bank altered its modeling processes so as to make them acceptable to supervisors, the bank would be subject to the alternative Basle approach, whatever that might be.¹⁸

(2) In order to meet the definition of “adequately capitalized”, the qualifying institution would need to hold sufficient *equity* capital so as to meet an insolvency probability standard (alternatively, or in addition, the bank could hold some combination of equity and subordinated debt to meet a maximum expected loss rate to insured deposits).¹⁹ This calculation of adequate capital could be made for each business line and then the business line calculations added up to reach an institution-wide capital allocation, or the bank could

¹⁷ It is technically possible to configure the ratings-based approach to take account of differences across loss-correlations at individual banks (i.e., differences in portfolio construction) by developing diversification measures that would be used to “weight” the capital requirements for each risk bucket. Also, differences in, for example, LIED distributions (that arise from differences in the quality of banks’ loan-workout procedures) could be handled within a risk-bucket-based Basle standard. As a matter of semantics, however, I would prefer to view these refinements as pushing over the line toward a “full-models” approach or a hybrid “bucket/models” approach.

¹⁸ In order to provide proper incentive for large banks to develop adequate internal risk models for use within an FM approach, the current Basle standard might be modified to drive up the cost of RCA (by closing down certain “loopholes”), and/or large banks might be deemed to be “inadequately capitalized” if they had not developed acceptable models by a date certain.

¹⁹ If, for example, the regulatory soundness standard were defined as holding “sufficient capital to reduce to no more than 0.1% the probability of insolvency over a one-year horizon”, the bank would have to hold *at least* enough equity capital to “cover” 99.9% of its estimated cumulative loss distribution.

utilize some method, if approved by supervisors, to jointly estimate the loss distribution, and therefore the capital calculation, across all business lines.²⁰

The above description of an FM approach is, of course, highly simplified, and a myriad of details (beyond the scope of this paper) would need to be considered. In theory, however, the full models approach is the only one that results in an explicit measurement of soundness (e.g., insolvency probability) unique to each institution. Furthermore, so long as the “approved” internal models were precisely the same ones being used by banks for their daily business decisions (a good idea, in any event, to forestall “gaming” of the FM approach), the incentive to engage in regulatory capital arbitrage would disappear.

Unfortunately, the FM approach may not yet be ready for “prime-time”. There are currently three categories of deficiency within large banks’ internal models – deficiencies that, in my view, preclude migration to the FM approach in the near future.

(1) Measurements of operating risk are crude or non-existent, yet some observers believe that such risk – broadly defined to include legal, regulatory, information systems, reputational, and other risks – is important relative to market and credit risks. Given the current state of the art in measuring operating risk, it is conceivable that a workable FM approach could be made to include a process for assessing capital against operating risk in crude fashion, perhaps through a simple add-on expressed as a percentage of the capital called for by the models’ measurements of market and credit risks. We do not yet have a basis for concluding, one way or the other, whether such a simplified approach would result in capital charges that were substantially more “accurate” than for other possible approaches to modifying the Basle standard.

(2) For several of the major banks surveyed, credit risks are measured in crude fashion or not at all for some of the banks’ lines of activity, most notably for consumer or small business credit products.

(3) Where credit risk is measured in a sophisticated fashion (generally within the trading account and for the large and middle-market lines within the banking book), significant shortcomings have been noted within the Fed study. These include model construction features (such as choice of planning horizon

²⁰ There are several possibilities for the calculation of PDFs in order to capture the three major categories of risk across each of the business lines; therefore, there are several ways in which institution-wide “adequate capital” could be calculated. To my knowledge, no bank yet *jointly* estimates market, credit, and operating risks within a business line, nor does any bank, again to my knowledge, *jointly* estimate credit risks across all business lines. It is therefore most likely that qualifying banks, at least initially, would estimate a PDF for each of the three risk categories for each business line, then combine in some fashion these independent estimates into a loss PDF for the business line. Adequate capital for the business line would then be calculated from that PDF, and adequate capital for the entire institution would be the sum of the capital calculations for each business line. Of course, such an additive procedure might overstate total bank-wide capital needs.

and loss paradigm (two-state versus multi-state models), estimates of loss-rates-given-default, treatment of credit-related optionality, and parameter calibration processes), model validation procedures (including a general lack of stress testing or back-testing), and (in some cases) the limited degree to which faith in the models' robustness is evidenced by the banks' day-to-day use of the models' outputs.

4. Concluding comments

The discussion above is necessarily cursory, given space constraints. Significant effort is underway within the Federal Reserve System and at other domestic and foreign agencies to identify the pros and cons of alternative schemes for a new Basle standard. Nothing in this paper should be construed as the author's support for one option over another. Indeed, the problems associated with any reform of Basle are so complex that only one conclusion seems clearly supportable – do not rush to judgment. A hastily considered replacement for the Accord could easily fail to reduce, and might increase, the Accord's ineffectiveness (from the regulators' perspective) and its costs (from the banks' perspective).

Furthermore, in crafting the Accord's replacement, it would be advisable to incorporate where possible the results of the considerable research being conducted on the subject of risk measurement and economic capital. This paper has focused mainly on research recently completed or underway by Federal Reserve staff, but that is just a small percentage of the work being done elsewhere, especially by practitioners. Even now, at a relatively early stage in the development of credit risk modeling, I believe it is possible to discern the difference between "best-practice" approaches and those that are less than acceptable from either a regulatory or a business perspective. A new Basle Accord that adhered to a principle of the "least common denominator" would serve no good regulatory purpose and arguably could place at a competitive disadvantage those institutions that have made a good-faith effort at advancing the art of risk measurement.

Finally, we should keep in mind that we need not rely *solely* on capital regulation and supervision to accomplish our prudential goals. Market discipline has been, and should continue to be, the first line of defence against inappropriate risk-taking by banks. In this regard, improved financial disclosures, especially disclosure of the details of internal risk measurement models and capital allocation procedures, can only help in meeting both regulatory and business objectives. In addition, we should, where possible, incorporate market information into the regulatory/supervisory process. For example, when considering whether a particular bank's internal capital allocations are appropriate (or whether, in a ratings-based approach, the bank's

capital allocations should be included within the sample used to determine regulatory capital for each rating-bucket), we should ask whether the market believes that the bank's internal risk measurement processes are good ones. If a bank says that it is holding enough capital to meet an AA standard of insolvency probability, but its senior subordinated debt is trading at BBB yields, we should ponder whether the market thinks the bank's PDFs have considerably fatter tails than estimated by the bank. Other market tools, such as estimates of default frequency based on information embedded within equity prices, might also be considered by supervisors when determining the capital adequacy of any individual, publicly traded, institution.

In the end, it seems clear that the complexity of financial transactions – and therefore the difficulty of determining capital adequacy – will continue to increase. The next iteration of the Accord is therefore likely to be only that, a next step. Over the longer run, I believe that capital regulations that apply uniformly to all banks, however complex, will likely continue to be less effective than a supervisory process that rigorously analyzes risk at each individual institution. This view is at odds with the general lack of a strong supervisory culture in many countries, and it is at odds with the budget constraints that govern supervision in the US. Innovation in the financial marketplace, however, will continue to turn a deaf ear to these concerns.

5. For further reading

The following articles are also of interest to the reader: Jones and Kuester King (1995), Jones and Mingo (1998), Estrella (1995).

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