Formulas or Supervision? Remarks on the Future of Regulatory Capital

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INTRODUCTION

How much capital should a bank have? There was a time, not too long ago, when the answer to this question seemed simple, at least to some. Then came floating exchange rates, oil shocks, global inflation, swaps, inverse floaters, and other tribulations, and the answer seemed not to be so simple after all. Regulators responded in kind with more complicated formulas; they introduced risk weights, credit-equivalent amounts, potential future exposures, maturity buckets, and disallowances. How does this story end, and what is the moral of the story? Were things ever really simple? Do we have more confidence now in the accuracy of the capital assessments?

We must bear in mind two important facts in order to address those questions. First, regulatory capital has never been a mindless game played with simple mechanical formulas. Second, firms themselves have used a changing array of prevailing practices to develop their own estimates of the level of capital they should have. To be sure, mistakes have been made, but those mistakes typically have not resulted from thoughtless reliance on mechanical formulas.

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This paper focuses on the relative emphasis that the structure of regulatory capital places on formulas and on supervision. The two are not viewed as mutually exclusive, but as elements to which capital policy implicitly assigns relative weights. We will see that in U.S. regulatory practice, these weights have shifted over time, not always in the same direction. Furthermore, we will explore the relationships among regulatory formulas, supervisory appraisals, and the prevailing business practices in the banking industry.[1] We then ask, what is the appropriate mix of formulas and supervision?

Why is this an important issue? Consider three related reasons. First, there is a risk of an increasing disconnect between regulatory capital and what banks and other financial institutions do. The last few decades have brought tremendous changes in the nature of financial firms, their activities, and their approaches to risk management. In such an environment, past regulatory achievements provide no guarantee of future success. Second, for much the same reasons, inertia will almost surely lead regulators down the wrong path. Steady progress in a given direction is not enough if the business has a tendency to change course—to innovate. Third, banks and other institutions are in danger of being over- or underregulated as the business changes course. Overregulation can thwart a useful economic role for financial institutions. Underregulation can undermine

faith in the financial sector and dampen its role as a catalyst for economic progress.

The issues considered here are difficult and fundamental, and they seem resistant to an approach based solely on straightforward economic analysis. Therefore, this article makes use of a variety of tools: analytical, historical, doxographical. We examine the rationale for capital regulation; the history of regulatory capital in the United States, including current and proposed approaches to regulatory capital; and the expressed views of practitioners and theorists.

To preview the results, the principal conclusion is a reaffirmation of the benefits of informed supervision. Mechanical formulas may play a role in regulation, but they are in general incapable of providing a solution to the question of how much capital a bank should have. At the margin, scarce public resources are better employed to enhance supervision than to develop new formulas whose payoff may be largely illusory.

Assumptions of Regulatory Capital Policy

We examine in this section the basic reasoning that underlies regulatory capital as we observe it in practice. One conclusion to be drawn from the existing academic literature on this topic is that it is difficult to define—let alone compute—the right level of capital for an arbitrary institution.[2] In the end, the problem is so complicated and the technical tools so limited that reasonable persons may have substantial disagreements about the right amount of capital that a given firm should hold.

Since it is impossible to "prove" that there is any one right approach to regulatory capital, and since support for any approach must ultimately rest on some ungrounded propositions, I attempt here simply to list a series of assumptions that are likely to be representative of the thinking behind existing systems of regulatory capital. The structure provided by this inventory can then serve as a backdrop for the discussion of specific aspects of the regulatory capital framework.

Consider first some very general assumptions concerning the rationale for capital. These assumptions are relatively noncontroversial and are probably widely held.

1. Capital can help protect the safety and soundness of individual institutions.
2. Capital can help protect the safety and soundness of the financial system.
3. Supervisors can play a socially useful role by monitoring the capital levels of financial institutions.

Support for assumptions 1 and 2 may be found in Berger, Herring, and Szegö (1995) and in many of the references contained in that paper. Assumption 3 may be slightly less straightforward, particularly if an extreme "free market" point of view is adopted. Nevertheless, it seems likely that most observers would admit that the capital decisions of individual institutions may produce externalities and that an impartial public-sector supervisor with enforcement powers can play a useful monitoring role.

The following assumptions involve the appropriate levels of capital more directly, or the means of estimating such levels. Most of these assumptions are likely to have been maintained in the framing of capital requirements at one time or another.

4. There is some level of capital that is consistent with the interests of the firm and the regulatory and supervisory objectives of safety and soundness. Call this the optimum level of capital.
5. The optimum level of capital can be estimated with reasonable accuracy.
6. A lower bound for the optimum level of capital can be computed from a mechanical formula.
7. An accurate estimate of the optimum level of capital can be computed from a mechanical formula.

Assumption 4 strikes a balance between the objectives of the firm and those of regulators, which in general are not identical.[3] In assumptions 6 and 7, note that the term "mechanical formula" does not presuppose that the formula is simple, but only that it be computable in a mechanical way, for instance, by means of a computer program. Explicit regulatory capital requirements in the United States and in most other industrial countries are consistent with assumption 6. In fact, the 1988 Basle Accord (Basle Committee on Banking Supervision 1988) states that: "It should be stressed that the agreed framework is designed to establish *minimum* levels of capital for internationally active banks" (italics in original).

Assumption 7 is more controversial. The Basle Committee on Banking Supervision (1988), for example, is careful to point out that its measure is in no way optimal. The committee emphasizes "that capital adequacy as measured by the present framework, though important, is one of a number of factors to be taken into account when assessing the strength of banks." Of course, the fact that one specific formula is not sufficiently accurate does not rule out that other, more accurate formulas may exist.

If assumptions 1 through 7 all held, there would be a high degree of confidence in the well-functioning of regulatory capital. In fact, many of these assumptions are unlikely to be controversial. Most problematic are those assumptions that involve some knowledge of the optimum level of capital, perhaps obtained by means of a mechanical formula. I refrain at this point from taking a stand on the assumptions. In a later section, I return to the issue of whether optimum capital is calculable by means of mechanical formulas.

U.S. Regulatory Practice in Historical Perspective

A brief preliminary review of the history of regulatory capital for U.S. banks may provide a helpful perspective on the issue of the relative importance of formulas and supervision.[4] Before 1981, there were no explicit regulatory requirements for capital ratios. Examiners from the federal supervisory agencies (the Office of the Comptroller of the Currency, the Federal Deposit Insurance Corporation, and the Federal Reserve System) were responsible for formulating opinions about the capital adequacy of individual firms. Any formulas used differed from supervisor to supervisor, and possibly even from bank to bank, and were conceived as informal guidelines rather than as precise estimates of an optimum level of capital. In terms of the structure of the previous section, we could think of the pre-1981 regime as embodying the first five assumptions, but not the last two.

In 1981, in the aftermath of the thrift crisis and in the midst of widespread discontent with the actual capital ratios of many banking institutions, a new three-tier set of explicit capital requirements was introduced. These requirements were based on the ratio of primary capital, which consisted mainly of equity and loan loss reserves, to total assets. The multi-tier framework was instituted to facilitate the transition to the new system by larger institutions, whose capital ratios were in general less than desired. The distinctions among banks of different sizes were eliminated in 1985.[5] In this early period of explicit capital requirements, we could say that regulators and supervisors became more comfortable with assumption 6 regarding a lower bound for optimum capital.

Toward the mid-1980s, there was again some discontent with the levels of capital of U.S. institutions, and once again the focus tended to be on the larger firms. At the same time, regulators in other countries, including the United Kingdom and Japan, had similar concerns about their own institutions. These countries joined forces with others in the so-called Group of 10 and issued in 1988 the Basle Accord (Basle Committee on Banking Supervision 1988).[6]

The Accord differed in two significant respects from the structure of capital requirements then in place in the United States. First, for the purpose of calculating required capital, asset values were weighted by a few simple credit risk factors. Second, the risk-weighted assets were supplemented by credit-equivalent amounts corresponding to off-balance-sheet instruments. The 1988 innovations relied on the same assumptions 1 through 6 as the 1981 requirements. However, the changes reflected two new developments.

First, large firms were increasingly engaged in activities that produced risky exposures not captured (or not fully captured) on the balance sheet. This change exposed a natural weakness of mechanical formulas: they typically have to be adjusted when there are unforeseen changes in the environment. The second development was, in essence, increased confidence in assumption 6, that is, on the precision of formulas for calculating a lower bound for optimum capital. For example, factors corresponding to potential future exposure of off-balance-sheet instruments were based, albeit loosely, on state-of-the-art mathematical simulation methods.

The most recent event in our chronology is the introduction of market risk rules by the Basle Committee

(1996). The 1988 Basle Accord had recognized that there were various problems that were left unresolved for future iterations. The 1996 rules took the ground-breaking step of allowing banks to calculate their exposure to market risk using their own internal models, subject to some restrictions on the choices of parameters and features of the model.[7] As in 1988, these changes reflected increased confidence in assumptions 1 through 6, rather than the introduction of a new one. In 1996, the optimism centered on assumption 5—on the accuracy with which optimum capital could be estimated using state-of-the-art modeling techniques.

To summarize, history demonstrates that supervision and examination have always played a major role in regulatory capital in the United States, and that it is only since 1981 that mechanical formulas have been used explicitly across the board. Of the assumptions listed in the previous section, only assumption 7 failed to be invoked historically. However, through history, there has been a clear recurrent fascination with the idea of reducing everything to formulas, and it seems unlikely that such an ideal has been given up at this point. In the next section, I turn to assumption 7 or, more specifically, to the drawbacks of mechanical formulas and to their limitations in defining regulatory capital.

The Problems with Formulas

The landmark Basle Accord of 1988 was issued by the Basle Committee on Banking Supervision under the chairmanship of W.P. Cooke. The Accord relies heavily on mechanical formulas, but it is clear from the document that it by no means constitutes an unqualified endorsement of formulas. In fact, a few years earlier, Cooke (1981) had stated bluntly that "There is no objective basis for ex-cathedra statements about levels of capital. There can be no certainty, no dogma about capital adequacy." This section is an attempt to understand the limitations of mechanical formulas.

One could easily conceive of mechanical formulas playing a useful role in banking if the business were completely determined by formal laws that were clearly stated and strictly implemented. In the words of legal philosopher H.L.A. Hart (1994), "Everything could be known, and for everything, since it could be known, something could be done and specified in advance by rule. This would be a world fit for 'mechanical' jurisprudence." However, the reality of banking is quite different: the business has important informal determinants and conventions that have evolved over the course of several centuries and that continue to evolve.

Banking has developed in most countries as a market solution to a common array of business problems. Furthermore, not only is the institution of banking an evolving response to economic conditions, but evolving economic conditions are in turn profoundly affected by the institution of banking. These mutual influences are so important that it would be impossible, in the context of a mature banking sector, to identify one as logically or chronologically prior to the other.[8]

Fundamentally, banks and other financial firms are social institutions. They have emerged not by external design, but as sets of rules that rest on a social context of common activity. These rules are not limited to formal laws, like banking statutes and regulations, but also include conventions that are predicated on the agreement of the parties involved and on the existence of formal and informal criteria that may be used to determine whether the rules are being followed.[9]

Examples of informal rules abound in banking. There is remarkable consistency in the instruments that banks employ, even banks of different sizes and geographical locations. Consider, for example, commercial loans. There is some variation in the terms of these loans, such as maturity and reference interest rates, but the choices are typically conventional and essentially "menu-driven." Furthermore, even the criteria for loan approval are determined by the normal practices of the business. Other examples of conventional instruments are consumer loans, mortgages, demand deposits, and time deposits. Closer to the issue of regulatory capital are conventions with regard to risk management, such as simulation models for calculating exposures to fluctuations in market prices and, more generally, value-at-risk models. Consensus on these techniques, while not universal, is widespread.

The business practices of the financial sector, and in particular the network of informal rules and conventions on which they are partly based, provide a certain level of consistency, but they are also dynamic and complex. A supervisory or regulatory regime that ignores these practices will fail to deal with the economic reasons for the existence of the financial sector and, if the restrictions are binding or even relevant, the regime will create economic distortions and inefficiencies that will make everyone worse off. Consider in turn the implications of dynamism and complexity.

There is no question that the financial sector is dynamic. Commons ([1934] 1990) anticipated later observers in noting that "Working rules are continually changing in the history of an institution." And North (1990), drawing on historical observations, contends that "The stability of institutions in no way gainsays the fact that they are changing. From conventions, codes of conduct, and norms of behavior to statute law, and common law, and contracts between individuals, institutions are evolving and, therefore, are continually altering the choices available to us."

How can we rely on static formulas if they have to be applied to a business that is continually changing? Obviously, the only way to keep pace is to change the formulas. However, predictability in regulation is helpful, perhaps essential. What happens if, in an effort to keep up with the dynamism of banking, inflexible regulatory regimes have to be modified at an increasing pace? There is a tradeoff between predictability and dynamism, and there is a danger that changes are now (and will continue to be) required with increasing frequency.

Let us turn to the issue of complexity. The very fact that an activity is based on informal rules brings with it some degree of complexity. North (1990) contends that:

> It is much easier to describe and be precise about the formal rules that societies devise than to describe and be precise about the informal ways by which human beings have structured human interaction. But although they defy, for the most part, neat specification and it is extremely difficult to develop unambiguous tests of their significance, they are important.

To be sure, one of the reasons for the complexity of informal rules is that they have not been written down, or formalized. However, the problem is not simply that they have not been specified, but rather that they defy specification. Behind the network of routine practices of the business lurks a system of true inherent complexity.

So, where do we turn? A decision by the Supreme Court of the United States (1933) may be useful in providing some sense of direction.[10] In referring to the Sherman Anti-Trust Act of 1890, the Court stated that

> As a charter of freedom in the public interest, the act has a generality and adaptability comparable to that found to be desirable in constitutional provisions. It does not go into detailed definitions which might either work injury to legitimate enterprise or through particularization defeat its purposes by providing loopholes for escape. The restrictions the act imposes are not mechanical or artificial.

Abstracting from the specific legal issue facing the Court on that occasion, the general economic principles are close in spirit to those that we address here. The suggestions are clear: strive for generality and adaptability in statute and regulation, avoid detailed definitions that may be inefficient and circumventable, stay away from the mechanical or artificial.

Do we want to say, in conclusion, that there is no role for mechanical formulas in regulatory capital? No, that would be dogmatic and inflexible. Even if formulas are problematic as constraints on banks' decisions, they may still be useful in some circumstances, for instance, to convey certain kinds of information about the bank or to make some interbank comparisons. We do not want, however, to be unreasonably restrained by lingering mechanical formulas for years or decades at a time. It therefore seems advisable to avoid writing detailed mechanical formulas into statute and possibly even into regulation.

What Else Is There?

If mechanical formulas hold very little promise of identifying appropriate levels of regulatory capital, what else is there for regulators to turn to? In announcing the sweeping changes in financial regulation and supervision that took

place in the United Kingdom in 1997, Sir Andrew Large (1997) indicated that "I don't think we should lose sight of the fact that so much in regulation is not about structure but about attitude and management: the 'how' of regulation; the way it is done." The implications for regulatory capital seem clear. It is an important priority of supervisors to determine whether the appropriate "attitude and management" toward capital prevail in a firm, to focus on the way things are done. It is less clear that they need to provide the firm with mechanical formulas to estimate the appropriate level of capital.

Yet mechanical formulas produce tangible results, whereas attitude and management seem quite fuzzy. If we were to rely less on formulas, is there any substitute for the determinacy they seem to provide, or are we inevitably thrust into an environment in which there are no guideposts and only discretion prevails? This is potentially a serious difficulty, certainly in practical terms, but especially in view of the arguable importance for authorities to commit in advance to certain types of behavior in order to avoid problems of moral hazard and time inconsistency.[11] However, in banking, there is a network of informal constraints—as described in the preceding section—that can provide a solid grounding for the capital decisions of firms and the informed judgment of supervisors.

These informal constraints or conventions are also useful in dealing with moral hazard and time consistency problems. Although formal economic models often imply that mechanical rules are necessary for those purposes, Williamson (1983) and North (1990), among others, conclude that conventions are sufficient to achieve "credible commitments" in real-world situations. A particularly relevant case is presented by North and Weingast (1989). They argue that, following the Glorious Revolution in seventeenth-century England, the Crown and Parliament agreed to abide by credible commitments that led to new institutional arrangements. These new institutions, in turn, made possible the development of modern financial markets.

The foregoing considerations suggest that, in designing regulatory capital requirements, it is desirable to avoid excessive detail in statute and regulation. However, to determine how much capital a bank should have, detail is ultimately unavoidable. One solution to this regulatory dilemma is to ensure both that firms delve into whatever level of detail is necessary and that supervisors have the necessary expertise to determine whether the details are properly handled by the firm. In terms of the initial question of this paper, less weight could be placed on the development of mechanical formulas, and more weight could be devoted to supervision.

We should note that, in this regard, there is no immediate cause for alarm. The principal concerns, however, are not with the present, but with the future evolution of the system. How do we make further progress, and how do we avoid allowing the dynamic environment to elude us?

Let us review a couple of recent ideas. First, consider the "pre-commitment approach," an attempt to do away with mechanical formulas for the calculation of capital for market risk and to replace them with penalties for firms whose decisions are proven wrong by experience.[12] Under this approach, firms pre-commit a certain amount of capital for market risk at the beginning of, say, each quarter. This amount may be determined by whatever means the firm sees fit. At the end of the quarter, the supervisor compares the firm's losses arising from market risk, if any, with the pre-committed amount. If the loss exceeds the amount, a penalty of some sort is imposed. Kupiec and O'Brien (1995b) consider a broad range of possible penalties, from monetary fines to supervisory disclosures.

The pre-commitment approach is attractive for several reasons. First, it provides considerable flexibility in the determination of capital amounts. Second, it is not intrusive; it is designed to allow the firm to pursue its business objectives with few distortionary effects from regulation. Third, it seems to require little knowledge or effort on the part of the supervisor. With regard to banks' internal models, Kupiec and O'Brien (1995a) argue that "It is virtually impossible for a regulator to verify the accuracy of the size of the losses associated with rare tail events." They propose instead the easier task of comparing actual losses with a pre-committed amount.

Though theoretically attractive, there are serious problems in the implementation of the pre-commitment

approach. One central issue is the design of the penalty structure. The approach circumvents the need for mechanical formulas in the initial determination of capital, but regulators must address the need for a "penalty formula" at the other end. Should this be a mechanical formula, which might suffer from the shortcomings described in the previous section? Should there be room for supervisory discretion? Some proponents of the method might be put off by the introduction of discretion in a method conceived as objective and nondiscretionary. There are also other, more mundane issues, such as defining what is meant by "the firm's losses arising from market risk." Thus, the pre-commitment approach is basically attractive, but is not without its share of practical problems.

Another idea from the recent literature is what we might call the "supervisory approach," whose rationale is to focus primarily on the determination of optimum capital by the firm, monitored by the supervisor, while limiting reliance on mechanical formulas to a simple, well-defined role in which they are more likely to be useful.[13] Under this approach, the firm would be accountable in the first instance for determining its own appropriate level of capital, abiding by sound practices developed in the context of the business. Firms engaged in trading of complex financial instruments, for example, would need to apply sophisticated mathematical techniques, which they would be required by supervisors to have at any rate for risk management purposes. Firms that focus on small business lending would have to apply very different techniques, most likely emphasizing more traditional credit analysis.

The supervisor would monitor the performance of the firm in the determination of the appropriate level of capital. There is substantial potential synergy between the supervisory review of risk management activities, which is already an important part of bank examinations, and the monitoring of regulatory capital in the way described. Furthermore, the attention paid by supervisors to the process, not just to the final result, provides incentives for firms to refine their management of risk. In monitoring the determination of capital, the supervisors would also ensure that the views of the firm are consistent with the public goals of systemic safety and soundness, and that there is no attempt to take undue advantage of elements of the financial safety net, such as deposit insurance. Procedures to enforce compliance through supervisory sanctions would have to be in place, much as they are now in the United States and other countries.

Finally, mechanical formulas could be retained in a relatively modest role as rough indicators of severely inadequate capital. If an institution were to require closure, it is in the public interest to prevent any losses from having to be borne ultimately by taxpayers. A formula may be helpful in this regard as a trigger point, much in the same way that prompt corrective action regulation is implemented for U.S. banks.

One important issue in the supervisory approach is that it places a substantial burden both on firms and supervisors. Firms have to be ready to take the necessary steps to make an accurate assessment of their need for capital. For many of them, reliance on mechanical formulas would not be an option. Supervisors would have to develop and retain human and other resources that would enable them to come to grips with the full diversity of methods employed by firms.

The supervisory approach is in many ways similar to the system in place in the United States prior to 1981, which regulators in the end found unsatisfactory. However, the similarities are only superficial, because a broad array of new conventions has been introduced in the financial markets since 1981. For instance, in the 1970s, many financial institutions were caught off guard by sudden bursts of inflation and sharp rises in interest rates, and the magnitude of the resulting losses was staggering. Today, even the smallest institutions are aware of interest rate risk and are required by supervisors to manage it prudently. In general, firms and regulators are much more cognizant today of risk and risk management, and this awareness has led to a whole structure of conventions designed to deal flexibly with new risks as they are identified.

The approaches to regulatory capital described above are only two examples of methods that can help effect a shift from mechanical formulas to supervision in the context of regulatory capital. As these and other potential ideas are discussed, what criteria can be used to evalu-

ate them? Toward this goal, we conclude with the following series of questions, which are based on the analysis of this paper.

- Does the idea make sense in principle? Does it address the shortcomings of the current system and is it based on sound theoretical analysis?
- What are the practical implications of implementation? What exactly is required on the part of the institution and on the part of supervisors?
- Is it a short-term fix or a long-term solution? Is it capable of handling new instruments and practices?
- Is it applicable to the institution as a whole? Would other different—and potentially inconsistent—approaches have to be developed for other risks or other parts of the business?

ENDNOTES

1. Although most of the discussion of this paper focuses on banks, the principles delineated also apply to other types of financial institutions that perform similar services. The focus on banks is adopted to make the analysis more concrete, especially since history is one of the main tools employed in the paper. For similar reasons, examples are drawn mostly from the U.S. experience.

2. For example, see Berger, Herring, and Szegö (1995) and Dewatripont and Tirole (1994). Historical approaches to banking crises include Bernanke (1983) and Mishkin (1991), whereas Davis (1992) and Calomiris and Gorton (1991) combine theoretical and historical analysis.

3. The Modigliani-Miller (1958) theorem implies that under certain ideal conditions, the firm would not have a preference for any determinate level of capital. However, see also Berger, Herring, and Szegö (1995), and Miller (1995).

4. See Gaske (1995), Berger, Herring, and Szegö (1995), and Kaufman (1991).

5. Board of Governors of the Federal Reserve System (1985).

6. An account of the process that led to the Basle Accord is found in Bardos (1987-88).

7. The model-based rules are described in detail in Hendricks and Hirtle (1997).

8. An interesting attempt to model these types of mutual influences is found in Caplin and Nalebuff (1997).

9. In this paper, the terms "rules," "formulas," and "models" have very different meanings, as the usage in the text demonstrates. Rules are interpreted quite generally to include conventions and other practices that are generally followed in the course of business but are not formally prescribed, for example, by statute or regulation. Mechanical formulas include mathematical expressions, but more generally any formula that can be constructed, for example, by means of a computer program and therefore that can be computed without human judgment or intervention. Finally, models refers to mathematical techniques applied to a specific problem, say, to the estimation of optimum capital for a given bank. These models may include, among others, value-at-risk models for calculating market risk of trading portfolios.

10. I am grateful to Arturo Estrella, Sr., for this reference.

11. See, for example, Kydland and Prescott (1977).

12. See Kupiec and O'Brien (1995b).

13. Some thoughts on how a regulatory approach could be designed are found in Estrella (1995).

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