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A Prolegomenon to Future Capital Requirements

Arturo Estrella

Since the early 1980s, bank supervisors have made significant strides with regard to capital requirements. The last fundamental change in the United States followed the 1988 Basle Accord, which contained explicit requirements for off-balance-sheet positions as well as more conventional standards based on the balance sheet.

At present, supervisors are contemplating further steps in the refinement of capital requirements. They are considering, among other issues, explicit requirements for market risk, including the use of banks' own risk management models for capital requirement purposes, as well as possible longer run strategies for handling risks other than credit quality and price.[1]

If we assume that the current market risk proposal is successfully implemented, where do we turn next? More generally, what are the long-range goals of capital supervision? This article is intended as a preliminary step—a prolegomenon—in addressing these long-term issues.[2] The object of the article is to persuade those who think that capital requirements are worth studying that it is important to pause a moment and, abstracting from all that has been done, to delineate a set of fundamental principles for future work on capital requirements.

It seems important, at least from time to time, to expand the focus of the analysis of bank capital. If only narrow technical questions were ever posed, it would be difficult to address the broader issues with a satisfactory level of confidence in the results. Thus, the methodology of this article is somewhat unusual in the context of standard economics. The approach is empirical and deductive, but is not based explicitly on hypothetical microeconomic modeling, which is readily available elsewhere.[3] Instead, this article identifies the useful features of capital requirements, past and present, as a means of establishing criteria that we would find desirable in subsequent capital regimes.

As a helpful preliminary, we first draw a distinction between regulatory capital requirements (minimum capital) and the internal risk management and capital allocation of the firms (optimum capital). Although the two

areas overlap in methodology and terminology, they differ greatly as to their goals. Failure to recognize this distinction can lead to unnecessary confusion and has the potential to make capital requirements less useful and institutions' risk management less effective.

This article does not address specific capital proposals nor does it suggest specific new requirements. The framework it provides, however, has implications for possible future refinements in the supervisory approach to capital requirements.

The object of the article is to persuade those who think that capital requirements are worth studying that it is important to pause a moment and, abstracting from all that has been done, to delineate a set of fundamental principles for future work on capital requirements.

Minimum Capital

This section defines the concept and the goals of regulatory capital requirements through inherently empirical means. It proposes to identify from past and present capital rules the specific characteristics that have made those rules useful to their intended audiences. These characteristics may then be construed as goals for future minimum requirements.

In very broad terms, capital requirements consist of three basic components: a definition of capital, a measure of the exposure to risk that capital is intended to cover, and a required relationship between those two amounts (typically a minimum ratio). Consider the components in slightly greater detail.

Regulatory capital is defined to include those claims on the value of the firm that are first in line to absorb future losses arising from a broad range of contingencies. Such contingencies correspond generally to the notions of credit risk, price risk, model risk, operational risk, liquidity risk, legal risk, and so forth. Typical examples of capital instruments are equity—the best form of capital—and subordinated debt—which requires an event of default for losses to be absorbed. The primary purpose of these layers of capital is to protect the senior creditors of the firm, especially the depositors in the case of banks.

Exposure to risk, the second component of capital requirements, is the main focus of the current regulatory discussion. Until the late 1980s, exposure was measured for capital purposes by the size of a bank's balance sheet. In a prototypical traditional bank that issues short-term deposits and invests in long-term commercial loans, total assets may be a fine indicator of the institution's risk exposure. Such a portfolio would of course be subject to large potential changes in its liquidation value as a result of changing interest rates. Nonetheless, with historical accounting and smoothing of earnings over time, the major source of risk could be viewed as arising from potential defaults. Stated differently, risk in this case is credit risk.

The experience of high and highly variable inflation and interest rates in the 1970s and 1980s made such a simple representation a wishful anachronism. Furthermore, the rapid development of securitization and of new financial instruments in the 1980s, and the increasing activity of banks in those areas, complicated matters still more. By the mid-1980s, it was painfully obvious that total assets could no longer be assumed to represent the risk exposures of banking institutions.[4]

In part as a response to these issues, the 1988 Basle Accord introduced an additional measure of exposure corresponding to off-balance-sheet instruments and activities. The recognition that large off-balance-sheet exposures exist is arguably the most significant contribution of the 1988 Accord. The framers of the Accord were faced with the problem of handling increasingly complex instruments and risks, and they responded with a methodology that is less straightforward than that of earlier rules. For example, regulators were forced to deal with positions that have little or no current value but have the potential to create significant exposures for a bank in very short order.

There was no unique way of solving this problem and certainly no perfect one. The method selected was to translate off-balance-sheet exposures such as swaps, forwards, credit guarantees, and lines of credit into credit-equivalent amounts by taking some proportion—varying according to the category of the instrument—of the nominal amount. The result was the inclusion of large, previously unrecognized first-order exposures in the measure of exposure used for capital purposes.

Minimum capital requirements have been successful to the extent that they have reflected these sorts of large first-order exposure. The concept of exposure is distinct from that of risk. Exposure is not defined as corresponding to any particular type of risk, but rather 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. Exposure is calculated by means of well-defined rules that are straightforward (though not necessarily simplistic), verifiable, and roughly representative of the overall level of risk.

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Another general feature of the 1988 Accord, the exclusive focus on credit risk and the introduction of credit risk weights, is conceptually and practically more problematical. By identifying one specific risk—one particular source of exposure—this approach led the way to a conceptual disaggregation of exposure into risk-by-risk components. Because the Accord covered explicitly only credit risk, regulators have expressed the need to modify it in order to cover market risk. Moreover, there are other important risks to consider, for instance, settlement risk, operational risk, model risk, liquidity risk, and legal risk. Although it may appear that such disaggregation is likely to increase precision, identifying simple ways of measuring each of the individual risks is generally quite difficult.

This conceptual experiment may result in several complicated components, each representing an attempt at measuring exposure to a particular risk with a certain degree of precision. If taken to its logical conclusion, the process may lead to a very complex measure indeed. Moreover, if compromises are made along the way, or possibly even if they are not, the sum of the parts will not necessarily be more precise than a comprehensive measure of exposure along the lines of the Accord itself or of some of its predecessors. U.S. regulators recognized the potential dangers of disaggregation in 1989 by superimposing a simple leverage ratio requirement (based on a ratio of capital to assets) on the infrastructure of the Accord.[5]

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 the mortgage security's amortization feature, its pure interest rate risk is likely to be lower than that of a Treasury instrument of similar maturity. Nevertheless, this type of 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 typically 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? As argued earlier, a list of such characteristics may be construed to be at the same time descriptive and prescriptive. Among those characteristics, we find the following.

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.

Minimum capital is a guidepost. . . . It was not and is not intended as a level toward which the firm should aim nor as a standard for internal risk management.

Almost corollary to the preceding 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 supervisor. Since minimum capital is also generally *public knowledge*, the above comparisons may be performed not only by the institution and its supervisors, 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.

The foregoing discussion raises the question whether it is possible to achieve the goals set forth for minimum capital. How can all the recent inventive instruments be handled, and how will future instruments—now unknown—be incorporated in the framework? It is unrealistic to expect that a permanent solution to this problem exists; periodic review of any rule is advisable. However, the current rules, having served as one of the key models in the discussion, are not far from the ideals outlined above. For example, total assets have been seen as a useful basic component of exposure in present and previous regulatory regimes in the United States. The tougher question pertains to the treatment of off-balance-sheet positions, but a good start has been made already in this respect within the 1988 Accord. The principal difficulty with the methods of the Accord is their lack of flexibility in accommodating new instruments. An adequate discussion of this point would be too detailed and technical and would divert us from the focus of this article. Nevertheless, a claim may be stated—without proof—that regulators could use information on contractual or expected cash flows associated with new and existing instruments to define nominal amounts for capital purposes.

Minimum capital is a guidepost. It *represents a minimum required level that is seldom 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.

Optimum Capital

In this article, we refer to the level of capital that a firm determines is prudent, desirable, and achievable in the short run as "optimum capital." The firm's own decision as to what level of capital is desirable is predicated on its views regarding the trade-off 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 information available, 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. Even at present, 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.

In this section, we focus on the firm's determination of its optimum capital level. To be sure, the banking industry is sufficiently remote from the theoretical model of perfect competition to raise questions about the general welfare implications of individually determined optima. Some of those questions are considered in the next section.

Optimum capital is an idiosyncratic construct of the firm and is quite distinct from minimum capital as defined earlier. In fact, the relevant definition of capital, that is, the range of instruments considered as capital, need not be the same as for minimum capital. For example, a viable ongoing firm would generally wish to rely on equity capital to absorb losses rather than on potentially costly defaults. The firm is also likely to view capital more broadly as a source of financing for its activities, rather than exclusively as protection for its depositors, leading to a broader conception of capital.

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

Although disaggregation may be counterproductive in calculating minimum capital, an approach based on a detailed breakdown of risks and risk factors may be perfectly appropriate in the case of optimum capital. Clearly, the firm itself has access to all the information it needs regarding its own positions. In addition, the firm can go a long way on the road to complexity if it so chooses, something many large institutions are already in the process of

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doing. 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.[6]

As in the case of minimum capital, we may derive empirically some generalizations about the determination of optimum capital. That is, we may use the observed helpful characteristics of optimum capital to develop a set of goals for its determination. Among those characteristics, we find 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 the system's 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.

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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 supervisor, who is likely to be familiar with the full methodology leading to the ultimate results.

Optimum capital *involves no expectation or presumption of comparability across institutions or across time and is unstable in relation to the underlying 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 be interpreted only in the full context of the process from which they are derived.

Because optimum capital is subjective and firm-specific, it is difficult for an outsider, even for a primary supervisor, to gauge the appropriateness of a particular level. In this connection, the minimum capital level plays a useful role because it furnishes the outside observer with an objective frame of reference for examining the less transparent optimum measure. It is clear, however, that no simple rules of thumb are available for evaluating capital levels; if they were, the whole optimum process could be avoided.

In practice, a supervisor's level of comfort depends on the minimum required level of capital, on the excess of actual capital over that level, on the transparency of the firm's methods and reporting, on the firm's attitude

toward risk in general, and on any other indicators of financial condition that can be factored in, even if impressionistically. If a firm's actual capital level is a large multiple of the required minimum, the supervisor will generally be more comfortable than if it just exceeds the minimum. Even so, a large multiple might provide limited comfort with a firm that has complex, opaque operations and a marked tendency toward risk taking. Similarly, a small excess cushion might be acceptable for a conservative firm in a rebuilding period at the end of a general economic contraction.

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 or liquidity 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.

Optimum Capital and the "Social Optimum"

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 be an incentive for firms to determine and hold optimal levels of capital, as defined in the preceding section. From a public policy perspective, however, it is not immediately clear that a socially optimal capital structure would result. If firms do maintain individually optimal capital levels, are those levels consistent with socially optimal amounts? Moreover, are there competing incentives that would discourage firms from maintaining individually or socially optimal levels?

There is no simple answer to the first question. Although it is conceivable in theory that an optimal allocation of capital across firms may exist, it would be presumptuous to assume that such an optimum is readily quantifiable. Thus, it seems reasonable 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

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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.[7] 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.[8]

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.[9] 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 deficient, the probability of failure increases and the explicit or implicit insurer is left to bear the risks.

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 mispriced 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 internal 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 advantages of being preventive rather than palliative and of freeing the authorities from any precommitment as to the precise nature and extent of any subsequent 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, U.S. bank supervisors already have at their disposal a series of enforcement actions that can be used selectively even in cases where problems are not yet dangerously acute. In implementing either incentives or deterrents, the official examinations staff will face significant demands. However, such demands seem unavoidable in arrangements where the supervisory authority retains any substantive responsibility for the solvency of particular institutions or of the system as a whole.

Actual Capital and Its Life Cycle

The discussion has focused so far on the development of a frame of reference for capital. We can think of minimum capital and optimum capital as two guideposts for the evaluation of the actual level of capital held by a firm. The first is stable and objective and should always be exceeded; the second is variable and subjective and the institution should always strive to attain it. At least two questions suggest themselves. First, is the framework internally consistent? Second, how is actual capital to be gauged in reference to the framework at different points in time and for different firms?

If the supervisor and the institutions coincide in their basic understanding of the world, minimum and optimum capital should be mutually consistent. The minimum requirement would be calibrated as a lower bound for normal optimum levels. If estimated optimum capital turns out to be less than minimum capital, either the initial judgments that led to the formulation of the minimum were too strict or the ongoing judgments involved in the determination of the optimum are too lax. The frequency of such occurrences would indicate which possibility is more likely. Even if the framework is internally consistent, there may be some pathological cases in which the firm's determination of the optimum cannot be taken at face

value. A classic example is the insolvent firm. Because such firms have nothing to lose, they may find it optimal to assume inordinately large risks without commensurate capital levels. Nevertheless, a cursory look at banks' recent actual capital levels, if these are interpreted as indicative of internally determined optima, suggests that firms are content to hold large multiples of the minimum levels under appropriate circumstances.

Given the two guideposts of minimum and optimum capital, where should an institution's actual capital level be? By definition, in all cases, it should be as close as possible to the optimum level. But the optimum may be highly variable over time, so that the desirable excess over the minimum required level depends on various time- and firm-specific factors such as the riskiness of the firm's positions, the economic condition of the firm, the sector in which it operates, and the state of the economy as a whole. In good times, it will generally be optimal for the firm to build up its capital, which is at those times easier to come by. Retained earnings will be drawn from a more plentiful earnings base, and new issuance of capital in the markets will be relatively inexpensive.

In bad times, . . . it would be unwise either to place undue pressure on individual firms to raise relatively expensive capital too quickly or to extract onerous penalties that could impair the firm's successful recovery and ongoing viability.

In bad times, some capital will be absorbed by the occurrence of normal losses, that is, losses resulting from taking prudent risks. Capital ratios will be predictably lower, though still above the minimum requirements. At these times, when firms have lower retained earnings and face more expensive new issuance markets, it would be unwise either to place undue pressure on individual firms to raise relatively expensive capital too quickly or to extract onerous penalties that could impair the firm's successful recovery and ongoing viability. If the purpose of capital is to absorb losses arising in the normal course of business, it should not be viewed as an anomaly when it predictably does just that. Of course, the supervisor must be ready to act firmly if supernormal losses ensue, and comparing actual capital with the minimum level can be helpful in developing early signals of impending difficulties.

A promising method for dealing with capital variations and fluctuations is embodied to a significant degree in the "prompt regulatory action" provisions of the 1991 banking act.[10] The provisions establish a relationship between a firm's level of capital and the degree to which it is subject to regulatory constraints, for example, on lines of business. A well-capitalized institution is allowed to participate in risky activities with a minimum of additional regulatory intervention. Other institutions (or the same one at a different point in time) that just meet the capital requirements are subject to close scrutiny in applying for new activities, and those applications could be summarily denied. In the extreme, firms that fail to meet some minimum level of capital may be forced to shut down. In the design of such a system, care must be exercised so that the restrictions for firms with declining capital are not equivalent to the onerous penalties mentioned above, which could deal a mortal blow to an otherwise viable firm. In addition, it may be misleading to use capital as the single source of information for the operation of the system. Capital should be interpreted in light of various key factors, both cross-sectional and cyclical, such as the condition of the firm and the state of the economy.

Supervisory Use of Minimum and Optimum Capital

Minimum capital and optimum capital have peculiar characteristics that make each inherently useful but different from the other in fundamental ways. To be sure, some of the methods used in the development of the two constructs overlap. For example, the computation of minimum capital can include sophisticated calculations—frequently used for optimum capital—if they are straightforward and well defined. Nonetheless, an attempt to bring the two con-

structs closely in line could backfire. It could undermine the useful objectivity of minimum capital and deprive firms of the flexibility they need to determine optimum capital levels.

The separateness of minimum and optimum capital is necessary because, as noted in earlier sections of this article, their objectives are very different and their useful characteristics are mutually contradictory. In the economic analysis of the choice between two goods, two conflicting objectives are customarily fused by means of some unspecified or arbitrary relative weighting scheme. The result is that the optimal choice is normally a single combination containing some of each of the two goods. In the case of capital, such an interior solution is suboptimal because the firm and the supervisor need not limit themselves to a single construct. They can have both minimum capital and optimum capital rather than a hybrid construct that would disregard valuable information. The separate objectives need not be fused; they can both be satisfied.

Thus, the supervisor could monitor periodically—as frequently as feasible—compliance with the minimum requirements. In evaluating the excess of actual over minimum capital, the supervisor could take into account that different levels may be advisable for different firms and for a given firm at various points in the economic cycle. The supervisor may also wish to monitor firms more closely when minimum levels are approached, so that it may act swiftly and decisively should those levels be breached.

An attempt to bring the two constructs closely in line could . . . undermine the useful objectivity of minimum capital and deprive firms of the flexibility they need to determine optimum capital levels.

The supervisor may supplement the effectiveness of direct capital requirements by ensuring that the firm makes its best effort to determine an optimum level of capital and to approach that level as quickly as possible. Although the supervisor can make constructive use of information bearing on the optimum capital of the firm (for example, in evaluating the excess of actual over minimum capital), the development and determination of the optimum are best left to the firm. A single regulator is at an obvious comparative disadvantage in determining which particular methodology and assumptions are best suited for each of a multitude of idiosyncratic firms. Each firm is in the best position to make its own detailed decisions and should be responsible for doing so in a prudent manner.

Concluding Remarks

This article identifies two constructs—minimum and optimum capital—that provide a framework for evaluating a financial firm's actual level of capital. The basic conclusions are derived from a review of the successful measures employed in the past and the present by both regulators and institutions. Furthermore, the article argues that the distinct uses and characteristics of minimum and optimum capital make it inadvisable to combine them into a single measure, for they are so naturally contradictory that a hybrid would be much less informative than the two individual measures. This point may be confirmed by simply summarizing and reviewing the properties of the two constructs.

We find that minimum capital is objective, verifiable, public, and comparable across institutions and across time. It bears a stable relationship to the underlying positions, is generally based on somewhat rough—though ideally comprehensive—calculations, and represents a minimum required level of capital that is seldom directly binding. In contrast, optimum capital is subjective, hence difficult to replicate and validate, and internal to the firm. It is neither expected nor presumed to be comparable across institutions or across time, is unstable in relation to the underlying positions, represents an attempt at precision, and—as an optimum goal—is necessarily binding.

These two constructs, supplemented with other relevant information explaining differences in optimal cap-

ital levels across institutions and time, will give supervisors a workable framework for gauging the capital adequacy of a firm or group of firms. The approach requires adopting a specific direction in moving forward from the present regulatory regime, but it has the advantage of not requiring any drastic initial regulatory changes. Many appealing features of the current system could be retained. Over the longer run, however, the new direction could result in a substantially simpler, more responsive regulatory structure.

ENDNOTES

1. See, for example, Basle Committee on Banking Supervision (1993, 1995) and Council of European Communities (1993).

2. In the 1783 book *Prolegomena to Any Future Metaphysics*, Immanuel Kant sketched out his solution to all the fundamental issues in that branch of philosophy. As in Kant, the Greek term "prolegomenon" denotes here a critical discussion that sets the stage for further work in a given field. In contrast to Kant's ambitious agenda, the present claims are somewhat more modest.

3. An excellent recent review of the microeconomic literature on bank capital, with numerous references, is found in Santomero (1991).

4. See Bank for International Settlements (1986) and Edwards and Mishkin (1995).

5. See Board of Governors of the Federal Reserve System (1989).

6. For a helpful discussion of the current status of the risk management systems of financial institutions, see Group of Thirty (1993).

7. As a result of the 1991 banking act, deposit insurance premiums are currently based on various factors, including capital adequacy, related to the risk of losses to the insurance fund. See Section 302 of the Federal Deposit Insurance Corporation Improvement Act of 1991 and Federal Deposit Insurance Corporation (1992).

8. See, for example, White (1989).

9. See, for example, Santomero (1991).

10. See Section 131 of the Federal Deposit Insurance Corporation Improvement Act of 1991 and Board of Governors of the Federal Reserve System (1992).

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Historical Patterns and Recent Changes in the Relationship between Bank Holding Company Size and Risk

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The views expressed in this article are those of the authors and do not necessarily reflect the position of the Federal Reserve Bank of New York or the Federal Reserve System.

The number of banks in the United States fell from about 14,500 in the early 1980s to about 11,000 a decade later, and the average bank asset size rose by about 40 percent in inflation-adjusted terms. This trend toward fewer, larger banks raises an interesting question: How does the size of a banking company affect the amount and type of risk it takes? The answer is important for policymakers concerned with banking system risk.

This article investigates the relationship between asset size and risk at bank holding companies from 1987 to 1993.[1] We find that for most of this period, the *level* of risk at large bank holding companies did not differ significantly from that at small bank holding companies. However, we do find some significant differences in the *nature* of that risk. Although the advantage of size has allowed larger institutions to diversify their risk, differences in activities and leverage have counterbalanced this diversification advantage, leaving large bank holding companies with no less risk than small companies throughout most of the period that we examine.

Since 1991, however, a different pattern has begun to emerge. The lending patterns and off-balance-sheet activities of large and small bank holding companies have evolved and, most important, differences in the leverage of large and small companies have declined significantly. Consequently, the diversification advantage of size has become apparent, and we have begun to observe an inverse relationship between size and risk.

We suggest that the recent reduction in risk at large bank holding companies relative to small companies may stem from the regulatory reforms of the early 1990s. Implementation of risk-based capital requirements has most strongly affected banking companies that have had low capital ratios and have engaged heavily in risky lending and off-balance-sheet activities, characteristics generally associated with large banking companies. Moreover, the largest banking companies may now face additional pressure to reduce risk as a result of the Federal Deposit

Insurance Corporation Improvement Act, which strengthens market discipline by directing regulators to back away from a "too-big-to-fail" policy.

The Relationship between Size and Risk

We use information on the stock returns of publicly traded bank holding companies to measure their risk. In particular, our analysis is based on "equity risk," defined as the degree to which a bank holding company's weekly stock return fluctuates over a one-year period. Equity risk is a summary measure associated with the holding company as a whole—that is, it captures risk stemming from all of the holding company's subsidiaries and reflects diversification across them.

This approach has many advantages, but also some drawbacks—mainly that it limits our analysis to those bank holding companies that have publicly traded equity. The main advantage of our approach is that it provides a forward-looking measure of risk, since stock market valuations reflect the expectations of market participants (such as analysts and investors) regarding the future profitability of banking institutions. A second advantage is that it facilitates measurement of both risk and diversification using a single methodology, described below.

A Risk Decomposition

Our analysis draws upon two underlying principles of portfolio theory: (1) diversification reduces risk and (2) the potential for diversification increases with the size of a portfolio. We apply these principles to the banking institution. In particular, if a large bank holding company is nothing more than a scaled-up version of a small bank holding company, then we should expect large companies to exhibit lower risk because of the benefits of diversification. Both small and large bank holding companies engage in loan origination and loan funding, with large companies generally having access to a broader deposit base and a wider variety of borrowers. Portfolio theory would suggest that this diversification potential works to reduce the risk of large bank holding companies.[2] If, however, there are fundamental differences in the nature of the assets, liabilities, and off-balance-sheet positions of large and small bank holding companies, then large companies might not exhibit lower risk than small companies.

In our analysis, we divide equity risk into two components and calculate the relationship between asset size and each risk component. The first risk component, *systematic risk*, measures equity return variability related to underlying economic conditions affecting the banking industry as a whole. The remaining variability in stock returns, *firm-specific risk*, measures equity return variability unique to each company. Each component is derived by measuring the extent to which a given company's stock return tracks the stock returns of a large sample of bank holding companies (see appendix).[3]

This risk decomposition provides a convenient way to measure the role of diversification in explaining the relationship between size and risk at bank holding companies. Because the poorly diversified banking company is subject to shocks stemming from industrial, regional, or other types of asset or liability concentrations, it is likely to display a large amount of firm-specific risk—risk that a well-diversified company is much more likely to avoid. Diversification cannot help the well-diversified company eliminate systematic risk, however, since this risk is related to broad underlying economic conditions affecting the banking industry as a whole.

Systematic risk measures equity return variability related to underlying economic conditions. . . . Firm-specific risk measures equity return variability unique to each company.

Consider a hypothetical example: Suppose two bank holding companies have similar levels of total equity risk, but the first company's risk is predominately firm-specific.[4] We would conclude that the first company is less diversified than the second. We would also conclude that if

the first company were to increase its diversification (for example, by expanding the scope of its lending to new industries or regions of the country), then its firm-specific risk would decrease. With no concurrent increase in systematic risk, the overall equity risk of the company would decrease by the same amount.

Using the same reasoning, we make the following claim: If large bank holding companies are simply scaled-up, better diversified versions of small bank holding companies, then the greater a company's size, the lower its firm-specific risk. Since diversification reduces only firm-specific risk, however, we should observe no relationship between size and systematic risk. As in our hypothetical example, the end result would be an inverse relationship between size and total equity risk.

Of course, if large bank holding companies are not simply scaled-up versions of small companies, these relationships may not hold. For instance, if large companies pursue riskier activities, we may observe a positive relationship between size and either of the two components of equity risk, even if large bank holding companies are more diversified. The relationship between size and total equity risk would then be ambiguous.

Empirical Evidence

We now turn to empirical evidence to determine which of these two characterizations is more accurate. That is, can large bank holding companies be characterized simply as scaled-up, better diversified versions of small companies, or are there fundamental differences between the assets, liabilities, and off-balance-sheet positions of large and small institutions?

Our answer is based on an analysis of approximately 100 bank holding companies.[5] We measure holding company size using total assets. Since we must restrict our attention to publicly traded companies, our sample asset size distribution is not representative of all bank holding companies, but it does provide ample variation. For instance, the asset sizes in our sample in 1993 ranged from $340 million to $214 billion, with a median of $10 billion. Taken as a group, the companies in our original sample held a little less than half of all commercial banking assets in the United States in 1993.

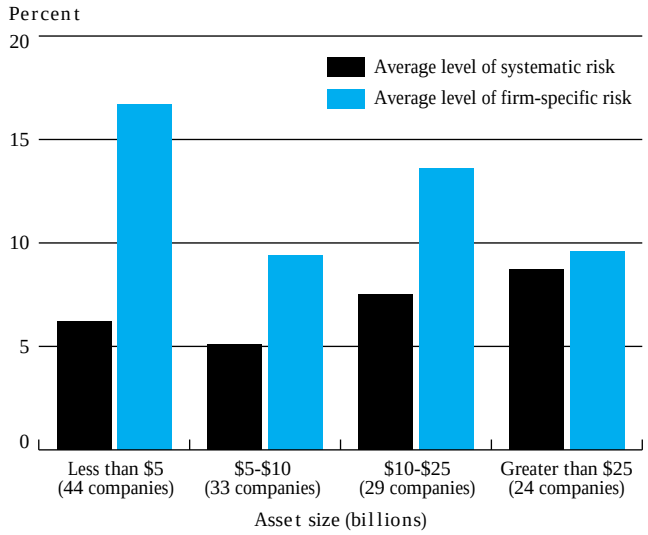
Using data from 1987 to 1993, Chart 1 illustrates the empirical relationships between size and each of the two components of equity risk.[6] Once asset size exceeds $5 billion, we observe a positive relationship between asset size and systematic risk. Firm-specific risk is highest for the smallest size group but otherwise bears little relationship to size. Note that the mix between systematic and firm-specific risk at large bank holding companies (those with assets of more than $25 billion) is very different from the mix at small companies (those with assets of less than $5 billion). In particular, firm-specific risk makes a bigger contribution to total equity risk at small companies than at large ones. (That contribution falls from 73 percent to 53 percent as asset size increases.)

Firm-specific risk makes a bigger contribution to total equity risk at small companies.

By combining the two components of risk, Chart 2 shows how total equity risk varies with holding

Chart 1

Relationship between Bank Holding Company Size and Risk Components, 1987-93



Source: Authors' calculations, based on data from the Center for Research in Security Prices and the consolidated financial statements of a sample of publicly traded bank holding companies.

company size. We see little discernible relationship between asset size and total equity risk.

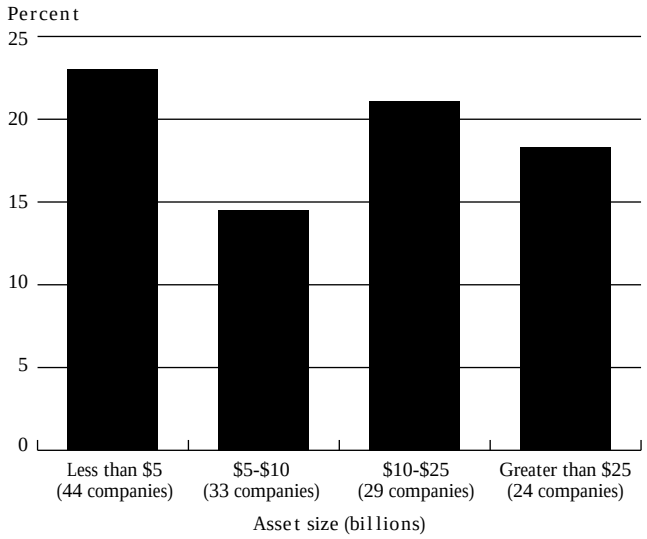
The patterns illustrated in these charts provide empirical support for the idea that size enhances diversification, since firm-specific risk makes a smaller contribution to total equity risk at large bank holding companies. However, size also appears to lead to an increased appetite for certain risky activities: systematic risk (unaffected by diversification) increases by 70 percent as we move from companies with $5 billion to $10 billion in assets to those with more than $25 billion. The different activities of small and large bank holding companies may also affect how firm-specific risk varies with size, masking the negative relationship that we would expect to see if large bank holding companies were simply scaled-up, better diversified versions of small companies.

Risky Business: How Portfolios Differ

Fundamental disparities in the portfolios of small and large bank holding companies are indeed important in understanding the differences in their risk characteristics.

Chart 2

Relationship between Bank Holding Company Size and Total Risk, 1987-93



Source: Authors' calculations, based on data from the Center for Research in Security Prices and the consolidated financial statements of a sample of publicly traded bank holding companies.

Note: Each bar indicates the average level of total risk (systematic risk plus firm-specific risk) for bank holding companies in a given size group.

Throughout most of the period that we examine, large companies were more likely to engage in certain risky activities, such as commercial and industrial lending. At the same time, small companies were more likely to be involved in the relatively safe activities of home mortgage and consumer lending.[7]

These portfolio differences are presented in Table 1. Using data from 1987, we contrast certain key balance-sheet characteristics and off-balance-sheet positions for a typical small and a typical large bank holding company in our sample. (Typical small company characteristics are defined as the median characteristics for the sample of companies with less than $5 billion in assets. Typical large company characteristics are defined as the median

Table 1

How Portfolio Attributes of Large and Small Bank Holding Companies Differ

Portfolio Attribute	Typical Small Bank Holding Company (Percent)	Typical Large Bank Holding Company (Percent)
Commercial and industrial loans/assets	18.74	23.70
Real estate loans/assets	20.57	16.09
Agricultural loans/assets	0.24	0.23
Consumer loans/assets	12.98	10.32
Loan concentration index[a]	29.36	28.89
Trading assets/assets	0.05	2.53
Deposits/assets	78.18	64.28
Noninterest deposits/assets	24.67	24.76
Foreign deposits/assets	0.04	21.21
Equity capital/assets	6.43	5.15
Interest rate swaps/assets[b]	0.00	19.20
Foreign exchange futures/assets[b]	0.00	28.72
Noninterest income/net interest income	54.17	86.24
Multiple census indicator[c]	0	1

Source: Consolidated financial statements of a sample of publicly traded bank holding companies.

Notes: Table presents the median portfolio attributes from 1987 for two subsets of our sample of publicly traded bank holding companies. The first column presents median portfolio attributes for holding companies with less than $5 billion in assets; the median size of the small holding companies is $3.6 billion. The second column presents median portfolio attributes for holding companies with more than $25 billion in assets; the median size of the large holding companies is $50 billion.

[a] The loan concentration index equals the sum of the squared shares of each of the bank holding company's loan types (commercial and industrial, real estate, agricultural, consumer, and other) as a fraction of total loans. Higher values of the index indicate more concentrated lending.

[b] Interest rate swaps and foreign exchange futures are based on notional principal amounts.

[c] This variable equals 1 for holding companies with commercial bank subsidiaries operating in more than one census region and zero otherwise.

characteristics for the sample of companies with more than $25 billion in assets.)

Of particular interest are differences in lending behavior, capital ratios, and geographical diversification. For example, the typical large company was far more likely to diversify geographically by operating commercial banking subsidiaries in more than one census region or by accepting foreign deposits. At the same time, the large bank holding company also engaged in more commercial and industrial lending and less consumer lending and operated with a smaller capital ratio.[8] (Higher leverage—that is, a smaller capital-to-assets ratio—increases equity risk because changes in asset values at highly leveraged firms have a larger impact on equity value.) Finally, large bank holding companies were more likely to hold assets in their trading accounts, were more likely to participate in derivatives markets, and generated a larger percentage of income from noninterest revenues.

Table 2
HOW PORTFOLIO ATTRIBUTES OF LARGE AND SMALL BANK HOLDING COMPANIES AFFECT RISK

	Percent Change in Risk When Moving *from* Small *to* Large Bank Holding Company Portfolio Attribute	
Portfolio Attribute	Systematic Risk	Firm-specific Risk
Commercial and industrial loans/assets	12.60*	11.59*
Real estate loans/assets	-4.67*	-3.39
Agricultural loans/assets	-0.02	-0.21*
Consumer loans/assets	-1.39	0.51
Loan concentration index	-0.65	-0.85*
Trading assets/assets	-0.03	-3.18
Deposits/assets	1.00	5.20
Noninterest deposits/assets	0.04	-0.04
Foreign deposits/assets	-10.80	-7.79
Equity capital/assets	12.40*	20.33*
Interest rate swaps/assets	-0.56	0.83
Foreign exchange futures/assets	4.88*	1.81
Noninterest income/net interest income	0.29	0.51*
Multiple census indicator	-21.20*	-26.00*

Source: Authors' calculations, based on data from the Center for Research in Security Prices and the consolidated financial statements of a sample of publicly traded bank holding companies.

Notes: Table presents the effect on systematic and firm-specific risk of changing from the portfolio attributes of the typical small holding company to those of the typical large holding company. The difference between large-company and small-company values for each portfolio attribute is multiplied by a regression coefficient estimated by relating the log of firm-specific risk or the log of systematic risk to the set of portfolio attributes shown in Table 1. Each regression also includes a measure of each holding company's stock liquidity as an explanatory variable. See Demsetz and Strahan (1995) for a detailed description of the regression model.

* Statistically significant at the 5 percent level.

For our purposes, these portfolio differences are interesting primarily because of their effects on each of the two components of equity risk. The strength of these effects is demonstrated in Table 2, which illustrates how risk changes as we move *from* the portfolio attributes of the typical small bank holding company *to* those of the typical large company.[9] For instance, changing from the capital-to-assets ratio of the small bank holding company to that of the large company leads to a 12 percent increase in systematic risk and a 20 percent increase in firm-specific risk. Changing from the ratio of commercial and industrial loans to assets of the small bank holding company to that of the typical large company leads to a 13 percent increase in systematic risk and a 12 percent increase in firm-specific risk.

Some of the other portfolio characteristics described in Tables 1 and 2 tend to *reduce* the risks of large bank holding companies. For instance, changing from the geographical diversification of commercial bank subsidiaries at the typical small bank holding company to that at the typical large company is associated with a 21 percent decrease in systematic risk and a 26 percent decrease in firm-specific risk.[10]

We gauge the collective importance of the portfolio characteristics in Table 2 by quantifying the relationship between size and risk *while holding portfolio characteristics constant*. By comparing this "conditional" relationship between size and risk with the "unconditional" relationship between the same two variables, we can illustrate just how important fundamental differences in the portfolio attributes of large and small bank holding companies are in explaining differences in their risk profiles. Ideally, we would quantify the conditional relationship by identifying a sample of bank holding companies of different sizes with similar portfolio attributes and observing how their risk characteristics differ. Since this experiment is not possible, we instead use regressions to quantify the conditional relationship between size and risk. We estimate two regressions relating systematic and firm-specific risk to asset size and the portfolio characteristics described in Table 2.[11]

The key results from our regression analysis appear in Table 3. Once we control for portfolio characteristics, the relationship between size and systematic risk becomes statistically indistinguishable from zero. In contrast, the negative relationship between size and firm-specific risk strengthens, implying that a 10 percent increase in total assets would lead to a 2.5 percent reduction in firm-specific risk, provided that this increase in assets was not accompanied by an increase in risk-enhancing activities. The relationships between size and the two components of equity risk are now consistent with the predictions of portfolio theory.

Why do we observe such important differences in the relationship between size and risk before and after controlling for portfolio characteristics? Consider commercial and industrial lending, which is (1) pursued more aggressively by large bank holding companies, as shown in Table 1, and (2) positively related to both systematic and firm-specific risk, as shown in Table 2. If we attempted to measure the relationship between size and systematic or firm-specific risk *without* controlling for this type of lending, we would actually measure a combination of two effects: the effect of size on risk *and* the effect of commercial and industrial lending on risk. We would therefore exaggerate the true effect of size on each risk component because of the strong positive relationships between commercial and industrial lending and holding company size *and* between commercial and industrial lending and holding company risk.

Omitting portfolio characteristics inversely related to size and directly related to risk (or vice versa) from the analysis would lead us to *understate* the true size/risk relationship. Overall, the commercial and industrial lending example typifies the norm. Whether we focus our attention on systematic risk or firm-specific risk, we find that the conditional relationship between size and risk is smaller than the unconditional relationship. According to the conditional relationship, size reduces firm-specific risk but, as expected, has little effect on systematic risk.[12]

According to the conditional relationship, size reduces firm-specific risk but, as expected, has little effect on systematic risk.

Table 3
RELATIONSHIP BETWEEN BANK HOLDING COMPANY SIZE AND RISK: WITH AND WITHOUT CONTROLS FOR PORTFOLIO ATTRIBUTES

	Percent Change in Risk following a 1 Percent Change in Size	
Type of Risk	Without Portfolio Control Variables	With Portfolio Control Variables
Systematic	0.17 (6.1)*	0.07 (1.7)
Firm-specific	-0.14 (-4.3)*	-0.25 (-5.7)*

Source: Authors' calculations, based on data from the Center for Research in Security Prices and the consolidated financial statements of a sample of publicly traded bank holding companies.

Notes: Table presents the coefficient on log of asset size from two regression models relating the log of systematic risk and the log of firm-specific risk to the log of size and a series of portfolio attribute control variables. Tables 1 and 2 describe the portfolio variables in the model. T-statistics are reported in parentheses below each of the coefficient estimates.

* Statistically significant at the 5 percent level.

WHY DO LARGE BANK HOLDING COMPANIES HOLD RISKIER PORTFOLIOS?

Although large bank holding companies have benefited from risk-reducing diversification, on average they have still taken on greater risk than small companies. This raises the question: Why have large bank holding companies chosen to counterbalance their diversification advantage by pursuing certain risk-enhancing activities and operating with less capital? An empirical analysis providing a definitive answer is beyond our present scope, but we can briefly examine a few factors that may have operated in the past.

First, it is important to recognize that risk-enhancing activities (such as commercial and industrial lending and participation in derivatives markets) frequently are also profit-enhancing activities for bank holding companies of all sizes. Large companies may simply be capable of pursuing these activities more aggressively because they are equipped with the diversification advantage of size. Likewise, they may choose to operate with lower capital ratios because of their diversification advantage. If small companies had that same advantage, they might also choose to operate with lower capital ratios.[13]

Second, economies of scale may make it cost-effective for large bank holding companies to specialize in riskier activities. For instance, derivatives dealers must invest in costly resources, such as sophisticated computer systems and skilled financial engineers. These investments may be worthwhile only for large-scale operations. Similarly, large bank holding companies may have cost advantages in terms of originating and holding commercial and industrial loans.[14] To the extent that there are economies of scale in risk-enhancing activities, we would likely observe large bank holding companies pursuing these activities more aggressively than small companies, even if small companies were as well diversified.

A final factor that may explain differences in risk taking by large and small bank holding companies is the moral hazard problem associated with the too-big-to-fail policy. Moral hazard occurs when deposit insurance or some other form of guarantee reduces the incentives for depositors and creditors to monitor and discipline bank risk taking. Although moral hazard is a problem for all depository institutions, the 1984 insolvency of Continental Illinois set a precedent establishing that both insured and uninsured deposits would be protected in the event of insolvencies at very large institutions.[15] If large depositors are de facto insured, the monitoring and discipline of risk taking at large institutions will be further reduced. A too-big-to-fail policy may therefore result in greater risk taking at large bank holding companies than at small ones.[16]

The portfolios of the large companies, characterized by greater leverage and riskier activities, offset the diversification advantage of size.

We have seen that large bank holding companies are better diversified than small ones but are no less risky. The portfolios of the large companies, characterized by greater leverage and riskier activities, offset the diversification advantage of size. However, there have been some very interesting changes in the relationship between size and risk since 1991, which we now explore.

Recent Changes in the Relationship between Size and Risk

A Yearly Analysis

To begin, we look at the evolution of the size/risk relationship from 1987 to 1993. Table 4 reports measurements of the strength of the relationships between size and systematic risk, size and firm-specific risk, and size and total equity risk. Each column reveals some interesting differences between the pre-1992 and post-1992 periods. Changes in the relationship between size and systematic risk are most striking. The size/systematic risk relationship is consistently positive from 1987 to 1991, but becomes statistically indistinguishable from zero in both 1992 and 1993. The relationship between size and firm-specific risk also changes over time. Between 1987 and 1991, this relationship tends to be negative but is generally weak. In 1992 and 1993, the inverse relationship between size and firm-specific risk strengthens and becomes statistically significant.

Post-1992 changes in the size/systematic risk and size/firm-specific risk relationships lead to changes in the size/total equity risk relationship. From 1987 to 1991,

Table 4
Year-by-Year Correlation of Bank Holding Company Size and Risk

Year	Sample Size	Asset Size and Systematic Risk	Asset Size and Firm-specific Risk	Asset Size and Total Equity Risk
1987	129	0.38*	-0.22*	0.10
1988	119	0.26*	-0.19	-0.04
1989	111	0.33*	-0.14	0.01
1990	105	0.42*	-0.07	0.20*
1991	98	0.27*	-0.03	0.12
1992	89	0.12	-0.47*	-0.21*
1993	80	0.17	-0.47*	-0.14

Source: Authors' calculations, based on data from the Center for Research in Security Prices and the consolidated financial statements of a sample of publicly traded bank holding companies.

Note: Table presents the Spearman (rank) correlation coefficient between total holding company assets and systematic risk, firm-specific risk, and total equity risk.

* Statistically significant at the 5 percent level.

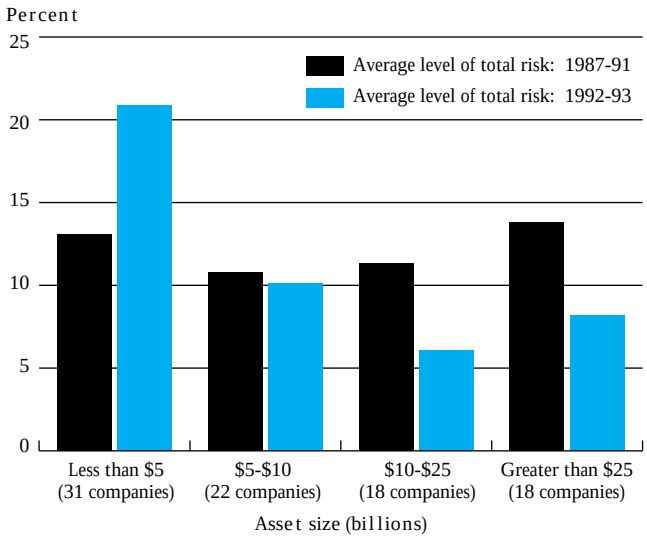
large bank holding companies display significantly greater systematic risk than small companies but display less firm-specific risk (significantly less in 1987). The two relationships tend to balance, such that the relationship between size and total equity risk over this period is either statistically indistinguishable from zero or positive. In 1992 and 1993, however, large bank holding companies display significantly less firm-specific risk than small bank holding companies, and they display similar systematic risk. As a result, the relationship between size and total equity risk is negative and, in 1992, significantly different from zero.

Note that only after 1991 do the unconditional size/risk relationships become consistent with the predictions of portfolio theory: Large bank holding companies display significantly less firm-specific risk than small companies but similar levels of systematic risk. As a result, we observe an inverse relationship between size and total equity risk. This contrasts with the generally insignificant size/risk relationship observed before 1991.

Just how striking has the recent change in the relationship between size and risk been? We answer this question in Chart 3, which shows how total equity risk varies with size for the 1987-91 and 1992-93 periods. For this analysis, we also take account of a potential statistical complication. In particular, if small bank holding companies are more likely to exit our original sample through acquisition or failure, and if the stock returns of acquired or failing companies are highly variable, then the evolution of the size/risk relationship in the sample would be biased. We avoid this potential source of bias by including only those bank holding companies that remain in the sample throughout the 1987-93 period.[17] As in Table 4, we find that the diversification advantage of size becomes apparent after 1991. In contrast to the earlier period, the relationship between size and total equity risk is negative, at least for bank holding companies with assets up to $25 billion.

Chart 3

Relationship between Bank Holding Company Size and Total Risk, 1987-91 and 1992-93



Source: Authors' calculations, based on data from the Center for Research in Security Prices and the consolidated financial statements of a sample of publicly traded bank holding companies.

We find that the diversification advantage of size becomes apparent after 1991.

Changes in the Portfolios of Large and Small Bank Holding Companies

We see for the first time in 1992 and 1993 that the potential risk-reducing benefits of diversification are evident in lower overall risk at large bank holding companies. What has changed? One possibility is the riskiness of banking activities. As we have seen, large and small bank holding companies have traditionally held different portfolios, so a reduction in the riskiness of activities in which large companies dominate (or an increase in the riskiness of activities in which small companies dominate) will reduce the risk of large bank holding companies relative to that of small ones.[18] A second possibility is that banking activities have themselves changed—that is, differences in the portfolio composition of the typical large and the typical small bank holding company may have diminished over time.

We can support this second hypothesis by comparing the 1987 and 1993 portfolio characteristics for a typical small and a typical large bank holding company (Table 5). There are some striking differences between the values of several of these characteristics. For our purposes, we will

focus on changes in those characteristics found to be most important in explaining differences in risk at large and small bank holding companies.

Trends in capital are very important in explaining the decline in equity risk at large companies relative to small ones. Although capital ratios of both small and large bank holding companies increased between 1987 and 1993, the increase associated with the typical large company was much greater, thus closing substantially the gap between the capital ratios of large and small bank holding companies. (In 1987, the typical small bank holding company held 25 percent more capital per dollar of assets than the typical large company. By 1993, the difference in the capital ratios had fallen to only 3.5 percent.)

Changes in lending practices between 1987 and 1993 also contributed to declines in equity risk at large bank holding companies relative to small ones. For instance, the ratio of consumer loans to assets decreased at the typical small company but increased at the typical large company. The commercial and industrial loan ratio at both small and large bank holding companies decreased, slightly reducing the differential between the small company and large company ratios. Because commercial and industrial lending tends to enhance risk and consumer lending tends to decrease it, these patterns are consistent with the observed decline in equity risk at large bank holding companies relative to small ones.[19]

The Role of Regulatory Changes

What accounts for the shifts in holding company portfolios? We certainly could point to the many changes in the banking industry in recent years. From July 1990 to March 1991, the U.S. economy underwent a recession, accompanied by a credit slowdown. But by 1992, improving loan performance and changes in the level and slope of the yield curve led to increased banking profits. Overall, the rate of bank failures in the 1990s has been very low, following a decade in which the failure rate reached record high levels

Table 5
How Portfolio Attributes of Large and Small Bank Holding Companies Differ, 1987 and 1993

Portfolio Attribute	Is Attribute Significant in Explaining Risk?	1987 Portfolio Attributes: Typical Small Bank Holding Company (Percent)	1987 Portfolio Attributes: Typical Large Bank Holding Company (Percent)	1993 Portfolio Attributes: Typical Small Bank Holding Company (Percent)	1993 Portfolio Attributes: Typical Large Bank Holding Company (Percent)
Commercial and industrial loans/assets	Yes	18.74	23.70	12.23	16.80
Real estate loans/assets	Yes	20.57	16.09	25.93	21.84
Agricultural loans/assets	Yes	0.24	0.23	0.02	0.10
Consumer loans/assets		12.98	10.32	7.10	11.40
Loan concentration index[a]	Yes	29.36	28.89	36.91	30.01
Trading assets/assets		0.05	2.53	0.00	0.53
Deposits/assets		78.18	64.28	83.64	74.55
Noninterest deposits/assets		24.67	24.76	22.88	21.49
Foreign deposits/assets		0.04	21.21	0.00	4.40
Equity capital/assets	Yes	6.43	5.15	7.30	7.05
Interest rate swaps/assets[b]		0.00	19.20	0.00	28.51
Foreign exchange futures/assets[b]	Yes	0.00	28.72	0.00	4.30
Noninterest income/net interest income	Yes	54.17	86.24	43.74	66.49
Multiple census indicator[c]	Yes	0	1	0	1

Source: Consolidated financial statements of a sample of publicly traded bank holding companies.

Notes: Table presents median portfolio attributes from 1987 and 1993 for two subsets from a sample of publicly traded bank holding companies. The first column indicates whether or not the portfolio attribute has a significant impact on holding company risk. Columns 2 and 4 present median portfolio attributes for companies with less than $5 billion in assets; the median size of the small bank holding companies is $3.6 billion in 1987 and $3.3 billion in 1993. Columns 3 and 5 present median portfolio attributes for holding companies with more than $25 billion in assets; the median size of the large bank holding companies is $50 billion in 1987 and $51 billion in 1993.

[a] The loan concentration index equals the sum of the squared shares of each of the bank holding company's loan types (commercial and industrial, real estate, agricultural, consumer, and other) as a fraction of total loans. Higher values of the index indicate more concentrated lending.

[b] Interest rate swaps and foreign exchange futures are based on notional principal amounts.

[c] This variable equals 1 for holding companies with commercial bank subsidiaries operating in more than one census region and zero otherwise.

not seen since the Depression (Edwards and Mishkin 1995).

Although these events are important in understanding the evolution of bank holding company risk, widespread economic conditions would likely affect companies of all sizes in a similar manner. Our results suggest that something has changed the risk-taking behavior of large banking companies *relative to that of small banking companies*.

Risk-Based Capital Requirements

Recent changes in the U.S. regulatory climate provide one possible explanation for changes in the behavior of large banking companies relative to that of small ones. In 1988, bank regulators established a set of international standards designed to incorporate credit risk into each country's capital adequacy rules, as well as to provide a "level playing field" for internationally active banking companies. In response to these international standards, each of the U.S. banking regulatory agencies amended its capital adequacy standards to include new risk-based capital requirements.

Recent changes in the U.S. regulatory climate provide one possible explanation for changes in the behavior of large banking companies relative to that of small ones.

The risk-based capital requirements, fully implemented since 1992, permit banks and bank holding companies engaged in relatively safe activities (such as home mortgage lending) to operate with less capital than those engaged in riskier activities. High-risk assets (such as commercial and industrial loans) tend to reduce a company's risk-based capital ratio, while low-risk assets (such as government securities) tend to increase that ratio. Consequently, a banking company can improve its risk-based capital ratio either by increasing capital or by shifting its portfolio from high-risk to low-risk assets. Moreover, risk-based capital requirements take account of the credit risk exposure associated with off-balance-sheet positions, including derivatives. As part of the reform of capital standards, U.S. regulators now also require banking companies to meet a minimum leverage ratio, defined as total regulatory capital divided by average assets.[20]

Several empirical studies indicate that these regulatory requirements led to declines in bank lending in the early 1990s. For instance, Laderman (1994) finds that banks with deficiencies in "tier 1" capital reduced lending sharply, in contrast to banks unconstrained by capital or constrained only by their "tier 2" capital.[21] Moreover, Peek and Rosengren (1993) find that loan growth was smaller at banks facing formal regulatory actions.

If large bank holding companies were more likely to be constrained by the new capital requirements, these requirements may have had their greatest effect on the portfolio choices of large companies. Table 6 uses data from 1991 to show that the tier 1 and total risk-based capital ratios, as well as the leverage ratio, fell with holding company size.[22] For instance, the tier 1 risk-based capital ratio fell from 10.2 percent for the typical small holding company to 6.6 percent for the typical large holding company. This pattern is not surprising given that large bank holding companies were more active in commercial and industrial lending and off-balance-sheet activities and tended to hold less capital as a percentage of assets. It suggests that risk-based capital requirements and leverage ratio requirements may indeed have had a greater effect on the recent behavior of large bank holding companies than on the behavior of small ones.

Table 6
Regulatory Capital Ratios for Bank Holding Companies by Size

Asset Size	Tier 1 Risk-based Capital Ratio	Total Risk-based Capital Ratio	Leverage Ratio
Less than $5 billion	10.2	12.1	6.6
$5 to $10 billion	8.9	10.8	6.5
$10 to $25 billion	8.0	10.5	6.6
Greater than $25 billion	6.6	10.5	5.4

Source: Consolidated financial statements of a sample of publicly traded bank holding companies.

Note: Table reports the median tier 1 and total risk-based capital ratios and the median leverage ratio for bank holding companies in each of four size categories as of the end of 1991.

Further refinements in risk-based capital requirements may emerge in the near future as market risks associated with banks' trading activities are incorporated into capital standards. Regulators from the U.S. banking agencies are developing market risk capital standards with bank regulators from other countries through the Basle Committee on Banking Supervision. Market risks, which encompass risks associated with changes in interest rates, foreign exchange rates, and equity prices, mainly affect large banking companies heavily engaged in trading and dealing in derivatives (such as interest rate and foreign exchange swaps). Any new capital requirements related to market risks will therefore most likely affect these large banking companies more than small ones.

Other Regulatory Changes

Additional changes in bank regulations have followed from passage of the Federal Deposit Insurance Corporation Improvement Act (FDICIA) of 1991, a broad-based attempt to strengthen the deposit insurance funds (the Savings Association Insurance Fund and the Bank Insurance Fund). The Prompt Corrective Action provision of FDICIA attempts to reduce the cost of bank failure by enabling regulators to intervene early when banks face financial difficulties. The act also attempts to reduce bank risk taking by furthering the scope of risk-based capital requirements and attempts to improve market discipline by discouraging a too-big-to-fail policy.

Like risk-based capital requirements, FDICIA's least-cost resolution provision (which mandates that the Federal Deposit Insurance Corporation use the least-cost method of resolving bank insolvencies) has presumably had its greatest effect on large banking companies. If depositors with accounts of more than $100,000 no longer believe that their bank is too big to fail but instead believe that they may face losses in the event of a failure, these depositors may bring additional market discipline to bear on large banks. In particular, large depositors or other creditors can penalize risky banks by requiring higher interest payments for the use of their funds.

By strengthening capital standards, raising the costs of holding a risky portfolio, and reducing the probability that a large banking company will be deemed too big to fail, recent regulatory changes would seem to have bitten hardest at large bank holding companies. Recent changes in large companies' portfolios, in particular increased capital and decreased risky lending, suggest that these regulatory changes have had a greater impact on the risk-taking behavior of large companies than on that of small companies. These new regulatory standards, however, have not been in place long enough to enable us to fully substantiate their role in the evolution of the size/risk relationship.

Conclusions

This article has explored the relationship between bank holding company size and risk. We have shown that in the past, size affected the mix between firm-specific and systematic risk but did not affect the level of total risk. Large banking companies operated with greater leverage and held riskier portfolios, offsetting the risk-reducing benefits normally associated with diversification.

In recent years, however, the relationship between size and risk has changed. The portfolios of large and small holding companies have become increasingly similar. As a result, the negative relationship between size and firm-specific risk has strengthened substantially, while the positive relationship between size and systematic risk has weakened. The diversification advantage of size has become evident in the lower total equity risk at large bank holding companies.

Our analysis suggests that changes in the regulatory climate could explain changes in the relationship between size and risk. New regulatory standards have not been in place long enough to assess their full effect on this relationship. Nevertheless, the evidence to date suggests that these standards have prompted large bank holding companies to reduce their overall risk to a level below that of small bank holding companies.

Appendix: Methodology for Measuring Systematic and Firm-Specific Risk

We define total equity risk as the variance of each bank holding company's weekly stock return over each year. In order to define systematic and firm-specific risk for each company, we estimate a return-generating model of the following form:

$$R_{t,i} = \alpha_i + \sum_{k=1}^{5} (\beta_i^k f_t^k) + \varepsilon_{t,i},$$

where t is an index for time, i is an index for each bank holding company, k is an index for each of five systematic factors (denoted f^k), and $R_{t,i}$ is the return for bank holding company stock i during week t. The return-generating model is estimated by a statistical procedure called factor analysis. Using only information on the stock returns of bank holding companies in our sample, factor analysis solves for the factors ($f^1_t,...,f^5_t$) and the factor loadings ($\beta^1_i,...,\beta^5_i$) that best explain the component of returns common to the -companies in our sample.

Intuitively, the f^k are akin to economic variables that generate changes in bank holding company stock returns, such as changes in the level of the stock market, changes in interest rates, and changes in the slope of the yield curve. The statistical procedure, however, does not require us to associate each factor with a particular source of economic risk. That part of a given company's stock return unexplained by the five factors is captured in $\varepsilon_{t,i}$. This "residual return" is determined by influences unique to each bank holding company.

We use this model to divide total risk (the variance of weekly stock returns) into systematic risk and firm-specific risk. Systematic risk is defined as that part of total variance explained by the systematic factors (f^k). The remainder of total variance is called firm-specific risk. Our procedure permits the following variance decomposition:

Total Risk=Systematic Risk+Firm-Specific Risk

$$\sigma^2(R_i) = \sum_{k=1}^{5} (\beta_i^k)^2 \sigma^2(f^k) + \sigma^2(\varepsilon_i) \ .$$

Notice that each bank holding company has a unique set of βs, where β_i^k measures company i's exposure to factor k. Bank holding companies heavily exposed to systematic factors will have large βs (in absolute value) and high levels of systematic risk. The first term above is the variability of company i's stock generated by its exposure to the five systematic factors. The stock returns of bank holding companies with concentrations in particular industries or regions will tend to be dominated by ε, since the fortunes of such companies will be tied to a particular type of business or area of the country. The second term above represents the variability in company i's stock generated by the residual return.

One advantage of this approach is that because the factors are determined using only data on bank holding company returns, the measure of systematic risk will incorporate sources of risk specific to the banking industry, such as changes in deposit insurance premia or changes in regulations. However, the procedure may assign to systematic risk certain risks normally considered diversifiable. For instance, if most of the bank holding companies in our sample have a common risk, such as lending to a particular sector of the economy, then a bank holding company with a high exposure to that sector will exhibit a high level of systematic risk.

ENDNOTES

1. A bank holding company is a company that owns or controls one or more banks. It may also own nonbank subsidiaries.

2. Of course, it is possible that large bank holding companies simply make larger loans rather than a greater number of loans to a wider variety of borrowers. In this case, there may be little or no diversification advantage of size.

3. There are several ways to carry out the risk decomposition. Our approach compares the stock returns of each bank holding company to the returns of a large sample of bank holding companies. Alternatively, the stock returns of each bank holding company could be compared with other variables measuring economic conditions, such as a stock market index or the level of interest rates. In Demsetz and Strahan (1995), we use three alternative approaches when decomposing total equity risk into its two components. As a check on the robustness of our methodology, we show that the size/risk relationships are similar in all three cases.

4. That is, risk is predominately related to some aspect of this particular bank holding company, perhaps a large concentration of loans to borrowers in a regional industry such as mining or agriculture.

5. We initially identified approximately 150 publicly traded bank holding companies by referring to the Bank Compustat database. We tracked these companies' stock returns and characteristics in each year between 1987 and 1993. Our analysis is based on those bank holding companies for which we could retrieve both stock return data and data describing bank holding company characteristics, and whose stock traded for at least thirty weeks in a given calendar year. There is some year-to-year variability in our sample size because several bank holding companies did not have traded stock in every year between 1987 and 1993. In the case of mergers, we dropped acquired companies from the sample after the date of acquisition. Acquirers remain in the sample.

6. Relationships derived using the pooled 1987-93 data are representative of those derived using annual data, with the exception of 1992 and 1993. Changes in the size/risk relationship in these years are discussed in the "Recent Changes" section. Our analysis focuses on the 1987-93 period because 1987 was the first year in which data describing certain bank holding company characteristics were available.

7. Other authors (Boyd and Gertler 1993 and Samolyk 1994) have also found that large banks held riskier portfolios than small banks during the 1980s and early 1990s.

8. Boyd and Runkle (1993) also find that large banks hold less capital than small banks.

9. Figures reported in Table 2 are based on those reported in Table 1 and coefficients from regressions with the log of firm-specific and the log of systematic risk as dependent variables and a number of bank holding company characteristics (including asset size) as independent variables. In particular, coefficients from a regression based on data from 1987 to 1993 are multiplied by differences in the characteristics of large and small bank holding companies in 1987 to derive figures reported in Table 2.

10. Levonian (1994) shows that bank accounting profits exhibit low correlation across states, suggesting that bank holding companies operating in many states may be able to reduce risk through diversification.

11. Each regression also includes an independent variable measuring the liquidity of each bank holding company's stock.

12. Although they do not focus on the role of size, Liang and Rhoades (1991) do find that the effects of diversification depend on banks' portfolio choices. Using balance-sheet data, they show that the risk-reducing benefits of diversification are partially offset by a positive relationship between diversification and leverage.

13. Large bank holding companies may also choose to operate with lower capital ratios because they have better access to funds through the capital markets. If large bank holding companies can raise new capital more quickly and more cheaply, they may have less need for a large capital cushion.

14. In addition, Diamond (1984) shows that diversification can actually reduce the cost of monitoring risky loans; hence, it may be efficient for risky lending to be concentrated in the hands of large, well-diversified bank holding companies.

15. On September 19, 1984, the Comptroller of the Currency testified before Congress that some banks were "too big to fail." For these banks, which were not explicitly named, all depositors would be insured. O'Hara and Shaw (1990) note that the *Wall Street Journal* named the eleven largest banks in reporting the story (on September 20) and go on to show that the stock returns on these eleven banks rose in response to the announcement of the too-big-to-fail policy.

16. Of course, large bank holding companies are likely to have established longstanding relationships with both borrowers and depositors. The desire to protect these relationships and the profits they generate may counterbalance the incentive problems inherent in the too-big-to-fail policy. As a result, the incentives for risk taking at the expense of the Federal Deposit Insurance Corporation are likely to be strong only at weakly capitalized institutions.

ENDNOTES (*Continued*)

17. The use of this "balanced panel" prevents us from generalizing our findings to all bank holding companies. We note, however, that the attrition rate was about the same for each of the first three size categories (about one-third) and only slightly smaller for the largest size category (about one-fifth), so the size distribution of the surviving bank holding companies is fairly representative of the overall size distribution.

18. This hypothesis, however, is difficult to test since the riskiness of the assets underlying bank holding company portfolios is not directly observable.

19. Recall that these figures are based on our sample of publicly traded bank holding companies and may not be fully representative of the entire population of bank holding companies.

20. This standard was added to the risk-based capital requirements because a bank could, in theory, hold no capital under these requirements if it held only very safe assets, such as government securities. See Spong (1994) for more detail on risk-based capital requirements and other recent regulatory changes.

21. Tier 1 capital includes those types of capital that provide the best protection against loss. The components of tier 2 capital can still protect against loss but are considered lower quality protection. See Spong (1994) for information on the components of tier 1 and tier 2 capital.

22. We focus on 1991 capital ratios because we are interested in changes in bank holding company behavior in 1992 and 1993. The tier 1 and total risk-based capital ratios are defined as tier 1 capital divided by risk-weighted assets and total capital divided by risk-weighted assets, respectively. The leverage ratio is defined as total capital divided by average assets.

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The Decline of Traditional Banking: Implications for Financial Stability and Regulatory Policy

Franklin R. Edwards and Frederic S. Mishkin [1]

The views expressed in this article are those of the authors and do not necessarily reflect the position of the Federal Reserve Bank of New York or the Federal Reserve System.

The traditional banking business has been to make long-term loans and fund them by issuing short-dated deposits, a process that is commonly described as "borrowing short and lending long." In recent years, fundamental economic forces have undercut the traditional role of banks in financial intermediation. As a source of funds for financial intermediaries, deposits have steadily diminished in importance. In addition, the profitability of traditional banking activities such as business lending has diminished in recent years. As a result, banks have increasingly turned to new, nontraditional financial activities as a way of maintaining their position as financial intermediaries.[2]

This article has two objectives: to examine the forces responsible for the declining role of traditional banking in the United States as well as in other countries, and to explore the implications of this decline and banks' responses to it for financial stability and regulatory policy. A key policy issue is whether the decline of banking threatens to make the financial system more fragile. If nothing else, the prospect of a mass exodus from the banking industry (possibly via increased failures) could cause instability in the financial system. Of greater concern is that declining profitability could tip the incentives of bank managers toward assuming greater risk in an effort to maintain former profit levels. For example, banks might make loans to less creditworthy borrowers or engage in nontraditional financial activities that promise higher returns but carry greater risk. A new activity that has generated particular concern recently is the expanding role of banks as dealers in derivatives products. There is a fear that in seeking new sources of revenue in derivatives, banks may be taking risks that could ultimately undermine their solvency and possibly the stability of the banking system.

The challenge posed by the decline of traditional banking is twofold: we need to maintain the soundness of the banking system while restructuring the banking industry to achieve long-term financial stability. A sound regulatory policy can encourage an orderly shrinkage of

traditional banking while strengthening the competitive position of banks, possibly by allowing them to expand into more profitable, nontraditional activities. In the transitional period, of course, regulators would have to continue to guard against excessive risk taking that could threaten financial stability.

The first part of our article documents the declining financial intermediation role of traditional banks in the United States. We discuss the economic forces driving this decline, in both the United States and foreign countries, and describe how banks have responded to these pressures. Included in this discussion is an examination of banks' activities in derivatives markets, a particularly fast-growing area of their off-balance-sheet activities. Finally, we examine the implications of the changing nature of banking for financial fragility and regulatory policy.

The Decline of Traditional Banking in the United States

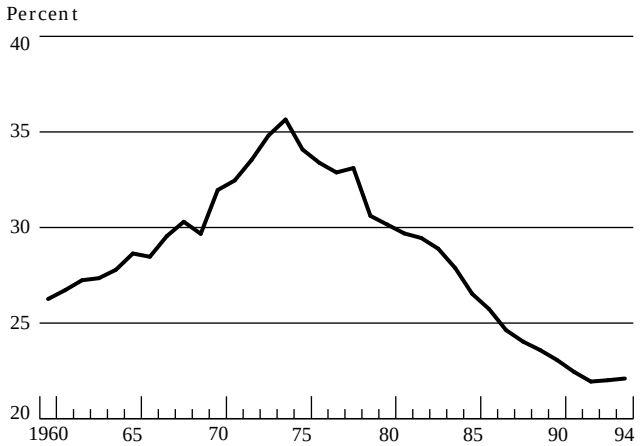
In the United States, the importance of commercial banks as a source of funds to nonfinancial borrowers has shrunk dramatically. In l974 banks provided 35 percent of these funds; today they provide around 22 percent (Chart 1). Thrift institutions (savings and loans, mutual savings banks, and credit unions), which can be viewed as specialized banking institutions, have also suffered a decline in market share, from more than 20 percent in the late 1970s to below 10 percent in the 1990s (Chart 2).

Another way of viewing the declining role of banking in traditional financial intermediation is to look at the size of banks' balance-sheet assets relative to those of other financial intermediaries (Table 1). Commercial banks' share of total financial intermediary assets fell from around the 40 percent range in the 1960-80 period to below 30 percent by the end of 1994. Similarly, the share of total financial intermediary assets held by thrift institutions

In the United States, the importance of commercial banks as a source of funds to nonfinancial borrowers has shrunk dramatically. In l974 banks provided 35 percent of these funds; today they provide around 22 percent.

Chart 1

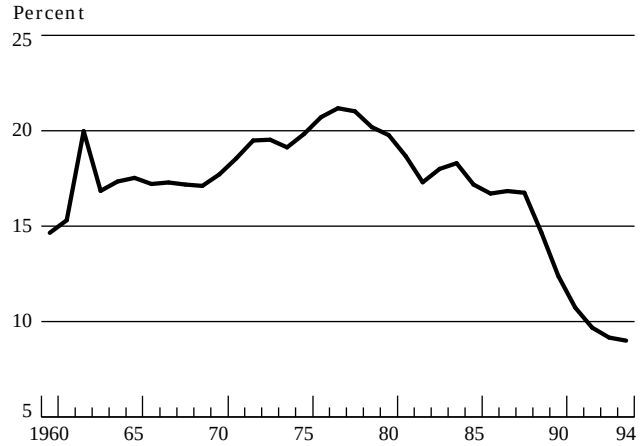
Commercial Banks' Share of Total Nonfinancial Borrowing
1960-94



Source: Board of Governors of the Federal Reserve System, Flow of Funds Accounts.

Chart 2

Thrifts' Share of Total Nonfinancial Borrowing
1960-94



Source: Board of Governors of the Federal Reserve System, Flow of Funds Accounts.

Table 1
RELATIVE SHARES OF TOTAL FINANCIAL INTERMEDIARY ASSETS, 1960-94
Percent

	1960	1970	1980	1990	1994
Insurance companies					
Life insurance	19.6	15.3	11.5	12.5	13.0
Property and casualty	4.4	3.8	4.5	4.9	4.6
Pension funds					
Private	6.4	8.4	12.5	14.9	16.2
Public (state and local government)	3.3	4.6	4.9	6.7	8.4
Finance companies	4.7	4.9	5.1	5.6	5.3
Mutual funds					
Stock and bond	2.9	3.6	1.7	5.9	10.8
Money market	0.0	0.0	1.9	4.6	4.2
Depository institutions (banks)					
Commercial banks	38.6	38.5	37.2	30.4	28.6
Savings and loans and mutual savings	19.0	19.4	19.6	12.5	7.0
Credit unions	1.1	1.4	1.6	2.0	2.0
Total	100.0	100.0	100.0	100.0	100.0

Source: Board of Governors of the Federal Reserve System, Flow of Funds Accounts.

declined from around 20 percent in the 1960-80 period to below 10 percent by 1994.[3]

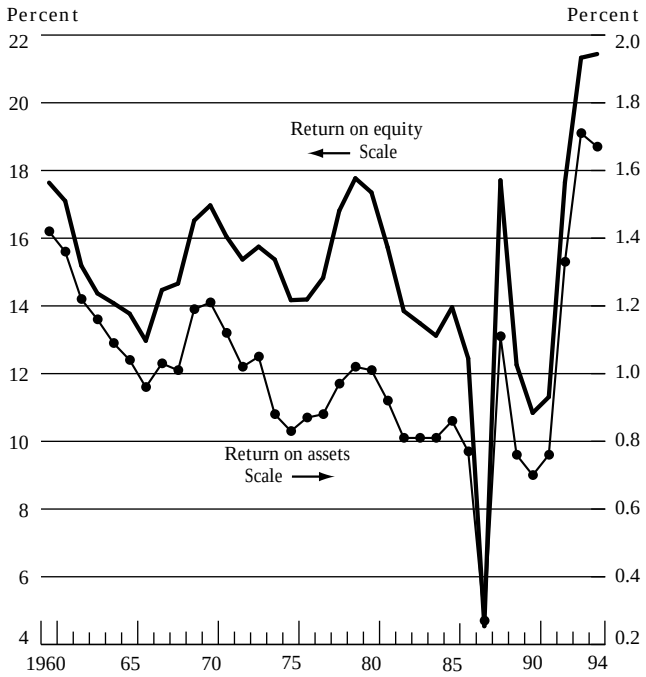
Boyd and Gertler (1994) and Kaufman and Mote (1994) correctly point out that the decline in the share of total financial intermediary assets held by banking institutions does not necessarily indicate that the banking industry is in decline. Because banks have been increasing their off-balance-sheet activities (an issue we discuss below), we may understate their role in financial markets if we look solely at the on-balance-sheet activities. However, the decline in *traditional* banking, which is reflected in the decline in banks' share of total financial intermediary assets, raises important policy issues that are the focus of this article.

There is also evidence of an erosion in traditional banking profitability. Nevertheless, standard measures of commercial bank profitability such as pretax rates of return on assets and equity (shown in Chart 3) do not provide a clear picture of the trend in bank profitability. Although banks' before-tax rate of return on equity declined from an average of 15 percent in the 1970-84 period to below 12 percent in the 1985-91 period, bank profits improved sharply beginning in 1992, and 1994 was a record year for bank profits.

Overall bank profitability, however, is not a good indicator of the profitability of traditional banking because it includes the increasingly important nontraditional businesses of banks. As a share of total bank income, noninterest income derived from off-balance-sheet activities, such as fee and trading income, averaged 19 percent in the 1960-80 period (Chart 4). By 1994, this source of income had grown to about 35 percent of total bank income. Although some of this growth in fee and trading income may be attributable to an expansion of traditional fee activities, much of it is not.

A crude measure of the profitability of the traditional banking business is to exclude noninterest income from total earnings, since much of this income comes from nontraditional activities. By this measure, the pretax return on equity fell from *more than* 10 percent in 1960 to levels that approached *negative* 10 percent in the late 1980s and early 1990s (Chart 5). This measure, however, does not adjust for the expenses associated with generating nonin-

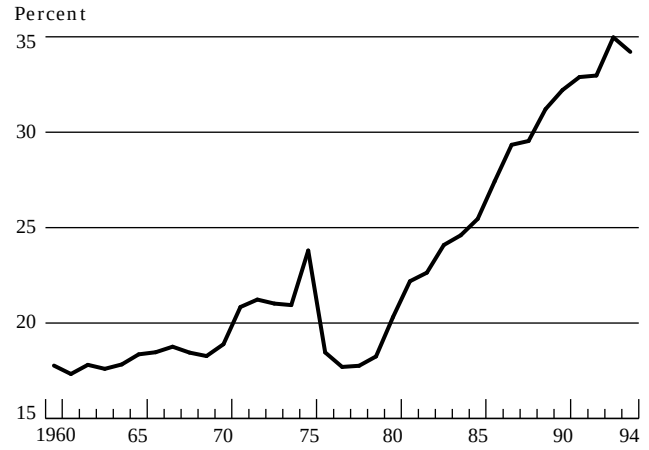
Chart 3
Return on Assets and Equity for Commercial Banks
1960-94



Sources: Federal Deposit Insurance Corporation, *Statistics on Banking* and *Quarterly Banking Profile*.

Chart 4

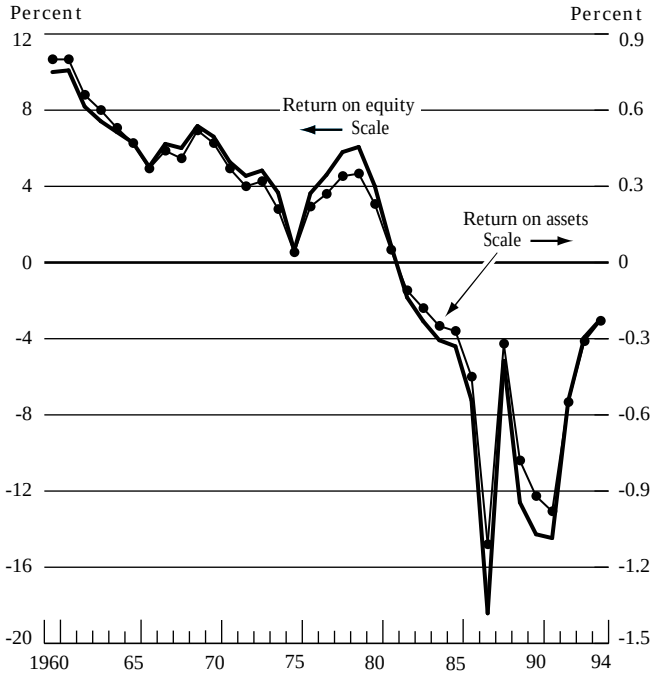
Share of Noninterest Income in Total Income for Commercial Banks
1960-94



Sources: Federal Deposit Insurance Corporation, *Statistics on Banking* and *Quarterly Banking Profile*.

Chart 5

Return on Assets and Equity for Commercial Banks Excluding Noninterest Income
1960-94



Sources: Federal Deposit Insurance Corporation, *Statistics on Banking* and *Quarterly Banking Profile*.

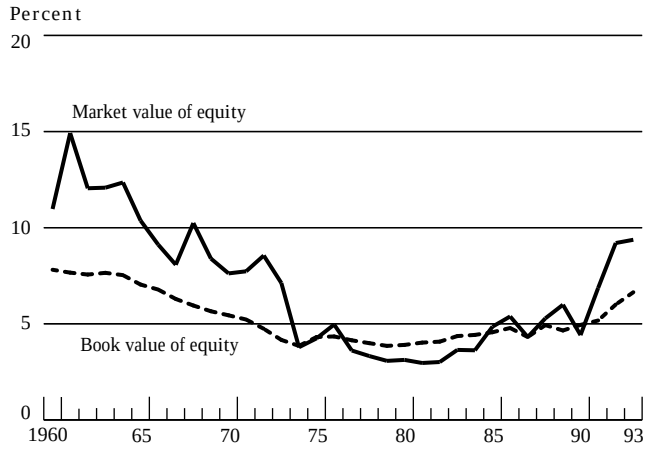
terest income and therefore overstates the decline in the profitability of traditional banking. Another indicator of the decline in the profitability of traditional banking is the fall in the ratio of market value to book value of bank capital from the mid-1960s to the early 1980s. As noted by Keeley (1990), this fall indicates that bank charters were becoming less valuable in this period (Chart 6). The decline in the value of bank charters in the years preceding the sharp increase in nontraditional activities supports the view that there was a substantial decline in the profitability of traditional banking. Only with the rise in nontraditional activities that begins in the early 1980s (Chart 4) does the market value of banks begin to rise.

Why is Traditional Banking in Decline?

Fundamental economic forces have led to financial innovations that have increased competition in financial markets. Greater competition in turn has diminished the cost advantage banks have had in acquiring funds and has undercut their position in loan markets. As a result, traditional banking has lost profitability, and banks have begun to diversify into new activities that bring higher returns.

Chart 6

Equity-to-Asset Ratios, Market Value vs. Book Value
1960-93



Source: Standard and Poor's Compustat.

Note: Chart presents equity-to-asset ratios for the top twenty-five bank holding companies in each year.

Diminished Advantage in Acquiring Funds (Liabilities)

Until 1980, deposits were a cheap source of funds for U.S. banking institutions (commercial banks, savings and loans, mutual savings banks, and credit unions). Deposit rate ceilings prevented banks from paying interest on checkable deposits, and Regulation Q limited them to paying specified interest rate ceilings on savings and time deposits. For many years, these restrictions worked to the advantage of banks because a major source of bank funds was checkable deposits (in l960 and earlier years, these deposits constituted more than 60 percent of total bank deposits). The zero interest cost on these deposits resulted in banks having a low average cost of funds.

This cost advantage did not last. The rise in inflation beginning in the late 1960s led to higher interest rates and made investors more sensitive to yield differentials on different assets. The result was the so-called disintermediation process, in which depositors took their money out of banks paying low interest rates on both checkable and time deposits and purchased higher yielding assets. In addition, restrictive bank regulations created an opportunity for nonbank financial institutions to invent new ways to offer bank depositors higher rates. Nonbank competitors were not subject to deposit rate ceilings and did not have the costs associated with having to hold non-interest-bearing reserves and paying deposit insurance premiums. A key development was the creation of money market mutual funds, which put banks at a competitive disadvantage because money market mutual fund shareholders (or depositors) could obtain check-writing services while earning a higher interest rate on their funds. Not surprisingly, as a source of funds for banks, low-cost checkable deposits declined dramatically, falling from 60 percent of bank liabilities in l960 to under 20 percent today.

The growing disadvantage of banks in raising funds led to their supporting legislation in the 1980s to eliminate Regulation Q ceilings on time deposits and to allow checkable deposits that paid interest (NOW accounts). Although the ensuing changes helped to make banks more competitive in their quest for funds, the banks' cost of funds rose substantially, reducing the cost advantage they enjoyed.

Diminished Income (or Loan) Advantages

Banks have also experienced a deterioration in the income advantages they once enjoyed on the asset side of their balance sheets. The growth of the commercial paper and junk bond markets and the increased securitization of assets have undercut banks' traditional advantage in providing credit.

Improvements in information technology, which have made it easier for households, corporations, and financial institutions to evaluate the quality of securities, have made it easier for business firms to borrow directly from the public by issuing securities. In particular, instead of going to banks to finance short-term credit needs, many business customers now borrow through the commercial paper market. Total nonfinancial commercial paper outstanding as a percentage of commercial and industrial bank loans has risen from 5 percent in l970 to more than 20 percent today.

The rise of money market mutual funds has also indirectly undercut banks by supporting the expansion of competing finance companies. The growth of assets in money market mutual funds to more than $500 billion created a ready market for commercial paper because money market mutual funds must hold liquid, high-quality, short-term assets. Further, the growth in the commercial paper market has enabled finance companies, which depend on issuing commercial paper for much of their funding, to expand their lending at the expense of banks. Finance companies provide credit to many of the same businesses that banks have traditionally served. In 1980, finance company loans to businesses amounted to about 30 percent of banks' commercial and industrial loans; today these loans constitute more than 60 percent of banks' commercial and industrial loans.

The junk bond market has also taken business away from banks. In the past, only Fortune 500 companies were able to raise funds by selling their bonds directly to the public, bypassing banks. Now, even lower quality corporate borrowers can readily raise funds through access to the junk

bond market. Despite predictions of the demise of the junk bond market after the Michael Milken embarrassment, it is clear that the junk bond market is here to stay. Although sales of new junk bonds slid to $2.9 billion by 1990, they rebounded to $16.9 billion in 1991, $42 billion in 1992, and $60 billion in 1993.

The ability to securitize assets has made nonbank financial institutions even more formidable competitors for banks. Advances in information and data processing technology have enabled nonbank competitors to originate loans, transform these into marketable securities, and sell them to obtain more funding with which to make more loans. Computer technology has eroded the competitive advantage of banks by lowering transactions costs and enabling nonbank financial institutions to evaluate credit risk efficiently through the use of statistical methods. When credit risk can be evaluated using statistical techniques, as in the case of consumer and mortgage lending, banks no longer have an advantage in making loans.[4] An effort is being made in the United States to develop a market for securitized small business loans as well.

U.S. banks are not alone in losing their monopoly power over depositors. Financial innovation and deregulation are occurring worldwide.

U.S. banks have also been beset by increased foreign competition, particularly from Japanese and European banks. The success of the Japanese economy and Japan's high savings rate gave Japanese banks access to cheaper funds than were available to American banks. This cost advantage permitted Japanese banks to seek out loan business in the United States more aggressively, eroding U.S. banks' market share. In addition, banks from all major countries followed their corporate customers to the United States and often enjoyed a competitive advantage because of less burdensome regulation in their own countries. Before 1980, two U.S. banks, Citicorp and BankAmerica Corporation, were the largest banks in the world. In the 1990s, neither of these banks ranks among the top twenty. Although some of this loss in market share may be due to the depreciation of the dollar, most of it is not.

Similar forces are working to undermine the traditional role of banks in other countries. The U.S. banks are not alone in losing their monopoly power over depositors. Financial innovation and deregulation are occurring worldwide and have created attractive alternatives for both depositors and borrowers. In Japan, for example, deregulation has opened a wide array of new financial instruments to the public, causing a disintermediation process similar to the one that has taken place in the United States. In European countries, innovations have steadily eroded the barriers that have traditionally protected banks from competition.

In other countries, banks have also faced increased competition from the expansion of securities markets. Both financial deregulation and fundamental economic forces abroad have improved the availability of information in securities markets, making it easier and less costly for business firms to finance their activities by issuing securities rather than going to banks. Further, even in countries where securities markets have not grown, banks have still lost loan business because their best corporate customers have had increasing access to foreign and offshore capital markets such as the Eurobond market. In smaller economies, such as Australia, which still do not have well-developed corporate bond or commercial paper markets, banks have lost loan business to international securities markets. In addition, the same forces that drove the securitization process in the United States are at work in other countries and will undercut the profitability of traditional banking there. Thus, although the decline of traditional banking has occurred earlier in the United States than in other countries, we can expect a diminished role for traditional banking in these countries as well.

How Have Banks Responded?

In any industry, a decline in profitability usually results in exit from the industry (often by widespread bankruptcies) and a shrinkage of market share. This occurred in the

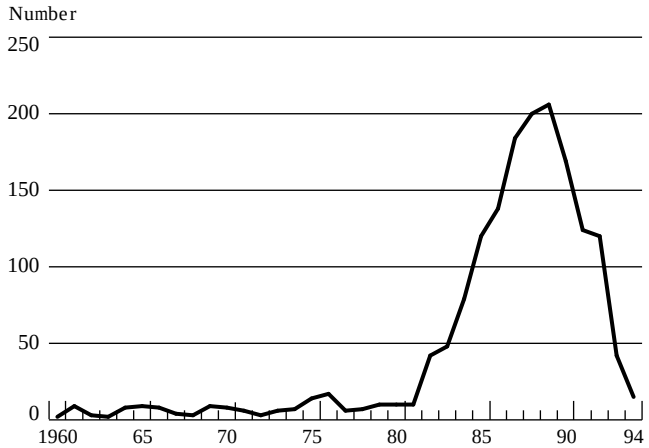
banking industry in the United States during the l980s through consolidations and bank failures. From 1960 to 1980, bank failures in the United States averaged less than ten per year, but during the l980s, bank failures soared, rising to more than 200 a year in the late l980s (Chart 7).

> *To survive and maintain adequate profit levels, many U.S. banks are facing two alternatives. First, they can attempt to maintain their traditional lending activity by expanding into new, riskier areas of lending. . . . [Second, they can] pursue new, off-balance-sheet activities that are more profitable.*

To survive and maintain adequate profit levels, many U.S. banks are facing two alternatives. First, they can attempt to maintain their traditional lending activity by expanding into new, riskier areas of lending. For example, U.S. banks have increased their risk taking by placing a greater percentage of their total funds in commercial real estate loans, traditionally a riskier type of loan (Chart 8). In addition, they have increased lending for corporate takeovers and leveraged buyouts, which are highly leveraged transactions. There is evidence that banks have in fact increased their lending to less creditworthy borrowers. During the l980s, banks' loan loss provisions relative to assets climbed substantially, reaching a peak of 1.25 per-

Chart 7

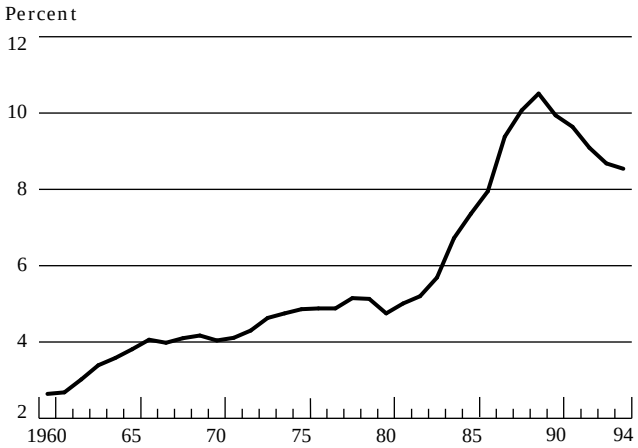
Bank Failures
1960-94



Sources: Federal Deposit Insurance Corporation, *1993 Annual Report* and *Quarterly Banking Profile.*

Chart 8

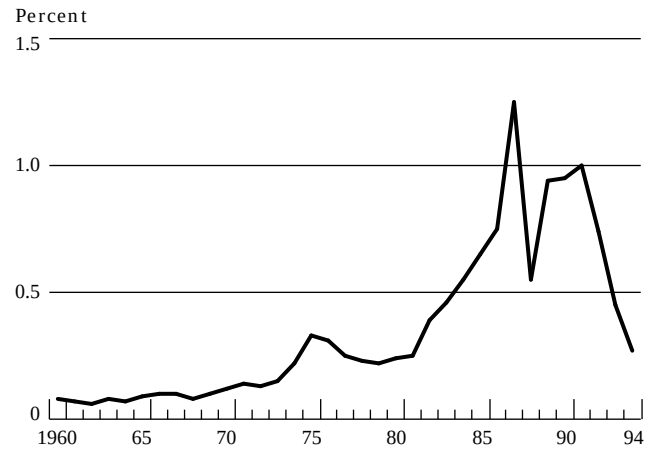
Commercial Real Estate Loans as a Percentage of Total Commercial Bank Assets
1960-94



Sources: Board of Governors of the Federal Reserve System, *Federal Reserve Bulletin* and Flow of Funds Accounts.

Chart 9

Loan Loss Provisions Relative to Assets for Commercial Banks
1960-94



Sources: Federal Deposit Insurance Corporation, *Statistics on Banking* and *Quarterly Banking Profile.*

cent in 1987. Only with the strong economy in 1994 have loan loss provisions fallen to levels found in the worst years of the 1970s (Chart 9). Recent evidence suggests that large banks have taken even more risk than have smaller banks: large banks have suffered the largest loan losses (Boyd and Gertler 1993). Thus, banks appear to have maintained their profitability (and their net interest margins—interest income minus interest expense divided by total assets) by taking greater risk (Chart 10).[5] Using stock market measures of risk, Demsetz and Strahan (1995) also find that before 1991 large bank holding companies took on more systematic risk than smaller bank holding companies.

The second way banks have sought to maintain former profit levels is to pursue new, off-balance-sheet activities that are more profitable. As Chart 4 shows, U.S. commercial banks did this during the early 1980s, doubling the share of their income coming from off-balance-sheet, noninterest-income activities.[6] This strategy, however, has generated concerns about what activities are proper for banks and whether nontraditional activities might be riskier and result in banks' taking excessive risk. Although banks have increased fee-based activities, the area of expanding activities in nontraditional banking that has raised the greatest concern is banks' derivatives activities. Great controversy surrounds the issue of whether banks should be permitted to engage in unlimited derivatives activities, including serving as off-exchange or over-the-counter (OTC) derivatives dealers. Some feel that such activities are riskier than traditional banking and could threaten the stability of the entire banking system. (We discuss this issue more fully later in the paper.)

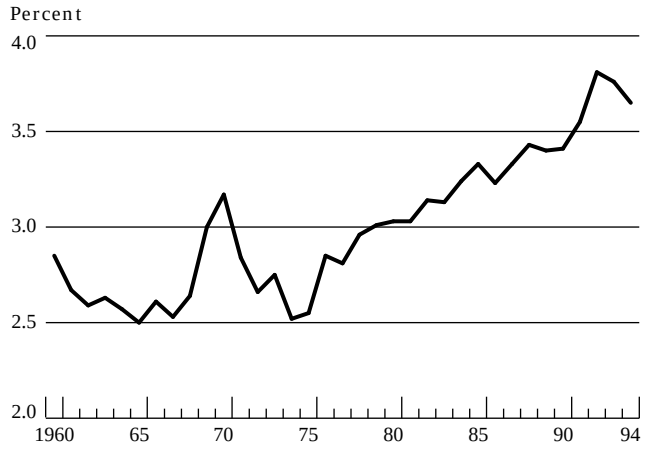
The United States is not the only country to experience increased risk taking by banks. Large losses and bank failures have occurred in other countries. Banks in Norway, Sweden, and Finland responded to deregulation by dramatically increasing their real estate lending, a move followed by a boom and bust in real estate sectors that resulted in the insolvency of many large banking institutions. Indeed, banks' loan losses in these countries as a fraction of GNP exceeded losses in both the banking and the savings and loans industries in the United States. The International Monetary Fund (1993) reports that government (or taxpayer) support to shore up the banking system in Scandinavian countries is estimated to range from 2.8 to 4.0 percent of GDP. This support is comparable to the savings and loan bailout in the United States, which amounted to 3.2 percent of GDP.

Japanese banks have also suffered large losses from riskier lending, particularly to the real estate sector. The collapse of real estate values in Japan left many banks with huge losses. Ministry of Finance estimates in June 1995 indicated that Japanese banks were holding 40 trillion yen ($470 billion) of nonperforming loans—loans on which interest payments had not been made for more than six months—but many private analysts think that the actual amount of nonperforming loans may be substantially larger.

Much of the controversy surrounding banks' efforts to diversify into off-balance-sheet activities has centered on the increasing role of banks in derivatives markets.

Chart 10

Net Interest Margins for Commercial Banks
1960-94



Sources: Federal Deposit Insurance Corporation, *Statistics on Banking* and *Quarterly Banking Profile.*

French and British banks suffered from the worldwide collapse of real estate prices and from major failures of risky real estate projects funded by banks. Olympia and York's collapse is a prominent example. The loan-loss provisions of British and French banks, like those of U.S. banks, have risen in the l990s. One result has been the massive bailout of Credit Lyonnais by the French government in March 1995. Even in countries with healthy banking systems, such as Switzerland and Germany, some banks have run into trouble. Regional banks in Switzerland failed, and Germany's BfG Bank suffered huge losses (DM 1.1 billion) in l992 and needed a capital infusion from its parent company, Credit Lyonnais. Thus, fundamental forces not limited to the United States have caused a decline in the profitability of traditional banking throughout the world and have created an incentive for banks to expand into new activities and take additional risks.

Banks' Off-Balance-Sheet Derivatives Activities

Much of the controversy surrounding banks' efforts to diversify into off-balance-sheet activities has centered on the increasing role of banks in derivatives markets. Large banks, in particular, have moved aggressively to become worldwide dealers in off-exchange or OTC derivatives, such as swaps.[7] Their motivation, clearly, has been to replace some of their lost "banking" revenue with the attractive returns that can be earned in derivatives markets.

Banks have increased their participation in derivatives markets dramatically in the last few years. In l994, U.S. banks held derivatives contracts totaling more than $16 trillion in notional value.[8] Of these contracts, 63 percent were interest rate derivatives, 35 percent were foreign exchange derivatives, and the remainder were equity and commodity derivatives.[9] In addition, most of these derivatives were held by large banks, and were held primarily to facilitate the banks' dealer and trading operations (Table 2).[10] In l994, the seven largest U.S.-bank derivatives dealers accounted for more than 90 percent of the notional value of all derivatives contracts held by U.S. banks (Table 3).[11] The profitability of derivatives activities has clearly encouraged banks to step up their involvement: in 1994, derivatives accounted for between 15 and 65 percent of the total trading income of four of the largest bank dealers (Table 4).[12]

The increased participation of banks in derivatives markets has been a concern to both regulators and legislators because they fear that derivatives may enable banks to take more risk than is prudent. There can be little doubt that derivatives can be used to increase risk substantially,

Table 2
DERIVATIVES CONTRACTS
December 31, 1994

	Trading ($ Billions)	Percentage of Total	Asset/ Liability Management ($ Billions)	Percentage of Total	Total ($ Billions)
BankAmerica	1,333	95	68	5	1,401
Bank One	0	0	45	100	45
Bankers Trust	1,982	98	44	2	2,026
Chase	1,293	95	67	5	1,360
Chemical	3,069	97	109	3	3,178
Citicorp	2,449	92	216	8	2,665
J.P. Morgan	2,180	88	292	12	2,472
NationsBank	485	95	26	5	511
Total/average[a]	12,791	94	867	6	13,658

Sources: Annual reports for 1994.

[a] Totals, expressed in billions of dollars, appear in columns 1, 3, and 5. Averages, expressed as percentages, appear in columns 2 and 4.

Table 3
NOTIONAL/CONTRACT DERIVATIVES AMOUNTS OF FIFTEEN MAJOR U.S. OVER-THE-COUNTER DERIVATIVES DEALERS
Millions of Dollars

Banks	
Chemical Banking Corporation	3,177,600
Citicorp	2,664,600
J.P. Morgan & Co., Inc.	2,472,500
Bankers Trust New York Corporation	2,025,736
BankAmerica Corporation	1,400,707
The Chase Manhattan Corporation	1,360,000
First Chicago Corporation	622,100
Securities firms	
Salomon, Inc.	1,509,000
Merrill Lynch & Co., Inc.	1,326,000
Lehman Brothers, Inc.	1,143,091
The Goldman Sachs Group, L.P.	995,275
Morgan Stanley Group, Inc.	843,000
Insurance companies	
American International Group, Inc.	376,869
General Re Corporation	306,159
The Prudential Insurance Co. of America	102,102
Total	17,852,239

Sources: Annual reports for 1994.

and can potentially be quite dangerous.[13] In the last year, many banks sustained substantial losses on interest rate derivatives instruments when interest rates continued to rise. Because of the leverage that is possible, derivatives enable banks to place sizable "bets" on interest rate and currency movements, which—if wrong—can result in sizable losses. In addition, as dealers in OTC derivatives markets, banks may be exposed to substantial counterparty credit risk. Unlike organized futures exchanges, the OTC market offers no clearinghouse guarantee to mitigate the credit risk involved in derivatives trading. Finally, because derivatives are often complex instruments, sophisticated risk-control systems may be necessary to measure and track a bank's potential exposure. Questions have been raised about whether banks are currently capable of managing these risks.

Concern about the growing participation of banks in derivatives markets is exemplified by the remarks of Representative Henry Gonzalez, Chairman of the Banking Committee of the House of Representatives:

> I have long believed that growing bank involvement in derivative products is, as I say and repeat, like a tinderbox waiting to explode. In the case of many market innovations, regulation lags behind until the crisis comes, as it has happened in our case with S&L's and banks. . . .
>
> We must work to avoid a crisis related to derivative products before, once again, . . . the taxpayer is left holding the bag.[14]

Table 4
CONTRIBUTION OF DERIVATIVES TRADING TO TOTAL TRADING INCOME

	1994 ($ Millions)	Percent	1993 ($ Millions)	Percent
Chase	108	15	201	28
Chemical	391	61	453	42
Citicorp	400	29	800	27
J.P. Morgan	663	65	797	39
Total/average[a]	1,562	42	2,251	34

Sources: Company annual reports.

[a] Totals, expressed in millions of dollars, appear in columns 1 and 3. Averages, expressed as percentages, appear in columns 2 and 4.

In May 1994, Representative Gonzalez and Representative Jim Leach introduced the Derivatives Safety and Soundness Act of l994. This bill directs the federal banking agencies to establish common principles and standards for capital, accounting, disclosure, and examination of financial institutions using derivatives. In addition, the bill requires the Federal Reserve and the U.S. Comptroller of the Currency to work with other central banks to develop comparable international supervisory standards for financial institutions using derivatives. In discussing the need for derivatives legislation, Representative Leach said, "one of the ironies of the development of [derivatives markets] is that while [individual firm] risk can be reduced . . . systematic risk can be increased." A second problem, Leach noted, is that in many cases derivatives instruments "are too sophisticated for financial managers."[15] A further indication of these concerns is the plethora of recent studies that have examined the activities of financial institutions in derivatives markets. Studies have been conducted by the Bank for International Settlements (the "Promisel Report"), the Bank of England, the Group of Thirty, the Office of the U.S. Comptroller of the Currency, the Commodity Futures Trading Commission, and, most recently, the U.S. Government Accounting Office (GAO).

The GAO released its report, "Financial Derivatives: Actions Needed to Protect the Financial System," in May 1994. The report concluded that there is some reason to believe that derivatives do pose a threat to financial stability. It raises the prospect that a default by a major OTC derivatives dealer—and in particular by a major bank—could result in spillover effects that could "close down" OTC derivatives markets, with potentially serious ramifications for the entire financial system. The GAO recommends that a number of measures be taken to strengthen government regulation and supervision of all participants in OTC derivatives markets, including banks.

The fear of a major bank failure because of OTC derivatives activities appears to stem from two sources. First, the sheer size of banks' OTC derivatives activities suggests that they may be exposed to substantial market and credit risk because of their derivatives positions. In particular, there is concern that as OTC derivatives deal-

ers, banks may be exposed to sizable counterparty credit risk. This concern has been heightened in recent months by the near-bankruptcy of Metallgesellschaft, Germany's fourteenth largest firm and a major end-user and counterparty in the swap market. Second, many fear that regulation, as well as managerial sophistication, has lagged developments in the derivatives area, and as a consequence, banks may be taking more risk than is prudent (and more than they even realize).

How Risky Are Banks' OTC Derivatives Activities?

Much of the concern about banks' activities in derivatives markets has centered on their central position as major dealers in the swap market. At year-end l994, the notional value of all swap contracts outstanding was $7.1 trillion (Table 5).[16] Interest rate swaps represented 82 percent of this amount, with currency swaps making up most of the remaining contracts (Table 6). Although detailed information about the nature of these swap agreements is not available, the bulk of them are probably "plain vanilla" swaps—an exchange of fixed for floating rates. As such, these contracts are similar to "strips" of forward or futures contracts (for example, Eurodollar futures strips). Swaps are attractive to end-users because of their customized nature, low cost, and longer maturities.

As major dealers in the swap market, banks have extensive counterparty obligations and may be exposed to

Table 5
Notional/Contract Amounts for Derivatives Worldwide by Individual Product Type
as of the End of Fiscal Years 1990-93

Type of Derivative	1990 ($ Billions)	1991 ($ Billions)	1992 ($ Billions)	1993 ($ Billions)	Percentage of Total 1993	Percentage Increase from 1990 to 1993
Forwards						
Forward rate agreements	1,156	1,533	1,807	2,522		
Foreign exchange forwards[a]	3,277	4,531	5,510	6,232		
Total forwards	4,433	6,064	7,317	8,754	35	97
Futures						
Interest rate futures	1,454	2,157	2,902	4,960		
Currency futures	16	18	25	30		
Equity index futures	70	77	81	119		
Total futures	1,540	2,252	3,008	5,109	20	231
Options						
Exchange-traded interest rate options	600	1,073	1,385	2,362		
Over-the-counter interest rate options	561	577	634	1,398		
Exchange-traded cutrency options	56	61	80	81		
Exchange-traded equity index options	96	137	168	286		
Total options	1,313	1,848	2,267	4,127	17	214
Swaps						
Interest rate swaps	2,312	3,065	3,851	6,177		
Currency swaps	578	807	860	900		
Total swaps	2,890	3,872	4,711	7,077	28	145
Total derivatives[b]	10,176	14,036	17,303	25,067	100	146
Total derivatives[c]	6,899	9,505	11,893	18,835		

Sources: Bank for International Settlements; U.S. Government Accounting Office; International Swaps and Derivatives Association; Federal Reserve Bank of New York.

[a] Estimates for foreign exchange forward contracts are from U.S. Government Accounting Office 1994 (GAO report), Table IV.5. These also include an unknown amount of over-the-counter foreign exchange options.

[b] Does not include complete data on physical commodity derivatives and equity options on the common stock of individual companies. Table IV.2 of the GAO report shows that seven of the databases contain equity and commodity derivatives that ranged from 1.1 to 3.4 percent of total derivatives' notional/contract amounts.

[c] Before including GAO estimates for foreign exchange forwards and over-the-counter options.

substantial market and counterparty credit risk. The notional or principal amount of the swap contracts that banks hold, however, is not a good measure of the magnitude of their credit exposure. Unlike credit instruments such as loans and bonds, swaps and other derivatives transactions do not involve payments of principal amounts. Derivatives contracts require periodic payments based on notional amounts but not payments of the notional amounts themselves. For example, a swap of a variable interest rate for a 7 percent fixed rate on a $10 million principal (notional) amount commits the swap parties to annual payments to each other on the order of $700,000, with differences in future payments depending on how interest rates move in the future. A party's credit exposure, therefore, is not the notional value of the contract, as it is for a loan, but the "replacement cost" of the contract.[17] Thus, the typical derivatives transaction involves a credit exposure that is only a fraction of its notional principal.

The GAO report closely examined fourteen major OTC derivatives dealers. Together, these dealers held derivative contracts with a notional principal of $6.5 trillion as of year-end l992. The "gross" credit exposure (or replacement cost) on these derivatives, however, was far less. The GAO estimated the replacement cost to be only $114 billion, or about 1.8 percent of the dealers' $6.5 trillion of notional outstandings.[18]

Table 6
NOTIONAL PRINCIPAL OF INTEREST RATE AND CURRENCY SWAPS WRITTEN ANNUALLY BY UNDERLYING AND OUTSTANDING
Billions of U.S. Dollars

Type of Swap	1987	1990	1991	1992	1993
Interest rate swaps					
U.S. dollar	287	676	926	1,336	1,546
Deutsche mark	22	106	103	237	399
Yen	32	137	194	428	789
Others	47	345	397	821	1,370
Subtotal	388	1,264	1,622	2,822	4,104
Currency swaps					
Dollar	38	65	122	106	109
Nondollar	48	148	206	196	186
Subtotal	86	213	328	302	295
Total swaps written	474	1,477	1,950	2,124	4,399
Total swaps outstanding (at year-end)	867	2,890	3,872	4,711	7,077

Source: International Swaps and Derivatives Association.

In addition, this figure does not take into account the various risk-management mechanisms that banks use to limit counterparty exposure. Bilateral contractual netting provisions, which allow banks to offset losses with gains from other contracts outstanding with a defaulting party and its corporate affiliates, are common. Moreover, when swaps are undertaken with lower quality parties, such counterparties are usually required to post collateral on a mark-to-market basis. After taking these risk-reducing mechanisms into account, the GAO report estimated the "net" credit exposure of the fourteen dealers to be only $68 billion, or about 1 percent of the notional value of their outstanding derivatives contracts.

Properly measured, therefore, banks' credit-risk exposures associated with their OTC derivatives activities do not seem out of proportion to their other credit exposures, such as the exposure they have to defaults on their loan portfolio.

This credit exposure is managed by banks in a variety of ways. Internal credit limits are commonly used to diversify credit risk and to restrict the size of exposures to individual counterparties, industries, and countries. Most counterparties in swap transactions are required to have investment grade ratings,[19] and credit "triggers" frequently require the automatic termination of a swap agreement if the credit rating of either party falls below a prespecified threshold (such as a single A rating).

To put banks' derivatives credit exposures in perspective, the derivatives exposures of bank derivatives dealers can be compared with credit exposures that the same banks face as a consequence of their loan portfolios.[20] For the seven largest U.S.-bank derivatives dealers, derivatives-related gross credit exposures as a percentage of bank equity were generally less than a fourth of their loan expo-

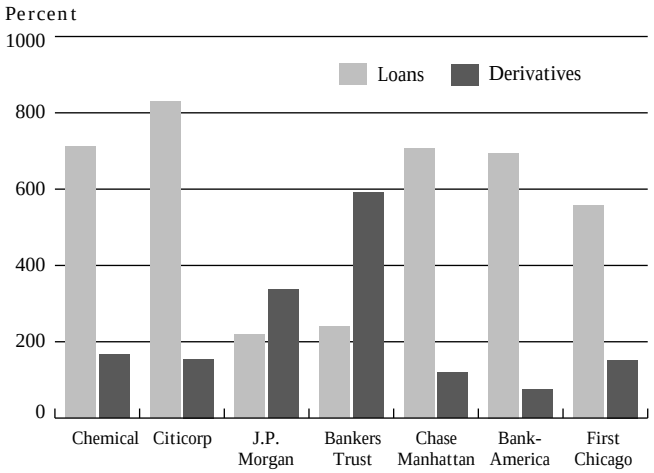
sures (Chart 11). Only Bankers Trust New York Corporation, which is probably the most active bank in derivatives markets, and J.P. Morgan had a gross derivatives credit exposure far in excess of their loan exposure. Although it is true that banks' credit exposure to derivatives is substantial—it exceeds 100 percent of the equity of all of the surveyed banks—a bank's capital would be wiped out by derivatives losses only if *all* counterparties were to default, there were no offsetting netting agreements or other risk-reduction mechanisms in force, and actual counterparty losses were identical to total credit exposures. Such assumptions are extreme, for loan defaults as well as for derivatives-related exposures.

Properly measured, therefore, banks' credit-risk exposures associated with their OTC derivatives activities do not seem out of proportion to their other credit exposures, such as the exposure they have to defaults on their loan portfolio. Banks also appear to be managing these derivatives-related exposures reasonably well. Indeed, the GAO reported that actual losses incurred by derivatives dealers as a result of counterparty defaults have been quite small: 0.2 percent of their combined gross credit exposure.[21]

Finally, derivatives activities can clearly be used by banks to increase their exposure to changes in interest rates and exchange rates—that is, to increase their market risk.

Chart 11

Credit Exposures from Derivatives and Loans of Seven U.S. Banks as a Percentage of Equity, 1994



Sources: Bank annual reports for 1994.

This kind of risk, however, is hardly new to banks. Banks have always been exposed to such risks because of their holdings of fixed-rate, long-term loans and securities, and because of their foreign operations and foreign currency positions. Derivatives can be used either to increase or decrease these risks. Consequently, like all other transactions that pose market risk, derivatives contracts must be managed prudently.

Regulation of Banks' Derivatives Activities

There has also been concern that banks may be taking excessive risk in their derivatives activities.[22] Indeed, the GAO report suggests that there may be an intrinsic regulatory problem associated with banks' dealing in OTC derivatives:

> The regulation of banks is essential, because they have deposit insurance and direct access to the Federal Reserve's discount window. At the same time, however, this combination of deposit insurance and access also can result in potential problems because it may induce the banks and their customers to inappropriately rely on such backing. Therefore, banks may be willing to run greater risks in their trading activities—in relation to their capital—than otherwise would be the case. In addition, market participants may prefer using banks for derivatives and related trading activities simply because banks are perceived to be safer counterparties. In the past, similar concerns caused us to recommend that nontraditional banking activities, such as those associated with underwriting and dealing in corporate debt and equity securities, be conducted only by well-managed and well-capitalized banks in separate subsidiaries of the bank holding company. Whether derivatives should be placed in this category depends on regulators' determinations on how they are being used by individual banks.[23]

An important question, therefore, is whether banks' derivatives activities are so different from other bank activities that they cannot be effectively regulated. Is there something special about derivatives that makes pru-

dential regulation to protect the federal deposit insurance fund and taxpayers more difficult or even impossible? A key issue is whether bank capital requirements, the central component of prudential regulation, can be successfully applied to banks' derivatives activities. If not, there may be an argument for either prohibiting derivatives activities (or possibly dealer activities) or segregating them into separately capitalized bank affiliates.[24]

Banks' derivatives activities are already subject to extensive prudential regulation. Both U.S. and Basle Accord capital requirements apply to U.S. banks' derivatives activities. U.S. banks are required to comply with two different types of capital requirements—a risk-based requirement and a leverage ratio requirement. The risk-based requirement applies to the credit risk associated with derivatives contracts or activities. The leverage ratio requires banks to hold capital as a cushion against losses arising from other risks associated with derivatives positions, such as operations risk. Not surprisingly, there is considerable controversy about whether these capital requirements are too low or too high.

The more important question, however, is whether *any* capital requirements on derivatives activities can successfully control banks' risk taking. Some argue that derivatives are so complex and so nontransparent that it is difficult for regulators to devise capital regulations to control banks' risk taking (or, for that matter, for the market to monitor banks' derivatives activities).

We are skeptical about this view. Although some derivatives instruments are undoubtedly complex, exposure to derivatives risk does not seem much different from exposure to many other bank activities, such as credit risk in a loan portfolio or interest rate risk in a variety of fixed-income securities. Banks can achieve high leverage in a number of ways other than through derivatives and can quickly change (or increase) their risk exposure in many different ways. While it is not clear how much capital should be required for a given derivatives risk exposure, these implementation problems are not unique to derivatives activities. All new bank activities are likely to present similar problems.

Thus, banks' recent push into derivatives activities raises all of the questions commonly raised when banks engage in new off-balance-sheet activities. Are these activities too risky for banks? Do banks have the managerial capacity to engage in these activities in a safe way? Can these activities be effectively regulated? The challenges posed by these questions are no different for derivatives than they are for other banking activities.

Implications for Policy

The decline of traditional banking presents a challenge to regulators and policymakers. On the one hand, banks may respond to their shrinking intermediary role and diminished profitability by taking greater risk, which, if unchecked, could undermine the stability of the banking system. There is some evidence that banks have in fact increased their risk taking, either by pursuing riskier strategies in their traditional business lines or by seeking out new and riskier activities. On the other hand, long-run financial stability would benefit from a restructuring of the banking industry that strengthens the competitive position of banks. Achieving this goal may require eliminating unnecessary (nonprudential) regulations and permitting banks to enter new markets and to engage in new activities.

One approach to achieving these dual objectives is to couple adequate capital requirements for banks with early corrective action by regulators to prevent capital from falling below specified levels.[25] Requiring banks to hold adequate capital promotes financial stability in two ways. First, it provides a greater cushion with which banks can absorb losses, lessening the likelihood of failure. Second, with more capital at risk, banks have less incentive to take excessive risk—they have more to lose if their bets go wrong. To ensure that banks hold the requisite amount of capital and do not engage in either excessively risky or illegal activities, supervision and field examinations of banks would continue to be necessary.[26] Requiring early corrective action by regulators to recapitalize a bank that has suffered an erosion in its capital promotes stability in three ways. First, it provides predictability for banks and bank shareholders. Certain regulatory actions predictably follow certain economic events. Second, it prevents a bank's capital from falling to levels that threaten losses to the bank insur-

ance fund. In addition, by requiring banks to maintain a positive net worth, it mitigates the moral hazard problem—banks will have something to lose by taking excessive risk. Lastly, early corrective action mitigates the regulatory forbearance problem by preventing regulators from using their discretion about whether or not to take action.[27]

A benefit of this regulatory strategy is that regulation need no longer restrict banks' activities. As long as banks must hold sufficient capital against whatever activities they engage in, taxpayers will be protected and banks will have an incentive to avoid excessive risk taking. Further, freedom to offer additional products and services will better enable banks to compete with nonbank competitors and with foreign banks, and will make banks less susceptible to failure because they will be better diversified. (An example of such diversification benefits is casualty insurance, where losses are due principally to acts of god and have a very low correlation with the losses that banks typically incur, which are due primarily to adverse economic events.)

Public disclosure of banks' risk exposures would increase market efficiency and bolster market discipline. Banks should provide a meaningful depiction of the risks associated with their trading activities, both in derivatives and in on-balance-sheet securities, and of their ability to manage these risks.

A key component of this approach is that bank risk exposures need to be measured accurately and capital requirements be set high enough to deter excessive risk taking. This requires, among other things, the adoption of market-value accounting principles for valuing bank assets and liabilities. Historical-cost accounting principles do not ensure that changes in the economic value of a bank's assets and liabilities will be reflected in its true net worth. It is the market value of a bank's assets and liabilities, together with the market value of its equity capital, that determines a bank's economic solvency. Further, the market value of a bank's net worth is what the bank risks when it takes additional risk.

Objections to market-value-based capital requirements center on the difficulty of making accurate market-value estimates of assets and liabilities. Historical-cost accounting has an important advantage in that it is easier to value assets and liabilities. Market-value accounting, in contrast, requires estimates and approximations that are harder to justify and are often more expensive to obtain. Despite these difficulties, market-value accounting may still be able to provide a more accurate picture of a bank's economic condition. Clearly, an important research topic for regulatory authorities is the feasibility of applying market-value accounting principles to banking institutions.

Adoption of market-value accounting would have the additional advantage of making a bank's condition more transparent and therefore making regulators and politicians more accountable. Regulators and politicians are subject to a principal-agent problem: they often have an incentive to hide potential problems, even though taxpayers would be better off if these problems were dealt with sooner rather than later (or not at all). Market-value accounting would make it easier for taxpayers to monitor the actions of regulators and politicians, and would make it more difficult for regulators to engage in policies of forbearance.

Another important component of a regulatory strategy to maintain bank soundness is supervisory monitoring. Regulation must be able to keep banks from changing their risk exposure after capital requirements are determined. Both this element of regulatory supervision and the need for early intervention have increased in importance of late because of the emergence of derivatives markets that make it easier for banks to quickly take large bets on interest rate and other asset price movements. As we have learned from the recent collapse of Barings, regulators must also ensure that adequate internal controls are in place with regard to asset quality and risk management procedures.

Finally, public disclosure of banks' risk exposures would increase market efficiency and bolster market discipline. Banks should provide a meaningful depiction of the risks associated with their trading activities, both in derivatives and in on-balance-sheet securities, and of their ability to manage these risks. More public information about the risks incurred by banks will better enable stockholders, creditors, and depositors to evaluate and monitor banks, and will act as a deterrent to excessive risk taking. This view is consistent with a recent discussion paper issued by the Euro-currency Standing Committee of the G-10 Central Banks (1994), which goes so far as to recommend that estimates of financial risk generated by firms' own internal risk management systems be adapted for public disclosure purposes.[28] Such information would supplement disclosures based on traditional accounting conventions by providing information about risk exposures and risk management that is not normally included in conventional balance sheet and income-statement reports.

CONCLUSION

The decline of traditional banking entails a risk to the financial system only if regulators fail to adapt their policies to the new financial environment that is emerging. A constructive regulatory approach is to adopt a system of structured bank capital requirements together with early corrective action by regulators. An important element of this system is the adoption of market-value accounting principles for all financial institutions. In addition, supervisory monitoring and greater public disclosure by all financial institutions of the risks associated with their trading activities would be beneficial. Lastly, to enhance the competitiveness and efficiency of financial markets, banks could be permitted to engage in a diversified array of both bank and nonbank products and services. This general regulatory strategy, we believe, can successfully keep in check excessive risk taking by banks while providing the flexibility for both banks and regulators to restructure the banking system to achieve greater long-term stability. Finally, we do not view banks' off-balance-sheet activities, including their derivatives activities, as a threat to financial stability. Properly used and regulated, derivatives can facilitate the management of risk and increase the long-term viability of banks and the financial system.

ENDNOTES

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2. Although many banks may be able to maintain their relative position as financial intermediaries by engaging in nontraditional banking activities, for policy purposes it is important to focus on the economic forces that have undercut the role of banking. Indeed, an important question is whether substantive public policy issues are raised by banks having to transform themselves into financial intermediaries that look more like nonbank financial intermediaries.

3. See also Edwards (l993).

4. Banks have also been engaged in the securitization process and, with the advent of higher bank capital requirements, have had greater incentives to move loans off balance sheet by securitizing them. Banks' involvement in the securitization process has been another contributing factor to the growth in their off-balance-sheet activities. Nevertheless, the basic point still stands: computer technology that can be used by nonbanking institutions to securitize assets has diminished the banks' competitive position.

5. U.S. banks have an incentive to take additional risk because of federal deposit insurance. Insured depositors have little incentive to monitor banks and to penalize them for taking too much risk. This moral hazard problem was compounded by our de facto "too-big-to-fail" policy for large banks. Although the 1991 Federal Deposit Insurance Corporation Improvement Act (FDICIA) has a least-cost resolution provision that makes it harder to bail out large depositors, there is an exception to the provision whereby a bank would be in effect declared too big to fail so that all depositors would be fully protected if a two-thirds majority of both the Board of Governors of the Federal Reserve System and the Directors of the Federal Deposit Insurance Corporation as well as the secretary of the Treasury agreed. Thus, the moral hazard problem created by the too-big-to-fail policy has been reduced but not entirely eliminated by the 1991 FDICIA legislation.

6. Note that some off-balance-sheet activities that produce fee income, such as loan commitments and letters of credit, can be classified as traditional banking business. The data in Chart 4 overstate somewhat nontraditional banking business.

7. As of the third quarter, l993, all insured commercial banks held interest rate swaps contracts with a notional value of $2.79 trillion. See Bank Administration Institute and McKinsey & Company, Inc. (1994, p. 5).

8. Federal Reserve call report (RC-L) data for U.S. banks for the first quarter of l992. See also U.S. General Accounting Office (1994, p. 182).

9. U.S. General Accounting Office (1994).

10. Salomon Brothers (1994, p. 8). Qualitative statements in the banks' annual reports suggest that much of their derivatives trading is customer-driven.

11. U.S. General Accounting Office (1994, p. 188, Appendix V, and p. l82, Appendix IV).

12. Salomon Brothers (1994, p. 9, Chart 5).

13. See Franklin R. Edwards (1994).

14. Remarks made on the floor of the House of Representatives, Congressional Record, June l8, l993, H 3322.

15. Mark Kollar (1994, p. 1, col. 2).

16. This amount includes interest rate and currency swaps plus caps, floors, collars, and swaptions outstanding. Equity, commodity, and multi-asset derivatives are not included. The latter totaled $131 billion at year-end l992, relative to a total of $4.7 trillion of swap contracts at year-end 1992. See Group of Thirty (1993, p. 58).

17. Measured at any point in time, credit risk exists only for counterparties with profitable positions. A losing counterparty has no credit risk. For example, assume that under an interest rate swap agreement, a firm receives fixed-interest payments and pays floating

ENDNOTES (*Continued*)

Note 17 Continued
rates. At the inception of this swap, the market value of the firm's position in the swap may be zero. If, subsequently, interest rates decline substantially, the firm will receive more than it will pay, so the firm will have a valuable or profitable position in the swap. This value, created by the change in interest rates, is the firm's replacement cost for the swap, and represents the credit risk to which it is exposed. If its counterparty defaults on future swap payments, the replacement cost is the cost to the firm of replacing the swap on the same favorable terms.

18. These include both swaps and forward contracts.

19. U.S. General Accounting Office (1994, p. 59, Table 3.1).

20. U.S. General Accounting Office (1994, pp. 54-55).

21. U.S. General Accounting Office (1994, p. 55).

22. For a review of the current regulation of banks' derivatives activities, see U.S. General Accounting Office (1994, pp. 69-84).

23. U.S. General Accounting Office (1994, p. 125).

24. Alternatively, there may be an argument for some form of "narrow banking," where the deposit-taking function of the bank is separated from other bank activities, such as derivatives activities.

25. This approach is discussed extensively in Benston and Kaufman (1988), elements of which are in the 1991 FDICIA act.

26. As Gorton and Rosen (1994) point out, corporate control (agency) issues may also contribute to excessive risk taking when traditional banking business declines. Thus, steps to control this agency problem may also be needed to control risk taking. What form these steps should take requires additional research and is beyond the scope of this paper.

27. As capital declined below certain "trigger" levels, for example, regulatory authorities would be required to take specific actions, such as restricting the ability of the bank to expand and preventing the bank from paying dividends and interest on subordinated debentures.

28. See also the Federal Reserve Bank of New York (1994), which is a companion piece to the Euro-currency Standing Committee's report.

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June 1995.

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In the Japanese yen futures pit, dual traders also obtain superior prices on their own trades, compared with customers. But they do not provide superior execution for their customers. These differences in dual traders' behavior in the two contracts appear to be related to whether dual traders can profit from private information on their customers' order flow. In the S&P 500 futures, dual traders profit by piggybacking on their customers' trades, which does not happen in the Japanese yen futures. Finally, dual traders do not appear to be involved in frontrunning.

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