Volume Title: Risk and Capital Adequacy in Commercial Banks

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Volume Publisher: University of Chicago Press

Volume ISBN: 0-226-50281-3 (cloth); 0-226-50282-1 (paper)

Volume URL: http://www.nber.org/books/mais81-1

Conference Date:

Publication Date: 1981

Chapter Title: Introduction to "Risk and Capital Adequacy in Commercial Banks"

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Chapter URL: http://www.nber.org/chapters/c13519

Chapter pages in book: (p. 1 - 16)

1 Introduction

During the 1970s, financial markets became more volatile, more competitive, and riskier. The Depository Institutions Deregulation Act of 1980 marked a major forward step toward still greater competition. In the minds of financial managers, it greatly increased the amount of uncertainty about the future and made it harder to choose wisely among operating policies. The act was merely one more factor adding to the complexity of decisions required from both managers and regulators. Risks of failure multiplied. The march of events appeared to demand rapid improvement in the techniques of analysis if latent difficulties were to be found and removed and new ones avoided.

The studies in this volume apply modern financial analysis to problems facing banks, especially the analysis derived from the theories of portfolio risk. They utilize recent developments from other spheres in order to improve decision-making by banks and the public. Particular emphasis is placed on measurements of risk and capital adequacy.[1] With more objective evaluations and a better understanding of potential trade-offs, unnecessary risks can be avoided, other risks can be reduced, and bank capital will not be wasted.

Other issues analyzed in this volume concern the degree to which the regulatory system can be improved and controls reduced. If the price-market system is given a greater role in determining the types and amounts of loans and investments that banks can make and the liabilities they can offer, efficiency can be improved. Opportunities exist to directly reduce examination and regulatory costs. Still more important are potential steps to improve bank decisions by allowing them to follow more closely market logic and developments rather than government rules and regulations.

1. Later chapters define in specific detail the technical terms found in the Introduction.

Portfolio theory shows that the risk that an institution will fail depends on the relationship between its economic net worth and the volatility of its portfolio returns which depend on its assets, liabilities, commitments, and operating costs. Difficulties arise because many future movements in asset returns as well as in the costs of liabilities cannot be accurately predicted. They depend on future events, such as inflation, monetary policy, the level of interest rates, and changes in the gross national product (GNP).

Financial markets appear to be efficient in using available information to predict the expected levels of returns and of asset values. However, because of happenings that are unexpected and unplanned for, such a prediction is only one element in a broad distribution of possible outcomes. The eventual results and accompanying gains or losses depend on events outside the control of the individual institution.

The most frequent cause of losses and insolvency of financial institutions is their failure to plan adequately for events that may occur but are not expected. Banks become insolvent when, wittingly or unwittingly, they concentrate too many of their loans, investments, or activities in areas where unanticipated events are likely to cause losses that move together and may be substantial. Possibilities of high profits blind them to their portfolio risks.

This volume analyzes four major approaches that firms can take to find and reduce risks.

1. Most vital is the need to diversify assets and liabilities so that the impact of unexpected events will not be overwhelming. In several cases of large losses, banks appear to have underestimated the probability of wide interest swings. Increases in interest rates cause heavy losses in the value of portfolios that contain loans, securities, and liabilities with an average maturity that is long. But a similar lack of diversification may occur by concentrating loans within a single industry, in a particular location, in foreign markets, or by making off-balance-sheet commitments.

2. The risks from nondiversification or from unforeseen events can be measured by estimating the probability distributions of possible outcomes around those that are predicted. The larger the share of such distribution that lies far below expected outcomes, the greater the danger. Knowledge of such perils can be used by an institution to reduce the total level of its risks of losses to an acceptable level.

3. As an alternative, capital can be increased so that it is sufficient to absorb any losses likely to occur with a specific probability (see chap. 8). In fact, one definition of adequate capital is the amount required to assure that the probabilities of future insolvency are reduced below a predetermined level.

4. From the public point of view, the danger that depositors or those who lend to an institution will lose their funds when an institution fails can be eliminated by insurance. A third party can guarantee the depositors

against loss. Such insurance is provided to many depositors by the Federal Deposit Insurance Corporation (FDIC) and similar federal agencies for the savings and loan and credit union industries. Our analysis asks how these organizations can be certain that the rates they charge are "fair"; that is, that premiums cover exactly the risks of loss they assume from an institution. Of special interest is the degree to which insurers can minimize their regulatory requirements while still protecting themselves against the assumption by individual firms of undue risks at the insurer's expense.

1.1 Risks and Regulations

During the 1970s, banks assumed many more risks than they had assumed in previous decades. The increased danger becomes evident when we examine changes in bank portfolios and consider the number of large banks that failed or required assistance from the FDIC. Between 1935 and 1970, no large bank became insolvent. The largest bank to fail had assets of $40 million. After 1970, the size of banks requiring assistance grew. More than twenty banks with assets of over $50 million failed. The bail-out of First Pennsylvania Bank, with over $8.4 billion in assets, by the FDIC in April 1980 raised the total assets of banks requiring assistance to over $20 billion.

During the 1970s, attacks on the government's role in the banking industry multiplied. Greater attention was given to the possible deleterious effect of government regulations. One result of this steady pressure against government regulation of financial institutions was the Deregulation Act of 1980. It brought about fears of additional failures, especially among thrift institutions.

1.1.1 Added Risks

Several of the studies for this volume show that the degree of risk assumed by banks went up rapidly. Chapters 4, 5, and 16 all present such evidence. The ratio of loans to deposits grew even as the ratio of capital to assets fell. The percentage of risky assets climbed. Traditional measures of liquidity showed declines as liability management led to the borrowing of large sums at market interest rates for extremely short periods. By the end of 1979, the largest bank holding companies reported managed liabilities (money purchased in the short-term market) equal to more than 80 percent of earning assets. The ability to retain such funds can shift rapidly. As an example, Franklin National Bank, one of the largest to close, was forced over the brink into bankruptcy when over $2 billion of such money—60 percent of its liabilities—fled in less than four months.

Book equity capital as a percentage of total assets also fell. From a ratio of 8.1 percent in 1960, it had fallen by 1970 to 6.6 percent, and it stood at 5.7 percent in 1979 (Federal Financial Institutions Examination Council

1980). The ratio of capital to assets dropped faster and further among large banks. In 1979, the five largest bank holding companies had a ratio below 3.75 percent.

These data on capital are those reported in the traditional accounting statements of the banks. These statements fail to reflect actual changes in values. Examination of balance sheets, confirmed by the changes in value shown by movements in the price of bank stocks, reveals a much larger drop in net worth. Chapters 3 and 5 discuss measurements of bank capital. The published reports do not include the values of intangibles or losses in asset values. An independent estimate of movements in net worth can be obtained by dividing the market value of a bank's equity by the amount reported on its books. A consistent record of these market-to-book ratios is available for ninety-eight large bank holding companies on the COMPUSTAT tapes (see chap. 5).

For the three years 1971–73, these data show that the average market value of bank equity was 25 percent above that reported. The stock market apparently judged that intangible assets—such as the value of deposits, location, and information—had value beyond that shown on the books. In contrast, for the three years 1977–79, the market valued the average bank at only two-thirds of its book value. Asset values fell as a result of rising interest rates. Since these losses were not recorded, most banks showed assets at well above their true values. Book values were also overstated because they failed to account for other problems, such as a higher ratio of poor loans and the threat of more competition accompanying deregulation.

Another source of increases in risk is found in the growing proportion of bank assets held abroad and the greater share of bank earnings arising from foreign operations. In 1970, 6.5 percent of the assets of United States banks were foreign. By 1979 this ratio had risen to over 17.2 percent. The five largest bank holding companies reported that in 1979 more than half their net income came from foreign operations. In addition to increased foreign risks, most large banking companies expanded into a number of nonbanking activities, many of which carried greater dangers of losses.

1.1.2 Rules and Regulations

During the 1970s, dissatisfaction with the methods of examining and regulating financial institutions mounted. It was claimed that the existing regulatory system was partly to blame for the poor record of the economy in saving and capital investment. Financial institutions play a major role in capital formation and distribution. They assert that their efficiency, proper choice of investments, and decision-making have been seriously hampered by the arbitrary regulations over investments, expansion, and required capital imposed on them by regulators ignorant of the facts and

using inadequate theories and understanding of how institutions control risks (Vojta 1973).

Existing regulations and the bank examination system attempt to control capital, liquidity, diversification, and risks while promoting sound management. However, controls are based on tradition, industry norms, and subjective evaluations. How to measure risks and what constitutes adequate capital have not been formulated in objective terms. It is unclear whether the decline in the ratio of capital to assets was due to market forces or to weaknesses in the regulatory system. In critical cases, problem banks have ignored regulatory constraints because suggestions for change could not be formulated in an enforceable manner.

Yet the need for some regulation is widely recognized. Without regulation, an undue percentage of financial institutions are likely to take excessive risks. Because of the large amount of leverage, the difficulty of depositors' policing risk levels, the high cost of information, and the number of small, uninformed depositors, an institution can profit by raising its risk ratio. Moral hazards are also high; it is hard to protect against conflicts of interest and self-dealing.

The regulations also aim at halting excessive instability in the money supply. In the past such instability led to severe contractions in jobs, production, and general economic activity. General agreement exists that decided advantages accrue to the public welfare if depositors, borrowers, and check recipients can be assured that individual financial institutions are sound (Merton 1979; Edwards and Scott 1979). Such assurance can be given in various ways, such as by requiring deposit insurance, by restricting risks assumed by the institutions to low levels, or by requiring capital adequate to absorb potential losses.

Different techniques are available to assure a proper degree of solvency and soundness. The problem is to make certain that the techniques adopted involve minimum interference in efficient operations of individual firms and financial markets as a whole. Efficient operations require improved estimates of the risks of loss and insolvency that firms assume as a result of their particular operations. There must also be better estimates of the amount of capital available to absorb these potential losses.

The introduction of federal deposit insurance was a major reform. It reduced fear among depositors, ended bank runs, and strengthened the stability of the economy. It also potentially increases competition and choice among borrowers and lenders by making entry easier. Depositors do not have to seek size to ensure the safety of their claims.

However, the existing system contains several actual and potential flaws. Because insurance premiums are fixed and flat at all levels of risk or capital adequacy, bank managers and stockholders can profit by increasing their risks at the expense of the FDIC and uninsured depositors. As a result, to curtail excessive risks, detailed regulations and examinations

are necessary. Many observers believe it would be more efficient to protect the public by greater use of the market and through insurance properly priced to reflect risks rather than through regulations (Scott and Mayer 1971; Barnett 1976*b*).

Another potential danger is the ambiguous position of uninsured depositors. Those in large banks have been insured de facto, while those in small banks have suffered losses. Moreover, since protection is not a matter of law, in critical periods all banks may become suspect. Unless changes are made, the future may witness major runs, together with all the problems the deposit insurance is supposed to avoid. Even if such a point is not reached, fear may bring about concentration of funds in only a few large banks, causing critical problems for the smaller banks.

It is also claimed that the system penalizes the well-managed bank. Poor managers are protected by the umbrella of the FDIC. Only in extreme situations will the stockholders and management be forced into bankruptcy. In most cases the FDIC helps bail them out of bad decisions. Many banks have been carried for long periods by the forbearance of the FDIC. When the economy was shaken in 1973, 1974, and 1980, a number of banks, including several large ones, turned out to have assumed excessive risks. The examination process did not protect the public against poor or unscrupulous management.

1.2 The Risk of Insolvency

At the beginning of any period, a bank has a certain distribution of assets, liabilities, commitments, and operating procedures. In economic terms, it has capital and reserves equal to the difference between the market value of its assets and its liabilities. It expects to earn a certain income during the course of the year and to make payments against its liabilities. At the start of the period, its income and the amounts that will be due to others can only be estimated. Their expected values and the probability that unpredicted events will cause shortfalls from these values depend on how the firm selects its assets, on its operations, and on movements in the economy. By the end of the period, unanticipated events are likely to lead to results far different from those projected.

The risk that a bank will become insolvent depends on the level of expected income and payments from it, the probable variance of this income, and its initial capital. The bank will become insolvent if events cause its income to be so negative as to more than offset its initial capital plus any contributions less any dividends paid during the year. The amount of risk depends both on the probability of insolvency caused by negative movements in income compared with initial capital and reserves and on the amount required to make depositors, lenders, and investors whole if insolvency occurs.

Income during the year is total economic income. It is not simply net earnings as reported on the books. To net book earnings must be added capital gains or losses in asset values. The two together make up economic income or total return. Risk measurement requires consideration of the firm's economic income and economic balance sheet.

1.2.1 Changes in Values

The value of a firm at any time equals the discounted expected future cash flows from both its assets and its liabilities. This value, and therefore the firm's income, will vary from initial expectations for a variety of reasons. We can conveniently divide potential changes into those affecting the value of existing assets and liabilities, which we call wealth effects, and those occurring as a result of operations during the year, spoken of as operating or income effects.

Wealth effects are changes that result from alterations in the rates of discount applied to currently scheduled cash flows. At the beginning of a year, a bank's assets and liabilities have an expected cash flow that accords with the particular portfolio selected. This cash flow will depend on promised interest payments, operating costs, expected defaults, expectations of delayed payments, and the time profile of expected amortization and principal payments.

The economic worth of a bank depends on the rate at which the cash flow is discounted to obtain its present value. Each class of positive or negative flows is discounted at a separate rate. The particular rate applicable to each class of asset or liability depends upon:

1. The costs and expected defaults of each activity. Thus the rate of interest charged on consumer loans is far higher than that on loans to brokers because handling costs and losses are greater. Such differences are adjusted for in calculating present values.
2. The flows from some activities are less predictable than others. The uncertainty risk must be paid for by a larger discount factor.
3. Normally, discount rates are higher the further into the future is the timing of the expected flow. Such differences among periods can be measured by discount factors provided by the term structure of interest rates on default-free assets.

Between any two evaluations, the discount rates applicable to each activity can shift because of a change in the values of any of these three factors—margins between gross and net interest, uncertainty or risk premiums, and the term structure of interest rates. If discount rates rise, the wealth or present value of a portfolio falls.

Operating or income effects on the bank's value result from changes in the portfolio made during the course of a period's operations and from changes in the scheduled cash flows from the assets or liabilities or from other types of operations, such as foreign exchange trading. New or

refinanced loans or investments will have different expected returns and risks than will those in the original portfolio. Depending on what is happening in the market, loan payments may be speeded up or delayed. Commitments may be taken down unexpectedly. Deposits may flow out or in. The firm may drastically alter its overhead or its type of activities. Some operating results can be anticipated, but many will be unexpected.

Some of the risks in this category are those of liquidity management, including that from disintermediation and commitments, and critical shifts in operations. If interest rates rise, the firm may experience an unexpected takedown of commitments, a failure to repay loans, a shrinking of sources of lower-cost funds. It may have to liquidate some assets, incurring transactions costs. Any of these factors can lead to a sharp change in income and total returns.

1.2.2 Net Worth

The value of a bank can shift between two periods because operations change income and outgo and also reshuffle future expected cash flows. At the same time, movements in the discount factors alter the present value of these future flows. Bank records and balance sheets often fail to record such actual changes in the values of assets and liabilities. If interest rates rise and the present value of a government bond drops from $10,000 to $9,000, the books continue to show it valued at its initial cost. In such cases, footnotes to balance sheets may show both book and market values of securities.

The shifting discounts also alter values of loans and other assets, as well as those of deposits and other liabilities and of intangibles not shown on the books. The effect of these shifts in discount rates and expected cash flows must be accounted for in calculating the bank's actual capital available to offset risks in case total returns become negative. Risks are reduced by actual net worth, not the net worth shown on the books.

1.3 The Rescue of the First Pennsylvania Bank

Chapter 5 presents a brief study of the rescue of the First Pennsylvania Corporation by an assistance package from the FDIC, aided by a group of large banks.[2] This case appears to document both the theoretical and the empirical analysis contained in this volume. Insolvency among large banks develops primarily when they assume nondiversified risks too large in comparison with their economic net worth. In this case, as in most cases, interest rate risks are most significant. I include the facts and conclusions from this case in this introduction because they illustrate so

2. The data and conclusions are drawn from the corporation's annual reports, not from examination or other data.

well the major points of our work. Only rarely is it possible to find, as we did in this instance, after results had been published, an example that embodies so completely all the dangers the study warned against.

The record reveals an organization that, as a result of the specific policy choices it made, began taking high risks in the early 1970s. The bank's earnings as a result of these policies were poor, but not disastrous. But, as the decade progressed, this policy of high risk-taking was not altered even as dangers grew in the economy. The amount of portfolio risk assumed by the bank continued to expand rapidly. Between December 1978 and December 1979, a time when most observers were warning against emerging dangers from possible large fluctuations in interest rates and in the economy, the bank actively increased the risk in its portfolio.

On 28 April 1980, the FDIC announced a special assistance program. It would lend $325,000,000—with no interest rate for the first year and below-market rates for the next four years—to First Pennsylvania Bank. According to the FDIC, the loan was made to prevent the bank from closing, following a finding that its continued operation was essential to provide adequate banking service in the community.

First Pennsylvania National Bank is a successor to the first private bank established in the United States in 1782. At the end of 1979, it was the twenty-third largest bank in the United States, with over $8.4 billion in assets.

1.3.1 Increasing Risks

Tables 5.5, 5.6, and 5.7 detail the steady increase in the risks assumed by First Pennsylvania Corporation between 1967 and 1979. At the start of the period, book equity equaled 8.7 percent of net earning assets. At the end, the ratio was 4.2 percent. Using stock market values for equities, the ratio was 16.6 percent in 1967 and fell to 1.6 percent by 1979.

Neither the constant fall in the ratio of net worth to assets nor regulatory pressure stopped the bank from assuming ever larger portfolio risks. The share of earning assets financed by managed (interest-sensitive) liabilities was 26 percent in 1967. It rose steadily to 74.9 percent in 1979. The bank increased its earning assets by over 400 percent during this period, while its demand and savings deposits rose about 40 percent. Less than 10 percent of its rapid growth was funded by these more stable deposits. Risks were augmented by active trading in securities and mortgages. As interest rates rose during the decade, net operating earnings before loan losses of the bank declined. At the same time, earnings became more variable.

Similar risk-taking appeared in the corporation's loan portfolio. The bank was at the upper extreme of risks among banks, as evidenced by the share of loans in its portfolio and the high gross earnings from the portfolio. Until 1973, the stock market welcomed the increased risk and

high leverage; the corporation's common stock sold at unusually high multiples for its earnings and book equity. But by 1974 the risks caught up. An upward shift occurred in the level of loan losses. An especially large increase in loan loss provisions was made for 1975 and 1976, while net charge-offs expanded greatly in 1976. At the same time, higher interest rates on its liabilities plus poor performance and failures to pay some loans by borrowers led to a fall in operating earnings.

Chapters 4 and 5 show that operating and loan losses are not likely to cause insolvency unless a bank also has a low initial capital and the losses are augmented by losses from high interest rate risks. First Pennsylvania seems to confirm these results.

Our analysis shows that a prior period's net earnings after loan losses are the best predictor of the next period's expected earnings. But unexpected events will cause earnings to rise above or fall below expectations. A drop in earnings will be fatal to a firm only if the unanticipated results cause earnings negative enough to wipe out all capital and reserves as well as claims against prior taxes.

Before 1980, the largest earning declines for First Pennsylvania occurred in 1976 and 1979. In 1976, predicted net earnings (using actual loan charge-offs) were expected to be 0.55 percent of earning assets. Instead, the bank experienced negative earnings of 0.04 percent before taxes but after loan losses. Such a shortfall of 0.59 percent should be considered probable, given past variations. In 1979 the drop was from predictable earnings of 0.55 percent to an actual rate of 0.10 percent. If loan loss provisions are used instead of actual loan charge-offs, the size of unexpected changes is about the same, but the timing varies somewhat. Despite these unpredicted declines, the bank reported book earnings after tax credits of $18 million in 1975 and $16 million in 1979.

The first six months of 1980 again witnessed a shortfall from expectations. But predictable earnings after loan losses, based on the 1979 results, were only 0.10 percent of earning assets. Instead of a small earnings, the company reported losses at an annual rate of 0.80 percent. This drop of 0.90 below expectations was nearly twice that of any decline the bank had experienced in the previous decade. (The loss is probably overstated, since the bank almost certainly took the opportunity of its unusual situation to write off more loans than usual.) Even so, the data in chapter 4 show that a fall of 0.90 percent is probable under adverse economic conditions. Managers and regulators should recognize the potential volatility of earnings and plan to absorb such unpredictable swings through maintaining adequate capital. In fact, the book capital shown by the bank at the start of 1980 was over $350 million—far more than ample to absorb the reported operating loss of $30 million, but as we shall see the reported total was misleading.

1.3.2 Interest Rate Risk

The analysis in this volume indicates that the greatest danger to financial institutions arises from interest rate risks, principally borrowing short and lending long. Again, the First Pennsylvania case tends to confirm this analysis. Interest rate risk depends on the net difference in the maturity (more correctly, duration) of a bank's assets and liabilities. The longer the average maturity of the assets, the larger will be the fall in their value if interest rates rise. Effects of higher interest rates show up partly through a decline in net operating income, as payments on liabilities rise faster than income from assets. More important, however, are drops in capital values owing to the market's projection of future rates.

Table 5.7 shows a rise in the share of securities in the bank's assets between 1975 and 1979. At the same time, the average maturity of the investment portfolio nearly doubled. The bank obviously sought higher interest rate risks, probably on the assumption that it could beat the market. In 1979 the average maturity of securities held by the bank was over ten years—a period at least twice as long as the maturity of the average bank's security portfolio.

The total maturity of all assets is determined by the composition of the loan portfolio and the amount of short-term assets in addition to holdings of securities. The maturity (duration) of the assets other than securities is difficult to estimate. It depends on the maturity for which loans are written, on the frequency and the amount by which interest rates can be varied, and on the probability that borrowers will be able to meet contractual terms. Even though other assets in First Pennsylvania were worth four times as much as the investments in securities, it appears probable that the interest rate risk for all the other assets combined was less than that for the securities alone. As a rough guess, despite their much larger size, their total change in value owing to movements in interest rates may have been only 25 to 100 percent of that experienced by the investment portfolio. According to this guesstimate, the effect of a 1 percent change in interest rates on the bank's wealth would be from 1.25 to 2.0 times the effect from the portfolio of securities alone.

1.3.3 Net Worth

At the start of 1980, the book value of the bank's equity was reported as $350 million. However, a footnote to the balance sheet showed that the market value of its securities was $191 million below the amount at which they were carried on the books. If we use ratios of 1.25 and 2.00 to account for similar effects on the remainder of the portfolio, we can estimate that the published balance sheet overstated tangible assets by from $238 to $382 million. Intangibles probably would add somewhat to net worth, though how much is uncertain.

According to these calculations, actual net worth was somewhere between a negative number and $160 million. The percentage available to cover risks of losses was between a negative ratio and 2 percent of earning assets. On 31 December 1979 the stock market valued the bank's equity at $136 million.

1.3.4 Changes in the First Quarter of 1980

At the end of the first quarter of 1980, First Pennsylvania reported a loss in net earnings, after a provision for loan losses and taxes, of $5 million. In addition, it reported net losses from sales of securities of $1.4 million. Neither of these sums would amount to much if the bank had actually had the $350 million of net worth shown on its balance sheet.

However, during this period interest rates on United States government securities rose between 20 and 30 percent. Risk premiums increased, and mortgage prepayments slowed. These forces caused a further drop in the net worth of First Pennsylvania's securities portfolio of up to $150 million. The widened gap between the market and the book value of the securities portfolio alone should have been sufficient to wipe out any net worth the bank might have had at the beginning of the year.

The reaction of uninsured depositors and lenders to these developments seems slower than might have been expected. Perhaps they failed to recognize the increased danger that they would not be repaid in full. Perhaps they reasoned—correctly—that the FDIC would bail them out. In any case, starting in March, a steady withdrawal of funds held in the bank by uninsured depositors got under way. With it came a spate of rumors that the bank was in trouble. The outflow accelerated. By 23 April the bank was borrowing over $600 million from the Federal Reserve. Rather than declaring the bank insolvent, the FDIC mounted a rescue operation to allow the bank to remain in operation.

In this example, the bank assumed substantial portfolio risks out of proportion to its economic capital. Although the interest rate movements that occurred were large, they were not improbable in view of interest rate history. Given a situation of inadequate capital, economic events—not unexpectedly—brought about a need for the FDIC rescue.

1.4 What Can Be Learned?

This volume presents theories that explain how risks arise and how they are measured. The theories are based on simplifying assumptions. When institutions and markets are examined, coincidence between facts and many of the assumptions is good. Still, care must be exercised in applying the results. Adjustments may lag. Significant variables may be omitted. Information and transaction costs may be high. Existing regula-

tions are important in shaping what happens. However, despite these problems, the approach and the empirical data of this volume do serve to increase greatly our knowledge of the measurement of capital adequacy. The techniques developed are capable of further development and refinement.

One may hope that improved applications of modern theories and better analysis of risk and capital can serve multiple purposes. Of primary importance is better decision-making within banks. Capital is scarce and should be used where needed. Although banks have specialized for centuries in the analysis of risk, current developments constantly raise new questions. The concept of what a bank is and does continually changes.

Our large banks are no longer local institutions specializing in loans to business. The scope of their activities has expanded in all dimensions. Thus markets are regional, national, and international. With bank holding companies and Edge Act corporations, their geographical and industrial range expands. Competition increases from other institutions and from other markets. Liabilities are no longer accepted passively or merely as a result of marketing programs. They are actively bought and managed. Interest rates fluctuate through far wider ranges. Old established corporations such as Penn Central or W. T. Grant become insolvent. New industries such as real estate investment trusts appear like a wave of the future but lead, instead, to serious losses for the banks. Large brokerage firms fail. Foreign governments collapse under economic strain or revolution.

Traditional concepts of both credit and liquidity risks require reexamination. The role of capital and its measurement become more critical as the amount available in banks falls. Many bankers welcome the idea of leaving behind the security of diminished competition within a wall of government regulations. Others are comfortable in what they are doing. They fear change even though it may be inevitable.

The analysis in this volume builds a better base for understanding what is happening and where it may lead. It attempts to throw light on why risks occur; how the danger to banks can be reduced; and how managers and owners can better measure the risks they are accepting so that they can be properly weighed against potential gains.

Just as important as better firm decisions is knowledge of how to improve our regulatory system. While some regulation is necessary, critical questions arise as to how much and of what type. Our current system is complex and expensive. The major costs are not those found in the budgets of the regulatory agencies, but rather the costs to the economy as a whole.

There are clear indications that existing regulations reduce productivity and raise the costs of borrowing and lending. Many feel that regula-

tions are a dead hand that constrains the efficient operations both of banks and our total financial system.

Some costs seem obvious. Competition is reduced. The wastes of nonprice competition proliferate. The distribution of income from intermediation is not in accordance with market forces. The hidden costs may be even more important. How far are day-to-day decisions of bankers warped by a failure of regulations and the examination process to stay abreast of current developments? Is there any reason to believe that regulations can keep up? The general philosophy of our economy holds that gains and losses are necessary to keep managements alert and abreast of events. Lacking the discipline or information of the market, regulators will always lag behind in knowledge of what is happening. Such lags can be costly. They can also lead to evasion or to elaborate efforts by banks to reshape operations around the constraints of the regulations.

If one grants that regulatory agencies serve a necessary function, then we must strive to improve their operations. How can recent theoretical developments aid their decision-making? Are we at a point where the amount of detailed controls can be reduced? Even if there is no major alteration in techniques, a better understanding of risk and capital can reduce the fear of disaster, which is the primary justification for many existing regulatory features. Those who support existing restrictions rarely compare costs and benefits.

A major difficulty with existing regulations is that they are primarily subjective. In important cases, the regulations do not work. They depend upon banks' agreeing with the judgment of the regulators. Because decisions are subjective, they are extremely difficult to enforce in court. Even with increased powers from the right to issue cease and desist orders, banks that choose to be obdurate can hold off corrective actions until it is too late.

One of the purposes of these studies is to introduce more objective standards. They show that risk can be measured and, within limits, priced. Systems can be established with clearer rules, understandable to all. While advantageous, it is not necessary that measurements be exact. The reduction of uncertainty and an increased ability to base judgments on a firmer foundation can lead to decided improvements.

1.4.1 The Need to Prepare for the Unpredictable

Traditional management and examination processes properly emphasize risks from lack of liquidity, credit, and diversification. They examine capital, growth, and management. Studies for early warning systems designed to identify banks likely to fail, as well as the studies made for this book, confirm that these are critical variables. What has usually not been as clear is the magnitude of specific dangers and the cost of corrective actions.

There seems to be too much emphasis on retrospective concepts. Dangers to banks are less likely to arise from known types of dangers. While some bankers may be ignorant or stupid, clearly the vast majority are not. Regulations should be shaped so as to optimize the behavior of the great bulk of the industry, not to make the many suffer for the mistakes of the few.

On the whole, anticipated risks carry market premiums. Banks can choose higher-risk investments and expect to be paid for their choice. Over a period, however, they will not make large or unusual gains from selecting known high-risk investments. The market as a whole can bear risks well and therefore pays premiums primarily for nondiversifiable risks. Profits will not increase simply because more risks are taken. At the opposite extreme, faulty choice of activities or inept management may bring about losses. Revenues from poorly selected operations will fall below expenses. Such losses show up as low overall earnings, as a decrease in actual capital, and as a low level of expected net worth. If they are not corrected, insolvency will follow.

Major dangers to banks are more likely to arise from unanticipated changes. Movements of interest rates, of reserves, of output, and of international events cause vast swings around expected returns. It is the knowledge that these swings will occur and will at times be large that forms the key to avoiding bankruptcy. The emphasis on examinations and expected defaults in categories of loans is useful for pricing and in planning for small portfolios, but too often the danger of macroevents has been neglected. As in the case of the First Pennsylvania, too high a risk from unpredictable movements has been accepted.

To measure the dangers of unpredictable events, we need to estimate the probable distribution of returns about their expected value. Later chapters discuss the difficulties of such measurements. They also present examples of how such estimates can be made, as well as giving orders of magnitude for various risks.

The danger of insolvency for portfolios with specific volatilities can be reduced to a given level by the inclusion of adequate capital. The discussion that follows shows the relationship between volatility, net worth, and risks. It demonstrates how these relationships can be measured. One particular measure is the insurance premium, fair to both the insurer and the insured, needed to cover portfolios containing specific levels of volatility and capital.

A key point that emerges is that the probability distributions for unpredictable events can be estimated. When a bank selects its assets, liabilities, commitments, and operations, it determines both the level of expected returns and the chances that losses will occur. It cannot know with certainty what results will be achieved, but it can minimize its probability of bankruptcy by making sure that the risks it assumes do not exceed the capacity of its economic capital to absorb possible losses.

1.5 The Structure of This Volume

This book is divided into two parts that are distinct in content and exposition. Part 1, consisting of chapters 2 through 7, summarizes the bulk of the study of capital adequacy. These chapters explain the theory and measurement of capital adequacy. They show how the risks of insolvency can be calculated, and they discuss measures of portfolio variances and net worth. They give some general background on capital in the regulatory process and suggest how the deposit insurance process might improve its use of market information.

Part 1 generalizes and draws upon the detailed studies contained in part 2 as well as upon a number of other studies conducted as part of the overall project. It discusses results in a less technical manner, to make knowledge of capital adequacy available to a wider readership.

Part 2 consists of some of the special studies performed for the project. They were sponsored by the National Bureau of Economic Research and funded by the National Science Foundation. These studies contain material at different levels of technical difficulty. They are included because they break important new ground in the development of the theory of capital adequacy and the measurement of portfolio risks in financial institutions.

I The Theory and Measurement of Risk and Capital Adequacy