

**Regulatory Capital and the Supervision of Financial Institutions:
Some Basic Distinctions and Policy Choices**

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1. Introduction

Discussion of regulatory capital for banks and other financial intermediaries has tended to focus on very detailed issues, as opposed to the general lay of the land. For instance, regulators have tended to concentrate on increasingly complex formulas designed to calculate minimum regulatory requirements.¹ These formulas have traditionally been based on general reasoning, although they are increasingly dependent on statistical models. Academics, on the other hand, have focused on mathematical models that lead to explicit expressions for the optimum amount of capital for a firm, usually from the point of view of its owners or managers.²

In an attempt to put the foregoing detailed analysis in perspective, this paper approaches the issue of capital regulation and supervision in broad terms, essentially from the top down.³ It draws distinctions among various targets for the capital levels of firms, which may differ according to the point of view of key interested parties. As indicated in Figure 1, three capital concepts or targets are considered, namely:

- economic capital, defined as the desired level from the point of view of the firm itself,
- optimum capital, the level that maximizes social welfare, in some sense, and
- minimum capital, the floor imposed on the firm by regulatory rules.

It is important to note that these three targets may in general not coincide, and that confusing one target for another may lead to poor regulation and undesirable results.

We then descend one level to consider the determinants of these distinct targets. How is each target determined? To the extent that policy can influence these determinants, how is each target *best* determined? Most of the determinants considered are in fact within the purview of regulators: regulatory pressure and enforcement, regulatory capital formulas, financial supervision. The one apparent exception is market discipline. This important element, however, is also affected by regulatory intervention. A negative reason is that there is a danger that regulation could interfere with the proper functioning of market discipline, which clearly should be avoided in the design of new regulation. More positively, regulators can make use of market forces whenever the incentives of the market and the regulator are or can be aligned.

The paper concludes by considering the relationship between the concepts examined here and the general outlines of the 1999 proposal of the Basel Committee on Banking Supervision. From the broad perspective of the paper, there is substantial overlap between the paper's capital concepts and the main "pillars" of the Basel proposal. These relationships are mapped in Table 1, which also provides references that discuss these issues in greater detail.

In sections 2 and 3, the paper focuses on the distinctions drawn in the top level of Figure 1, specifically between economic capital and optimum capital, and between optimum and minimum capital. Sections 4, 5 and 6 then turn to some of the determinants in the next level of Figure 1: formulas versus supervision, supervision and regulation

¹ See, for example, Basel Committee on Banking Supervision (1988) and (1999).

² Santomero (1991) and Berger et al. (1995) survey this literature. Some authors have modeled regulatory concerns as well. See, for example, Dewatripont and Tirole (1994) and Boot et al. (1999).

³ This paper draws on the author's previous work on the topic. The primary references are listed in Table 1, and pdf versions of the papers may be found in <http://www.ny.frb.org/rmaghome/economist/estrella/estrella.html>.

versus market discipline, and simple versus complex formulas. Section 7 describes some features of the 1999 Basel proposal and reviews the mapping between the proposal and the concepts of this paper. Finally, section 8 provides some concluding thoughts.

Figure 1

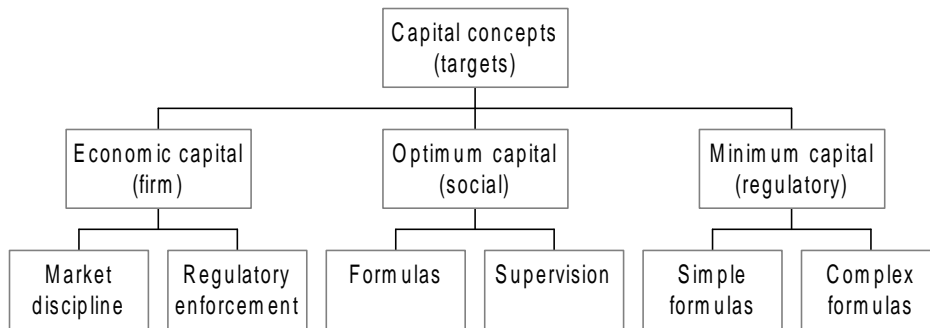


Table 1
Capital targets: mapping into Basel proposal and references

	Economic capital	Optimum capital	Minimum capital
Corresponds to	Third Pillar:	Second Pillar:	First Pillar:
1999 Basel proposal's	Market discipline	Supervisory review of capital adequacy	Minimum capital requirements
Relevant references	Estrella (1995) Estrella (1999)	Estrella (1995) Estrella (1998)	Estrella (1995) Estrella, Park and Peristiani (1999)

2. Economic capital versus optimum capital⁴

This section focuses on the potential differences between the level of capital that each firm individually would prefer for itself (economic capital) and the level of capital for each individual firm that would best serve the needs of the public (optimum capital). In fact, the distinction subsumes a much greater number of different views, since “the firm” could be represented by owners, managers, debt-holders, depositors, etc. We abstract here from such finer distinctions, focusing essentially on the point of view of the owner.

The banking industry, like others in the financial sector, is subject to extensive regulation and supervision. In and of itself, such close scrutiny would seem to put

⁴ This section draws on Estrella (1995), p. 7, “Optimum capital and the ‘social optimum’.”

pressure on firms to determine and hold optimal levels of capital, in some sense. From a public policy perspective, however, it is not immediately clear that a socially optimal capital structure would result from pure market forces. If firms do maintain individually optimal “economic capital” levels, are those levels consistent with socially optimal amounts? Moreover, are there competing incentives that drive firms away from maintaining individually or socially optimal levels?

There is no simple answer to the first question. Although it is conceivable in theory to define an allocation of capital across firms that maximizes some social welfare function, it would be presumptuous to assume that such an optimum is readily quantifiable in practice. It seems reasonable, as a first approximation, to adopt the market solution to this issue, namely, to assume that in the absence of perverse incentives, individually determined optima are acceptable for public policy purposes. This brings us to the second question: do such perverse incentives exist? Frequently cited in this context are the elements of the “safety net”: special arrangements provided by official authorities because of the special nature of the banking business. The benefits of the safety net, if not properly priced, have the potential to generate undesirable behavior.

An example of the concerns associated with the safety net is provided by deposit insurance, whose primary purpose is the protection of small depositors. A typical account of the misuse of deposit insurance proceeds as follows. Firms have access to government-provided deposit insurance at a flat rate that is not reflective of each institution's potential risks. The mispriced insurance then leads to moral hazard: the institution can hold inordinately risky assets without driving away the protected depositors. Eventually, the risky assets collapse, the firm becomes insolvent, the depositors are made whole by the insurance fund, and the insurer and the taxpayers incur large losses. This sort of scenario is often cited in connection with the U.S. thrift predicament of the 1970s and 1980s.

One might attribute this chain of events to too much risk. Alternatively, however, one might conclude that there was too little capital. Normally, a firm is concerned with self-preservation. There are various incentives for management, shareholders, debtholders, and depositors to favor the firm's continued existence over the dissipation of its net worth. In the absence of other complications, the firm's view of its optimum level of capital should be consistent both with the actual riskiness of its activities and with the objective of attaining a certain prudent likelihood of the preservation of firm value.

Realistically, other complications do exist, such as deposit insurance and real or perceived implicit guarantees of the “too big to fail” variety. If the firm takes the benefits of these provisions into account in determining its optimum capital, and if the corresponding price structure for those benefits is inexact, the probability of failure increases and the explicit or implicit insurer is left to bear the risks. This possibility introduces a wedge between economic capital, determined solely on the basis of the firm's interests, and socially optimum capital.

One way to approach this problem is to insist that the firm not reduce its estimate of optimum capital as a result of unpriced or inexactly priced benefits from the safety net. In the absence of such a requirement, and strictly from the individual firm's point of view, the existence of the safety net may represent an opportunity for the firm to hold a lower level of capital without jeopardizing its funding or its expected profit. Ignoring such benefits in the determination of the optimum is akin to establishing an insurance premium or reserve within the firm in the form of additional capital. This reserve would reduce the

likelihood of firm insolvency approximately to the level that would obtain in the absence of the safety net and would correspondingly limit the costs to the official authorities and to the public interest. From a public policy perspective, this solution has the advantage of being preventive rather than palliative, and it has the potential to reduce the frequency and severity of official rescue efforts.

What incentives do firms have to establish optimum capital goals in this manner, and how can such an approach be enforced? A strong and informed supervisory system can be the key in providing the requisite incentives and deterrents. The benefits associated with the safety net, as well as other benefits such as authorization to participate in a variety of activities, can be made available as incentives to well-capitalized institutions. Although the determination of optimum capital is usually complex and highly subjective, a well-informed supervisor may determine whether the approach to optimum capital is reasonable and whether it avoids reductions corresponding to any unpriced benefits of the safety net. Contact between the firm and its supervisor at both the technical and management levels can help eliminate any differences of opinion that may arise.

As to deterrents, bank supervisors in the United States and other countries have at their disposal various enforcement actions that can be used selectively even in cases where problems are not yet dangerously acute. In implementing either incentives or deterrents, the supervisors face significant demands on their coverage and expertise.

3. Optimum capital versus minimum capital⁵

3.1 *Optimum capital*

As defined in the previous section, the principal difference between economic capital and socially optimum capital is that the latter abstracts from unintentional incentives that arise, for example, from the provision of a safety net to banking institutions. Absent those incentives, optimum capital is the level of capital that a firm determines is prudent, desirable, and achievable in the short run. The firm's own decision as to what level of capital is desirable is predicated on its views regarding the tradeoff between the costs and benefits of capital. Capital is costly, generally more so than other claims. At a point in time, and given the particular risks faced by the firm, management may specify a given level of capital that meets its subjective goals for coverage. This calculus is hardly exact, especially since some risks are very difficult to model and quantify. Moreover, the firm may in some cases exercise considerable discretion regarding the nature and level of risks it faces. Nevertheless, using all the detailed available information, management should be able to specify some ultimate capital goal, as well as a plan to move swiftly toward that goal in the near term.

The development and application of optimum capital are fundamental components of a market-oriented approach to capital. A firm's actual level of capital is frequently disclosed and is regarded by the investing public as a fairly direct result of the firm's management policies. Thus, the motivation for the firm to maintain adequate prudential capital derives not only from its own internal judgment and that of its supervisors, but also from the force of public scrutiny.

The determination of optimum capital entails continually facing tough questions and decisions about goals, means, and consequences. Optimum capital itself is a

⁵ This section is based on Estrella (1995), pp. 2-7.

conceptual goal more than an objective reality. It is pursued not because the firm will know and attain the thing in itself, but because it imposes a discipline and a sense of direction that are conducive to responsible management. It seems preferable not to impose on the firm a specific methodology for determining optimum capital, but rather to allow it to be developed from within, according to the firm's own conception of its business goals and perception of its environment.

The useful flexibility embodied in the notion of optimum capital also creates some difficulties in its successful application. Among the features of optimum capital that make it difficult to pin down are the following.

Optimum capital is *subjective, hence difficult to replicate and validate*. Many tough decisions must be faced in coming up with an optimum capital amount. Such determinations may seem objective because of the quite substantial mathematical and statistical apparatus that frequently underlies them. However, mathematics is only an aid in portions of the process and contributes to the modeling of some of the relationships, not necessarily to the accuracy of the resulting numerical levels, which remain subjective. The decision maker cannot escape responsibility for the ultimate judgments about the goals of the exercise and the level of coverage desired. The firm must also attain a deep understanding of the construction of optimum capital and of the related risk management system and must track its output and performance on a continuous basis. This role is intrinsic to the firm and it is neither practical nor appropriate for others to assume it.

Optimum capital is *internal to the firm*. In determining optimum capital, firms draw on proprietary information that they may not wish to disseminate for reasons of business competitiveness. Furthermore, the methodology itself may be proprietary. Given the present state of the art in risk management, there are many different ways of measuring risk, and the discovery of accurate tractable methods may be of much value to their developers. The public may be aware of the estimated level of optimum capital only to the extent that the firm is able to attain that level on an ongoing basis, in which case it would be reflected in the publicly reported actual capital level. In general, however, the figure is most meaningful to the firm itself and to its regulator, who is likely to be familiar with the full methodology leading to the ultimate results.

Optimum capital is *difficult to compare across institutions or across time, and may be unstable in relation to the underlying notional positions*. The subjectivity of the measure clearly makes comparisons across institutions difficult or impossible. Moreover, many of the methods applied to calculate, say, price risk are dependent on fluid measures of market values or instrument volatilities. Such measures change from minute to minute, certainly from day to day, with resulting changes in the computed riskiness of a portfolio even if its composition remains essentially intact. Ultimately, results can only be interpreted in the full context of the process from which they are derived.

Finally, optimum capital *represents an attempt at precision, and — as an optimum goal — is necessarily binding*. The level of precision may depend on the component of optimum capital being estimated. The methods applied to price risk, such as the mathematically intensive value-at-risk measures, may be fundamentally different from those applied to credit risk, liquidity risk, or operational risk. Legal risk is likely to be difficult to quantify, but may be significant. However determined, the final result is by definition binding. The firm should approach it as quickly as possible given market conditions. Nevertheless, each institution faces cost and timing considerations and at any

time the institution is more likely to be on a path leading to the optimum than at that point itself.

3.2 *Minimum capital*

Minimum capital requirements have been successful to the extent that they have reflected large first-order exposures. The concept of exposure is distinct from that of risk. Exposure may be defined as a measure of the aggregate value that is subject to risks in general. For instance, the face value of a debt instrument may provide a good basic measure of exposure. Analysts may differ as to the precise riskiness of the instrument — its sensitivity to interest rate movements, the likelihood of counterparty default, potential settlement problems, and the like. Nevertheless, the range of values involved in those differences is frequently of second order as compared with the basic exposure of the instrument. In regulatory practice, exposure is usually calculated by means of well-defined rules that are straightforward (though not necessarily simplistic), verifiable, and roughly representative of the overall level of risk.

A comprehensive measure of exposure may be successful because any conceivable instrument is subject to some type of risk. The classic commercial loan is subject to credit risk, to be sure. A long-term Treasury bond may have no credit risk, but it can have significant price risk, much beyond that of a short-term loan. A mortgage security may also have little credit risk: the investor has ultimate recourse to collateral and in many cases to government guarantees. Furthermore, because of its amortization feature, its pure interest rate risk is likely to be lower than that of a Treasury instrument of similar maturity. Nevertheless, the mortgage security is subject to prepayment or convexity risk, which can be fairly intractable and unpredictable. Thus, as a first-order approximation, a comprehensive exposure calculation may be preferable to a much more detailed calculation based on a breakdown of risk factors. The payoff from the latter approach is attainable only if regulators can and will pursue it to its logical conclusion.

Historically, explicit capital requirements have represented attempts to capture first-order exposures, as defined above. More generally, what common characteristics have capital requirements shared that have made them useful to supervisors, regulators, investors, depositors, and the public at large?

Minimum capital is *objective and verifiable*. The basic information and formulas used to compute the required amounts are generally well defined in advance. The procedures are mechanical and, once in place, they are applied without the intervention of ongoing value judgments. One advantage accruing from this fact is that the rules are easily verifiable by anyone with expertise and access to the relevant information. An auditor should be able to replicate the calculations, and any observer should be able to reconstruct a portion of the computations if the required data are available.

Almost corollary to the preceding point is that minimum capital is *comparable across institutions and across time, and bears a stable relationship to the underlying positions*. Capital rules generally yield the same result for the same portfolio, independently of the random vagaries of the markets and of any subjective decisions on the part of the firm or the regulator. Since minimum capital is also generally *public knowledge*, the above comparisons may be performed not only by the institution and its regulators, but also by investors, investment analysts, competitors, and any other interested parties.

Minimum capital is generally *based on somewhat rough — though ideally comprehensive — calculations*. Its function is to measure first-order exposures in an informative but approximate way. The conflict between accuracy and simplicity is more often than not resolved in favor of the latter, though carefully constructed requirements can achieve — in the aggregate — some accuracy as well. The calculations required should be straightforward in order to achieve the benefits discussed earlier. For instance, the gamma of an options portfolio may be sufficiently straightforward for these purposes, even if there are those who would not see sufficient simplicity in the calculation of a weighted average of second derivatives of an assortment of option pricing formulas.

Minimum capital is a guidepost. It *represents a minimum required level that is seldom expected to be directly binding*. Ideally, it is related to the positions that account for the bulk of a firm's exposure to risk in an objective and predictable way and is thus generally understandable. It was not and is not intended as a level toward which the firm should aim nor as a standard for internal risk management. Because it is meant to be only a rough minimum standard, such interpretations could be unsafe. Instead, the actual capital of the firm should appreciably exceed the minimum. Beyond that, it is difficult to give precise rules as to how large the excess should be, although the next section provides some general guidelines. It is clearly not in the interests of regulators, depositors, and taxpayers to allow a bank's net worth to deteriorate to socially costly negative levels. A minimum capital level provides an early warning of such an event. For these reasons, minimum capital is not a proxy for some other elusive concept, it is of interest in and of itself.

4. Formulas versus supervision⁶

4.1 *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

⁶ Based on Estrella (1998).

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.

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.

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) 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. 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 inter-bank 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.

It is interesting to note that other authors have reached very similar conclusions using very different methodologies. An example is Boot et al. (1999), in which the authors consider the implications for regulatory design of the competitive environment and the state of development of the financial system. They conclude that: "...the increasingly competitive and dynamic environment should redirect the focus of regulation to setting basic minimum standards, essentially certification requirements. ... Additionally, discretionary supervision is needed to monitor the integrity and viability of financial institutions."

A second example is Llewellyn (1999), who derives a set of principles for regulatory design from the close analysis of recent banking crises worldwide. Two of his principles, numbers (9) and (10), are particularly relevant here. They state that "Official agencies need to have significant powers and independence to conduct effective monitoring and supervision..." and "Less emphasis should be placed on detailed and prescriptive rules and more on internal risk analysis, management and control systems."

4.2 *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. 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.

5. Supervision and regulation versus market discipline

5.1 *The possibility of incentive-compatible information transfer*

To what extent can supervisors rely on the market to provide the information they need to assess the performance of firms and the incentives they would like to have in place for firms to behave appropriately? We have already pointed out in Section 2 that some features of the financial system, such as the regulatory safety net, may introduce incentives for firms that are not entirely compatible with regulators’ objectives. Another potential problem is that if the incentives of the firm are not exactly aligned with those of the regulator, the firm may not willingly provide reliable information to the supervisors.

There are cases in which this phenomenon is clear cut, for instance, if the firm is engaging in fraudulent or otherwise illegal activities. Other cases are subtler. Consider a situation in which a firm is operating in good faith, but is flirting with levels of solvency

that the supervisor considers problematical. In those circumstances, it is unlikely that the firm and the supervisor will see completely eye to eye as far as the appropriate conditions that would warrant shutting down the firm. Specifically, the firm may be more optimistic than the supervisor as to the likelihood of improved future prospects. Alternatively, the payoff structure for the firm and the regulator may be quite different in cases in which the firm subsequently improves or deteriorates further.

Estrella (1999) presents a model in which one party provides information to another, who makes a decision that affects both. The key features are: (1) there is uncertainty about an outcome of importance to each of the two parties, (2) one party possesses better information than the other about the stochastic distribution of the uncertainty, and (3) a decision for which the information is relevant is taken by the other party. In the paper's application to banking, the regulator faces the choice of whether or not to shut down a bank, based on information the bank provides.

If provided with full information, the regulator generally selects a natural strategy that involves shutting down the firm in well-defined adverse circumstances. However, if full information is not directly available to the regulator, who must then rely on the firm to provide it, incentive compatibility tends to lead to inferior equilibria from the point of view of the regulator. This incentive compatibility problem is most acute when the firm's level of capital is close to the minimum. Well-capitalized firms have preferences that coincide more closely with those of the regulator and have thus more of an incentive to be forthcoming, and the regulator has a better opportunity of achieving a first best result.

In the case of firms that are at or above the minimum capital threshold, thus, it is generally useful for the supervisor to have direct knowledge of the internal information of the firm that leads to its internal judgements. In contrast, an incentive-compatible rule may be effective in cases in which the potential information is extreme. For instance, when the information is so negative that the firm agrees to shut down, or when it is so positive that the incentives are aligned, given the available information. In practical cases, it is unlikely that expectations will be so dramatic, and direct knowledge of the internal information of the firm is generally useful, even with better-capitalized firms.

These patterns are supportive of a scheme such as prompt corrective action, as instituted in the Federal Deposit Insurance Corporation Improvement Act of 1991 (FDICIA), in which firms are scrutinized more thoroughly as their capital ratios fall, and are shut down when the ratio falls below a specified level. The results are also supportive of approaches to regulatory capital that emphasize direct supervision by the regulator and public disclosure by firms.

5.2 Complementarity of supervision and market discipline

One may conceive of negative consequences arising from the absence of either supervision or market discipline. However, the two are not mutually exclusive and in fact may be complementary, as in the dissemination of information. The supervisor has access to all publicly available information with regard to a firm as well as to market prices for the firm's marketable financial instruments. This type of information is used by banking supervisors in many countries, for instance in the development and application of early warning systems. Some of this information is collected as a result of regulation, but some of it is divulged primarily as a result of pressure from market sources.

In a similar way, market discipline benefits from the publication of information collected by regulators and supervisors. Some of this information provides a standard basis for comparisons across firms or across time, which might otherwise not be feasible. Even market information may be more accessible as a result of regulatory actions. An example is provided by the incentives in the 1988 Basel Accord for internationally-active banks to issue subordinated debt, which is part of Tier 2 capital. Although results have varied across countries, that is, across legal and financial systems, in some cases the issuance has produced a source of market price data that can be very useful to both the market and supervisors.

Thus, there is no real conflict between supervision and market discipline. In general, it is better to have both, which may in turn produce synergies between the two.

6. Simple versus complex formulas

Bank regulators have relied on capital ratios formally or informally for a very long time. The motivation for their use, however, has not always been the same. For instance, in the days before explicit capital requirements, bank supervisors would use capital ratios as rules of thumb to obtain an independent gauge of the adequacy of the level of capital of an institution. There was no illusion that the simple ratios used (e.g., capital to total assets or deposits) could provide an accurate measure of the appropriate capital level for a bank, but large deviations of actual capital ratios from supervisory benchmarks were cause for further scrutiny.

When capital ratios were introduced formally in regulation in 1981 (see Gilbert, Stone, Trebing 1985), they were applied in a different way. The regulatory requirement set a minimum level of capital that the institution had to hold. Because, then as now, there was substantial diversity among banking institutions, the degree to which the requirement was binding depended significantly on the type of institution. Indeed, several classes of institutions were initially defined and accorded different treatment by the regulation. Basically, the requirements were most binding for less than a couple of dozen large banks, whereas smaller banks tended to comply more readily with more stringent requirements. Eventually, the size distinctions were eliminated.

The Basel Accord of 1988 attempted to deal with the diversity in institutional activities by applying different credit risk weights to different positions and by including in the base for the capital ratio a measure of the off-balance sheet exposures of the bank. These calibrations notwithstanding, the intent was not to determine an exact appropriate level of capital for the bank, but rather to provide a more flexible way of determining the minimum required level (see Basel Committee on Banking Supervision 1988).

Another significant regulatory development in the U.S. was the Federal Deposit Insurance Corporation Improvement Act of 1991 (FDICIA), which introduced the concept of “prompt corrective action.” The degree of supervisory intervention in specific banks is now determined by a formula largely driven by the Basel ratios and by a simple leverage ratio. Banks are classified as “adequately capitalized” if they meet the Basel requirements, but new distinctions among levels of capital were introduced. For example, a bank is “well capitalized” if it holds a certain buffer above the “adequate” levels.

In contrast, a bank that falls below a specific level, set somewhat lower than the minimum “adequate” level, is determined to be “critically undercapitalized” and must be shut down by supervisors. This is a different concept of a minimum requirement from the

one used in earlier regulation, in that failure to comply results in the closure of the institution. Rather than a minimum safe operating level, which the earlier rules had tried to identify, the new cutoff point is a backstop level, below which the bank is no longer considered to be viable.

What is the appropriate role, if any, for simple ratios such as the traditional leverage ratio in capital regulation? Section 3 discussed the distinction between minimum and optimum capital levels. If there is a role for simple capital ratios, it is more likely that such a role is in the context of the minimum requirement. The concept of minimum capital is more closely related to the notion of exposure, which simple ratios are capable of capturing. Furthermore, there is evidence that the information contained in simple capital ratios is useful, and at any rate no less useful than that contained in some more complex ratios.

The empirical research in Estrella, Park and Peristiani (1999) shows that for the purposes of predicting bank failure in the United States, simple ratios are not outperformed by more complex measures, in particular by the risk-weighted ratio of the 1988 Basel Accord. The paper compared the performance of the leverage ratio (capital to assets) with that of a capital-to-gross-revenue ratio and the risk-weighted ratio in predicting U.S. bank failures. The main conclusion of this research is not that the simple ratios are better than the more complex measures, but that there are useful exercises in which the simple ratios fare no worse. Given the advantages of simplicity and comparability, it makes sense to consider simple ratios in the context of minimum capital requirements.

7. The June 1999 Basel proposal

The June 1999 capital proposal from the Basel Committee on Banking Supervision is most significant recent event in this field. As suggested in the introduction, there is a natural mapping between the three “pillars” of that proposal and the concepts identified in this paper. In fact, Estrella (1995) was intended in part as a “forecast” of new directions in capital regulation, and recent events have tended to confirm the viability of some of those forecasts. However, the process is still very much ongoing and it is too early to draw definitive conclusions in this regard. This section follows up on the mapping described in the introduction by providing a bit more detail with regard to the three pillars of the new proposal.

The discussion of the first pillar, minimum capital requirements, is the most extensive in the 1999 Basel document. Some of the important changes from the present Accord are in the possible use of external and/or internal credit ratings, recognition of risk mitigation, and explicit coverage of risks other than credit risk.

External credit ratings could be used to expand and rationalize the current system of credit risk weights. Whereas the present Accord has only five risk-weight categories, defined in terms of very broad counterparty classes, this part of the new proposal would assign weights that are tied to the credit ratings issued by recognized rating agencies. A similar approach based on the internal credit ratings of banks themselves is also being considered. The functioning of this alternative is similar, save for the use of internal ratings, which could differ across firms.

The new proposal also considers the difficult issue of risk mitigation. In some cases, it is clear that a combination of positions is less risky than each position alone.

Examples are some forms of collateralization and netting by novation. In other cases, it may seem that one position is a hedge for a second, but the exact extent of risk mitigation may be difficult to determine. The proposal seeks comments on approaches to the recognition of risk mitigation, particularly in the areas of credit derivatives, collateral, guarantees, and on-balance-sheet netting.

As to risks other than credit risk, the proposal discusses primarily interest rate risk in the banking book and operational risk. The Committee is considering an “outlier” approach to interest rate risk, under which only firms that have substantial measured levels of risk would face a capital charge in this regard. Among approaches considered for operational risk are simple ratios and modeling techniques. In most of these areas, the emphasis of the proposal is on eliciting comments from the industry.

The treatment of the second and third pillars is not as extensive or detailed as that of the first. However, it is significant that for the first time in international capital regulation, supervision and market discipline are placed at the same level of the hierarchy as the regulatory minimum. In discussing the second pillar, supervisory review of capital adequacy, the proposal states that: “The supervisory review process should not be viewed as a discretionary pillar but, rather, as a critical complement to both the minimum regulatory capital requirement and market discipline.”

Similarly, the discussion of the third pillar, market discipline, stresses that: “In order for market participants to assess a bank’s capital adequacy, they need to have information about the bank’s capital structure as well as its risk profile. Therefore, the Committee considers disclosures about capital levels, risk exposures and capital adequacy to be important in achieving a meaningful level of market discipline.”

8. Conclusions

This paper has discussed various distinctions with regard to regulatory capital that the author has emphasized in earlier work. The paper seeks to construct a more transparent overarching structure that contains the distinctions. The particular distinctions emphasized are important in the design of regulatory capital regimes, but also for firms’ own approach to capital adequacy. Failure to recognize the distinctions could lead to confusion as to the goals of capital adequacy, could create unnecessary and undesirable regulatory burdens, and could exacerbate risks in individual institutions and in the financial system.

The key top-level distinctions in the paper identify three capital concepts or targets: the economic capital of the firm, the socially optimum capital level and the minimum level of capital required by regulation. In general, these three levels need not coincide. As to the determinants of these levels, the paper argues that both market discipline and regulatory pressure are important determinants of economic capital. For socially optimum capital, it is argued that the most appropriate determinant is official monitoring and supervision. Finally, in the case of the regulatory minimum, the paper makes a case for considering simple ratios, which are not very burdensome, but may be sufficiently informative in this context.

The paper also discusses briefly the 1999 Basel proposal for regulatory capital. It suggests that there is a simple mapping between the three capital concepts of the paper and the three “pillars” of the Basel proposal.

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