

***B*anks' Responses to Binding Regulatory Capital Requirements**

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In recent years bank regulators have increased their focus on the adequacy of banking organizations' capital ratios.¹ The increased emphasis on capital regulation raises a number of interrelated questions. Is focusing on capital an efficient way to regulate banks? What is the best way to structure capital regulations? How do banks respond to different types of capital regulations? And what are the costs and benefits to banks of different ways of meeting capital regulations? This article focuses on the last two questions, examining banks' responses, and the costs associated with their responses, to capital regulations employed since the early 1980s.²

Understanding banks' responses to capital regulations may be helpful in designing regulations that meet regulators' objectives. One objective of capital regulation has been to reduce the number of bank failures. Equity capital provides a cushion to absorb losses that would otherwise cause a bank to fail. Regulators have considered preventing failure an important goal at least in part because of concern that one bank's failure may adversely affect the stability of other financial institutions.³ Another objective has been to reduce the losses to depositors and the deposit insurer when a bank fails. Both equity and debt subordinated to depositors provide a cushion to reduce the losses to depositors and the deposit insurer in the event of failure. Regulators are especially sensitive to deposit insurance losses because the government not only provides insurance through formal programs such as the Federal Deposit Insurance Corporation (FDIC) but also, in the absence of de jure coverage, has historically been the insurer of last resort.

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While U.S. bank regulators have been refining their approach to capital regulation since the early 1980s (see Table 1), this is not to say that they were previously uninterested in banks' capital levels. During the 1970s regulators were concerned about capital, but there were no regulations that specified minimum capital ratios. At the beginning of the 1980s regulators became dissatisfied with many banks' capital ratios, especially those of the larger banking organizations.⁴ As a result, U.S. regulators specified minimum numerical capital-to-asset ratios for almost all banks in 1981; the remaining banks were required to raise their capital-to-asset ratios and were brought under numerical standards in 1983.⁵

The banking industry increased its capital ratios in the years after the 1981 guidelines were adopted. However, the simplistic use of total assets as a risk measure became questionable as banks adjusted their portfolios. Given regulators' concern with preventing failure and protecting the deposit insurer, an appropriate measure of capital adequacy would measure a bank's ability to absorb losses from its portfolio with-

out failing or imposing substantial costs on the deposit insurance agency. During the 1980s, however, banks reduced their investment in high-liquidity, low-return assets and increased their exposure in potentially risky off-balance-sheet transactions, such as letters of credit and over-the-counter derivatives. Thus, capital-to-total-asset ratios that may have been adequate in the early 1980s were likely becoming less adequate later in the decade. As a consequence, the United States, along with other industrialized countries, adopted risk-based capital standards in 1988 that took full effect in 1992.⁶ These standards, often referred to as the Basle Agreement, established capital ratios that are dependent on banks' overall exposure to credit risk. Bank supervisors are engaged in on-going efforts to incorporate other forms of risk—for example, standards for market risk were recently adopted.

In response to concerns regarding the thrift bailouts of the 1980s and the potential for a similar bailout of banks, Congress passed the FDIC Improvement Act (FDICIA) in 1991. FDICIA made a number of changes that were intended to reduce taxpayers' and

Table 1
Overview of Major Changes in Capital Regulation, 1981 to 1996

1981	The Federal Deposit Insurance Corporation (FDIC) sets numeric guidelines for all the banks it regulates.
1981	The Office of the Comptroller of the Currency (OCC) and Federal Reserve divide banks into three categories: community, regional, and multinational (the seventeen largest banking organizations). Numeric guidelines are set for the community and regional banks. No standards are set for the multinational banks, but they are encouraged to raise their capital ratios.
1983	The OCC and Federal Reserve impose the regional bank numeric guidelines on multinational banks.
1985	The FDIC, OCC, and Federal Reserve establish a common set of capital guidelines that apply to all banking organizations.
1990	Interim risk-based capital guidelines take effect for all banking organizations. The risk-based guidelines are supplemented with leverage guidelines.
1991	The FDIC Improvement Act, which establishes five capital categories, is passed. Regulators are given a menu of mandatory and optional enforcement actions they may undertake as a bank's capital ratios decline. Regulators ultimately define the categories both in terms of risk-based and leverage ratios.
1992	Final risk-based capital guidelines take effect for all banking organizations. The risk-based guidelines are still supplemented with leverage guidelines.

Note: The table provides only a broad overview of bank capital regulation. Numerous refinements in the measures of both capital and risk exposure occurred during this period. For more detailed discussions of the evolution of capital regulations, see Alfriend (1988), Gilbert, Stone, and Trebing (1985), Keeton (1989), and Wall (1989, 1993).

the government's exposure to problem financial institutions.⁷ Among these changes are provisions for prompt corrective action that impose increasingly strict limits on banks as their capital ratios decline. The act provides a classification system with five tiers based primarily on banks' capital ratios, with the lowest tier having a capital-to-assets ratio of less than 2 percent. Regulators are strongly encouraged to close any bank falling into the lowest tier if the bank is unable to raise its capital ratio within ninety days of falling below 2 percent.

The combined effect of the Basle Agreement and FDICIA is to make capital ratios one of the primary measures, for regulatory purposes, of U.S. banks' financial condition. Banks may not respond to these regulations if the regulations are not binding or if the costs of meeting the regulations are greater than the benefits. If banks do respond, they generally do so in one of two ways. A bank may increase its capital ratios as measured under the regulatory standards without reducing either the probability that the bank will fail or the losses to depositors and the deposit insurance agency if the bank fails. This first general category of response will be referred to hereafter as cosmetic changes to the capital ratio. One way for a bank to make cosmetic improvements in its capital ratios would be to reduce its total assets to improve its capital-to-assets ratio while increasing portfolio risk by increasing the proportion of risky assets, as appeared to be happening in the early to mid-1980s. The other way of making cosmetic changes is to exploit differences between capital as measured for regulatory purposes and the bank's true economic capital. A bank may exploit these differences by (1) selling assets that have appreciated in value (but not those with reduced value) to increase capital measured by regulatory accounting, even if this action sometimes reduces the bank's economic capital, and (2) refusing to recognize substantial reductions in the market value of assets.⁸

A second general response to capital regulations would be to increase measured capital ratios in a way that also reduces the probability of failure and the expected losses to depositors and the deposit insurer if the bank should fail. Examples of this type of response include reducing risk exposure and increasing the capital base without taking offsetting measures that increase risks.

Studies of the theoretical determinants of bank capital levels suggest that taxes, deposit insurance, bankruptcy costs, and managerial incentives may play a significant role in determining the optimal level of bank capital. Further, theory suggests that attempts to

raise new capital via stock issues could be costly to shareholders because such efforts signal that management has adverse news about the bank.

Empirical evidence on the effectiveness of capital regulation suggests that regulations have had a significant impact on most banks' capital ratios in the period since the 1981 numeric guidelines were imposed. Part of the increase in capital for some banks during at least part of this period appears to have been the result of cosmetic changes. Some theories and empirical evidence suggest that certain banks respond to higher capital ratios by increasing their risk exposure. However, none of the empirical evidence suggests that banks increased their portfolio risk exposure by so much that it more than offset the reduced risk from higher capital. The evidence also suggests that banks may have increased their regulatory capital by selling appreciated assets and delaying the recognition of losses.

Banks also have responded to the regulation by reducing their risk exposure and increasing their capital. Banks reduced their risk exposure via loan sales and perhaps by refusing to make new loans while allowing existing loans to be repaid. Further, banks issued new equity to help meet the regulatory guidelines even though these issues often reduced the price of existing shares, as predicted by some theories.

The next sections of this article review the theoretical determinants of changes in capital and the effectiveness of capital regulation. The article then considers the literature on cosmetic changes to capital ratios and on responses that increase the risk cushion.

Determinants of Capital Strategy

In evaluating its capital position, a bank must consider both the static costs associated with any given capital ratio and the dynamic costs associated with adjusting it. The static costs, and possibly the dynamic costs, depend in part on the penalties regulators impose for inadequate capital ratios. Banks are similar to other corporations, however, in that they are subject to a variety of nonregulatory costs associated with the level and changes in their capital position.

Bank regulators have long considered the maintenance of adequate capital levels an important element of maintaining banks' safety and soundness. Banks with inadequate levels have been subject to a variety of penalties depending on the size of the deficiency, including (1) more frequent and longer examinations,

(2) moral suasion aimed at senior management and the board of directors, (3) denial of applications to acquire banks, (4) formal agreements with their regulator to raise capital and take other actions (such as suspending dividends until capital reaches acceptable levels), and (5) effectively forcing closure by withdrawing the bank's charter or its deposit insurance.

In addition to these penalties, provisions in FDICIA for prompt corrective action include a series of mandatory and optional penalties to be imposed on banks as their capital level declines. In many ways these provisions are not a dramatic change because they do not supply many new penalties and they continue to allow regulators to exercise substantial discretion in imposing penalties. In another sense, however, prompt corrective action is a significant change in that it reduces the potential for regulators to exercise forbearance for undercapitalized banks. Regulators are now required to specify a series of ranges of capital ratios and then choose from a menu of potential penalties associated with each range. Further, FDICIA mandates the development of risk-based insurance premiums, and a bank's capital level is currently one of the two determinants of the risk premium's size.

The regulatory pressure on banks to maintain capital levels is one-sided; regulators will protest capital ratios that are too low, but they virtually never complain about excessively high capital ratios. Market forces, however, could potentially impose varying costs based on both the level of a bank's capital and changes in the bank's capital structure. The theoretical starting point for analyzing market forces is Franco Modigliani and Merton H. Miller's (1958) demonstration that a firm's capital structure (the choice of its debt-to-equity ratio) does not affect its value in perfect markets. An implication of this model is that securities prices are an unbiased estimate of their intrinsic value and, hence, the timing of a sale and the type of security sold by the firm do not affect the value of the firm. Modigliani and Miller established not only the conditions under which capital structure is irrelevant but also conditions under which capital structure may be relevant.⁹

Building on a variety of studies analyzing nonfinancial corporations' optimal capital, Yair E. Orgler and Robert A. Taggart Jr. (1983) developed a market model of optimal capital structure for banks.¹⁰ In their model, lower capital ratios provide banks with more favorable tax treatment and an increase in the value of their deposit insurance. Offsetting these benefits of lower capital ratios are the (eventual) diseconomies of scale in producing deposit services and the dead-

weight costs of bankruptcy that are partially borne by the banks' owners.¹¹ Mark J. Flannery (1994) argued that agency costs also may be an important determinant of bank capital structures.¹² Lower capital ratios impose desirable limits on management and reduce the need for shareholder monitoring. Conversely, lower ratios increase the incentives for bank shareholders to have managers undertake riskier projects and to reject some low-risk investments. These costs of reduced capital may be mitigated, Flannery argued, by having the bank issue deposits with very short maturities so that debtholders may take effective action if the bank adopts a high-risk investment strategy. Thus, Flannery contended that banks should issue very short-term debt and maintain low capital ratios (although they would not necessarily be undercapitalized by regulatory standards).

Ronald E. Shrieves and Drew Dahl (1992) and Joseph P. Hughes and Loretta J. Mester (1996) pointed to another agency problem that may influence banks' capital structure—managerial risk aversion. Most individuals are thought to be risk-averse, and there is no good reason for thinking that bank managers are more risk-averse than the average shareholder. However, bank managers have proportionately far more of their total wealth (including human capital) invested in their bank than do most shareholders, and, as a consequence, managers have more to lose from the bank's failure. Thus, bank managers may choose higher capital levels, given their risk exposure, than would be optimal from a shareholder's perspective. Hughes and Mester estimated bank cost functions that allowed for managerial risk aversion and found support for this hypothesis.

An implicit assumption of the static trade-off models of capital structure is that the cost of adjusting a bank's capital structure is zero. Recent work that focuses on information asymmetries between managers and investors has suggested, however, that the process of adjusting the capital ratio may convey important information to shareholders. An important part of the analyses of information asymmetries has focused on the issuance of new securities by corporations. Stewart C. Myers and Nicholas S. Majluf (1984) examined a firm's decision to issue debt or equity and concluded that the announcement to issue equity conveys negative information to the market about the firm's value. That is, a firm issues stock when its stock price is higher than management believes is the firm's intrinsic value and issues debt otherwise. Myers and Majluf's model suggests that firms generally prefer to issue debt rather than equity. Their hypothesis, stated in

general terms, is that actions implying that future earnings will be sufficient to generate adequate capital are a positive signal to shareholders while actions that imply future earnings will be insufficient are a negative sign. Their model approach has been extended to develop hypotheses about other methods of maintaining or raising capital ratios such as recognizing gains on appreciated assets—methods that do not include equity issuance.

Thus, theory suggests a variety of benefits and costs to shareholders associated with higher capital ratios. These benefits include a reduction in taxes, an increase in the value of deposit insurance, and an increase in bank managements' incentive to operate efficiently. The costs include increased dead-weight costs of bankruptcy, diseconomies of scale in producing deposit services, and incentives to take on excessive risk. Theory also suggests that the optimal level of capital from the managers' perspective may be higher than that desired by shareholders if managers are risk-averse. In addition, banks may not always be at their optimum level of capital if adjusting capital ratios is costly. Announcements of new capital issues may be viewed by the market as an adverse signal about the issuing bank's value and hence lead to a decline in the price of the bank's stock.

Do Banks Respond to Capital Regulation?

The question of whether banks respond to capital regulation hinges on two issues: Are regulatory capital requirements above those that the market would require for at least some banks? And are the penalties for falling below the regulatory guidelines large enough to induce banks to raise their capital ratios? For the purposes of this analysis, the relevant market requirement is not the standard that would be imposed in the absence of any government intervention but, rather, that which the market would require given the regulatory safety net that has been extended to banks, as noted by Allen N. Berger, Richard J. Herring, and Giorgio P. Szegö (1995). Empirical analysis of this issue may be divided into three periods: prior to the 1981 numeric capital standards, from 1981 to the passage of FDICIA in 1991, and post-FDICIA.

Several studies—Sam Peltzman (1970), John J. Mingo (1975), Alan J. Marcus (1983), and Dietrich J. Kimball and Christopher James (1983)—examined the effectiveness of capital regulations in the period before

numeric standards were adopted in 1981. Their results, though mixed, tend to indicate that regulators were ineffective in influencing banks' capital ratios. A problem with interpreting these studies' results is that the regulatory requirements for any given bank organization were set on a case-by-case basis and the factors used to evaluate capital adequacy were likely to be highly correlated with those used by the market. A second problem is that the regulatory penalties associated with varying levels of capital inadequacy were not transparent.

The numeric capital standards imposed on most banks in 1981 gave outside observers (that is, anyone lacking direct access to supervisory reports) a clearer picture of regulatory expectations but failed to clarify the penalty function.¹³ Dilip K. Shome, Stephen D. Smith, and Arnold A. Heggstad (1986) raised doubts about whether the 1981 standards were binding. For their sample of ninety-nine bank holding companies, the companies' market value was significantly positively related to their book-equity-to-total-asset ratio in 1981-82. However, this relationship became insignificant in 1983.

Michael C. Keeley's (1988) analysis suggests that the 1981 regulatory standards were effective in causing large bank holding companies with inadequate capital to raise their capital ratios. Keeley divided his sample into capital-sufficient banks (those that met the 1985 capital standards in 1981) and capital-deficient banks (those not meeting the 1985 standards in 1981). He showed that the capital-deficient banks raised their ratios during the 1982-86 period so that almost all met the standards by the end of the period.

A problem with analyzing Keeley's results is that the pressure for higher capital ratios could have come from regulators, as Keeley suggests, but it could also have come from market pressures, as Shome, Smith, and Heggstad's results imply. C. Sloan Swindle (1995) attempted to separate the relative roles of the market and regulators using the regulators' private capital adequacy ratings obtained from Thomas F. Cargill's (1989) study. Swindle's results suggest that banks with lower regulatory capital ratings have higher expected increases in their primary capital ratios. How successful Swindle was in separating market and regulatory effects depends on the degree to which the regulatory ratings contain private information that is not available to the market.¹⁴

In an attempt to sort out the relative importance of regulators and the market, Larry D. Wall and David R. Peterson (1987, 1988) estimated a pair of equations that allow for separate market and regulatory influence.

They assumed that either the market or regulators exercise a binding influence on any individual banking organization but that determining which influence is binding is an empirical question for any given organization. The two equations assume that a change in the capital ratio is a function of the difference between the optimal and the existing capital ratio. The market and regulatory equations were estimated simultaneously using a disequilibrium estimation technique that provides estimates not only of the equation parameters but also of the probability that capital changes at each bank are best explained by the market model. Wall and D. Peterson's (1987) results for bank holding companies suggested that most of them came from the regulatory regime (that is, their capital changes are best explained by the regulatory model) during the 1982-84 period. In their 1988 study, results for the lead banks of large bank holding companies also suggested that regulatory standards were binding for most banks between 1982 and 1984.¹⁵

The late 1980s and early 1990s saw several potentially important changes that may have increased both regulatory and market pressure on banks to maintain high capital ratios. The adoption of risk-based standards in 1988 saw increased regulatory interest in banking organizations' off-balance-sheet activities. The passage of FDICIA in 1991 clarified the penalties for banks with inadequate regulatory capital ratios. However, other developments may have led to increased market pressure. The FDIC's resolution of some large failed banking organizations forced some nondeposit creditors to absorb losses that led to increased risk premiums on their subordinated debt, according to Flannery and Sorin M. Sorescu (1996). Further, FDICIA called for the least costly resolution of failed banking organizations; that requirement has been taken to imply that the FDIC should not extend de facto deposit insurance to deposits over the de jure coverage level of \$100,000.

To help clarify the relative roles of the market and regulators in the 1988-92 period, Wall and D. Peterson (1995) updated their prior disequilibrium analysis of changes in capital ratios, which assumed that the leverage ratio was the binding constraint rather than the risk-based capital ratios. Their results continued to show that the regulatory standards are binding for the majority of bank holding companies.

Thus, available evidence indicates that regulators have had significant influence on the capital ratios of a large proportion of banking organizations in the period since 1981. The next two sections look at the evidence on the extent to which these increases were merely

cosmetic and the different ways that banks could provide real increases in their capital cushion.

Cosmetic Responses to Capital Regulation

Cosmetic changes in bank capital ratios are possible because the measures of both capital and risk are imperfect proxies for the economically relevant variables. Regulators cannot construct perfect measures as long as bank managers have private information about the value or risk of their portfolios. However, even granting the impossibility of perfect measures, the crudeness of current measures offers substantial opportunities for cosmetic improvements in capital ratios. Capital-to-total-asset measures (leverage standards) are easily defeated by reducing low-risk, high-liquidity assets and substituting a smaller quantity of higher-risk, lower-liquidity assets. The existing risk-based standards are slightly more sophisticated, but numerous flaws remain: The standards (1) require that most consumer and commercial loans carry the same risk weighting and do not allow for differing quality within asset classes, (2) do not explicitly incorporate any charge for most noncredit risks such as interest rate risk, and (3) do not explicitly take account of diversification across different types of risk or even across different credit risks. The opportunities for increasing regulatory capital arise because capital is measured using accounting conventions rather than accurate measures of true economic values. Yet a bank's economic capital will determine its long-run viability and the amount of losses to depositors and deposit insurers in the event of failure. Banks can exploit accounting conventions by accelerating the recognition of gains on assets with market value greater than book value while slowing the recognition of losses on assets with market value less than book value.

Changing Measured Risk. Banks may effectively offset an increase in the capital ratios used by regulators by increasing their risk exposure as long as their bank managers have private information that is unobservable to regulators about the riskiness of their credit customers or any of their other risk exposures. Whether bank shareholders would benefit from such risk-increasing activities has been the subject of an ongoing debate.¹⁶

Yehuda Kahane (1977), Michael Koehn and Anthony M. Santomero (1980), and Daesik Kim and Santomero (1988) showed that an increase in the required equity-

to-total-asset ratio by regulators may induce an increase or decrease in the portfolio risk taken by a bank. The rise in portfolio risk exposure may only partially offset an increase in capital or it may more than fully offset the increase so that the bank becomes riskier.

In a pair of studies, Frederick T. Furlong and Keeley (1989) and Keeley and Furlong (1990) argued that the framework used in prior studies is inappropriate. The problem is that the prior studies took the expected cost of deposits as a constant that is independent of the bank's capital position or risk. At first this assumption might seem reasonable given that deposits are insured and deposit insurance premiums could not be risk-based by law at that time. The assumption of independence is wrong, however, because it ignores the states in which the bank fails and the FDIC pays for the deposits. When the model was adjusted so that the cost of deposits is a decreasing function of the risk of failure (because the FDIC pays depositors when the bank fails), then the results of prior studies did not hold. Banks' incentive to take more risk is greatest at low capital levels, and the incentive decreases as capital increases. One important limitation of these two studies is that banks continue to have an incentive to maximize risk in their models; an increase in capital merely reduces the magnitude of the gains from risk-taking.

Gerard Genotte and David Pyle (1991) incorporated an adjustment for the value of deposit insurance as suggested by Keeley and Furlong but also allowed for the expected return on an asset to decrease as a bank increases its holdings. Genotte and Pyle found that if an interior optimum for size and risk exists, then a rise in capital levels will lead to increased investment in the risky asset and a greater probability of failure. Robert B. Avery and Berger (1991) argued that, even if Genotte and Pyle's results for increased risk of default hold, the expected losses to the deposit insurer are decreasing in the absence of dead-weight liquidation costs of failure or extreme assumptions about the distribution of asset returns.

Sarah B. Kendall (1991) pointed out that other models of banks' incentive to take risk assume that only two end-of-period states are possible: (1) the bank is solvent and hence incurs no penalty or (2) the bank is insolvent and is closed. She noted that a bank could remain solvent but so undercapitalized that it incurs a regulatory penalty. She found that an increase in regulatory capital requirements has an ambiguous impact on its incentive to take more risk depending on its financial condition.

Paul S. Calem and Rafael Rob (1996) developed a model of changes in banks' asset choice and capital ra-

tios. They then simulated the model using parameters estimated over the 1984-93 period. They first considered bank behavior given a constant deposit insurance premium. In this case they found a U-shaped response of bank risk-taking in response to higher capital requirements. Severely undercapitalized banks take more risk in an attempt to return to adequate capital. Banks with minimally adequate capital reduce their risk exposure to reduce the risk that losses will cause them to be undercapitalized. Well-capitalized banks increase their risk exposure to offset the increase in capital. The effect of higher risk-based capital requirements depends on how strong the response of the requirements is to risk (how stringent the requirements are in their terminology). If higher risk-based requirements are not too stringent, they act like higher standards that are not risk-adjusted. However, more stringent standards will reduce portfolio risk. Finally, Calem and Rob considered an ex post penalty for taking losses in the form of ex post risk-based insurance premiums. They found that risk-related premiums had the effect of increasing the range of capital values over which undercapitalized banks took more risk. The risk-related premiums had no impact on better-capitalized banks.

While the theoretical evidence is mixed, the empirical evidence generally suggests that higher capital standards may be at most partially offset by increased risk but do not increase the probability of failure. Shrieves and Dahl (1992) found that, for commercial banks with assets of more than \$100 million during the 1983-87 period, an increase in capital is associated empirically with an increase in risk. Their evidence suggests that this relationship is true even for banks for which the regulatory capital ratios are not binding; however, this finding suggests that bank managers may be varying risk and leverage to hit some target for variability of equity. Mark E. Levonian (1992) found similar evidence that bank holding companies with traded options in the late 1980s showed both increased asset risk and capital, resulting in little change in the FDIC's expected losses.

Evidence against the hypothesis that higher capital levels lead to an increase in risk comes from two types of studies: studies of bank failures and studies of banks' involvement in off-balance-sheet activities. Berger, Herring, and Szegö (1995) summarized the findings of the bank failure literature concerning bank capital: "Virtually every bank failure model finds that a higher equity-to-asset ratio is associated with a lower future probability of failure."

Off-balance-sheet items are relevant to the issue of how banks respond to higher capital levels because the

1981 capital standard did not incorporate off-balance-sheet items. Banks seeking to offset the 1981 capital requirements via higher risk could do so by substituting off-balance-sheet items for on-balance-sheet items. Julapa Jagtiani, Anthony Saunders, and Gregory Udell (1995) found that changes in the capital requirements for banks have no consistent impact on the diffusion of off-balance-sheet activities. One caveat in interpreting the analysis of off-balance-sheet activities is that these activities may themselves create countervailing pressure for better capitalization. That is, in almost all cases, banks create a contingent liability to their customers that is valuable to the customers only if the bank can meet any obligation that arises from the off-balance-sheet transaction. Given that off-balance-sheet

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items are not covered de jure by deposit insurance, bank customers have an incentive to price their off-balance-sheet transactions in a way that reflects the risk that the bank's capital will ultimately be inadequate. G.D. Koppenhaver and Roger D. Stover (1991) found that capital and stand-by letters of credit are jointly determined, with higher levels of the former associated with higher levels of the latter. This result is consistent with the hypotheses that banks offset higher regulatory capital requirements by taking more risk and that off-balance-sheet customers demand higher capital ratios.

Recognizing Changes in the Market Value of Assets. At any given time, a bank is likely to have some assets that have appreciated in value from their original acquisition cost and others that have declined in value. Yet generally accepted accounting principles (GAAP) and regulatory accounting generally record assets at historic cost rather than at their current market value. Thus, regulatory capital may differ substantially from the economic capital available to support

the long-run viability of a bank and reduce losses should it fail. A bank can boost its regulatory capital by accelerating the recognition of gains or losses for assets by selling them, achieving the effect of marking these assets to market. Further, banks have some discretion in the timing of setting aside reserves for bad loans. Thus, a seemingly low-cost way for a banking organization to maintain or increase its regulatory capital ratios is to avoid recognizing losses on depreciated assets and accelerate recognition of gains on assets that have appreciated in value.¹⁷

Myron B. Slovin, Marie E. Sushka, and John A. Polonchek (1991) recognized the potential for increasing regulatory capital through banks' sale-and-leaseback transactions (for example, selling their headquarters building to outside investors and simultaneously leasing back the building) and divestitures. They argued, however, that these transactions may also send a negative signal to the financial markets about the value of existing assets and the bank's future earnings prospect. Banks with favorable information about their future prospects can, at least within certain ranges of regulatory capital ratios, signal their good news by not selling assets but rather waiting for future earnings to boost their capital. Banks with unfavorable information may find the do-nothing strategy too costly and be forced to engage in these transactions or take other action to boost capital. Slovin, Sushka, and Polonchek (1991) studied sale-and-leaseback transactions and divestitures for banking organizations during the period from 1974 to 1988. Prior studies of nonbank sale-and-leasebacks and divestitures had reported significantly positive abnormal returns to the sellers. In contrast, Slovin, Sushka, and Polonchek found significant negative prediction errors for sale-and-leasebacks and insignificantly positive prediction errors for divestitures. These results support their hypothesis that asset sales represent unfavorable information to investors.

In terms of recognizing losses, evidence suggests that banks manage their loan-loss allowance (reserves). If loan-loss reserves depend solely on expected future losses and they summarize all available information, then they alone should be sufficient to predict future loan charge-offs (the writing off of specific loans). Berger, Kathleen Kuester King, and James M. O'Brien (1991) showed, however, that in predicting the current value of charge-offs the information about lagged nonperforming loans adds significantly to that obtained from the loan-loss allowance. Mary Brady Greenawalt and Joseph F. Sinkey Jr. (1988) showed that loan-loss provisions are used for

income smoothing but did not look at their use for managing capital levels.

One potentially instructive case of banks deferring recognition of reductions in asset values involves banks' loans to Latin America. During the early and mid-1980s a number of large banks experienced a significant reduction in the value of their Latin American loan portfolios, but many of the largest banks did not fully recognize these losses until the late 1980s. Several studies examined the response of bank stock returns to various announcements related to their Latin American loan portfolios. Although securities markets quickly incorporated the implications of various moratoriums and reschedulings into stock returns, the banks took longer to recognize the reduction in values on their GAAP accounting statements.¹⁸ Thus, the purpose of the delay was unlikely to have been an attempt to hide the losses from securities markets. Slovin and Subbarao V. Jayanti (1993) provided evidence consistent with concern about capital exposure. They examined banks' excess stock returns around the times of the Mexican debt moratorium (August 19, 1982) and the Bolivian debt moratorium (May 31, 1984). The set of banks with exposure to each of these countries is broken into two groups: (1) those with adequate regulatory capital ratios and (2) those with inadequate capital ratios. Slovin and Jayanti found that banks with inadequate capital suffered significantly more adverse stock return reactions than did banks with adequate capital. Although loan-loss reserves were formally counted as a part of regulatory capital at this time, Slovin and Jayanti interpreted this fact as suggesting that the market believed that banks with inadequate capital would need to issue new capital, cut dividends, or reduce their asset base. James J. Musumeci and Sinkey (1990) reached a similar conclusion for the announcement of the Brazilian experience (February 20, 1987) using market value (but not book value) capital ratios.

Analyzing the recognition of changes in securities values may be especially interesting because securities may have either gains or losses and trade in relatively liquid markets.¹⁹ Myron S. Scholes, G. Peter Wilson, and Mark A. Wolfson (1990) examined the recognition of securities gains and losses by a sample of mostly very large banks that are on *Bank Compustat* data tapes. They found evidence that banks with lower capital ratios are likely to have smaller recognized losses or larger recognized gains than banks with higher capital ratios. Mark Carey (1994) examined more than 6,000 commercial banks' sales of securities from their investment portfolios, or gains trading. He found that

most gains trading is done to boost current earnings or to smooth earnings. Relatively few banks appear to engage in gains trading to boost their capital account, and the magnitude of such trading appears to be small. Carey also found little evidence that gains trading increases bank risk. Perhaps one important reason that gains trading is not done to boost capital is revealed in Carey (1992). He found that gains trading does not improve examiners' evaluations of a bank. Indeed, gains trading tends to reduce a bank's CAMEL rating (see note 14). Carey found that gains trading does not have a favorable effect on the firm's stock price. He suggested that gains trading may be motivated by managerial compensation contracts that emphasize accounting earnings, and he provided some weak evidence to support this hypothesis.

Summary of Cosmetic Changes. One type of cosmetic change that banks may make to their regulatory capital ratios is to increase their capital but at the same time increase their risk. Whether the increase in risk will more than offset the rise in capital and increase their probability of failure is unclear. The empirical evidence provides some indication that increases in capital are partially offset by greater risk-taking. However, none of the empirical studies indicate that higher regulatory capital requirements actually increase banks' risk of failure or the likely losses to depositors and deposit insurers in the event a bank failed. One potentially useful area for empirical work is to test the hypothesis in Calem and Rob (1996) that a bank's response to higher capital requirements may depend in part on their initial capital ratios.

Another type of cosmetic change involves raising regulatory capital levels in ways that do not increase the market value of capital. Examples of such actions include accelerated recognition of gains (but not losses) via sale-and-leaseback transactions, gains trading with securities, and deferring recognition of loan losses. These actions may sometimes circumvent the regulators. However, some empirical evidence suggests that the market can see through these accounting gimmicks, interpreting them as signs of likely weakness in future earnings and accordingly reducing the stock price of the bank.

Regulators cannot prevent all cosmetic changes to capital ratios, but they should be able to adjust regulatory requirements to offset banks from gaining material improvements through cosmetic changes. In principal, regulators could eliminate all cosmetic changes to equity by requiring mark-to-market accounting. However, Berger, King, and O'Brien (1991) pointed out that market value is an ambiguous concept and some of the

more relevant definitions of market value are not subject to perfect measurement. Nevertheless, they noted substantial opportunities for regulators to adjust for cosmetic changes to capital. Similarly, regulators could, in principal, eliminate all incentives for banks to increase their risk exposure by evaluating the riskiness of each bank's total portfolio. Such measures do not exist, however, and may not be attainable as long as management has private information about the riskiness of its assets. However, regulators can identify many of the strategies a bank can follow to increase its risk, and their ability to identify material increases should be enhanced by focusing more on banks' risk management procedures. Moreover, once regulators identify cosmetic changes to capital ratios, they can, at least in the United States, impose higher capital requirements to offset the cosmetic changes.

Effective Increases in the Capital Cushion

A bank may provide an effective increase in its capital cushion when that is the cheapest alternative or when regulators give the bank no choice. The increase may stem from reducing the bank's risk exposure or increasing its capital levels.

Wayne Passmore and Steven A. Sharpe (1994) analyzed banks' response to inadequate regulatory capital levels in a model in which banks cannot avoid the regulations by making cosmetic changes to capital ratios. Their analysis suggested that the reason a bank is undercapitalized influences the bank's response and that the time horizon under consideration is also important in some cases. Loan levels decline in the short run (before equity capital levels can adjust) in response to a variety of causes of undercapitalization, including an increase in the risk weighting on loans, an increase in the leverage requirement, or an exogenous capital shock. However, some of these causes may spur a short-term rise in securities holdings. The most striking short-run versus long-run difference relates to exogenous capital shocks, which in the long run has no effect on the size or distribution of a bank's portfolio.

Passmore and Sharpe also analyzed one other important case, that of a decline in loan demand. Ordinarily a decline in loan demand would be considered a drop in the quantity of loans demanded at the going contract rate of interest on loans. From the bank's perspective, however, another equally valid interpretation is that the quantity of loans demanded at the going

contract rate is unchanged but that the bank's expected rate of return at the going contract rate has dropped because the bank anticipates a higher default rate. The second interpretation is especially relevant when considering the impact of sudden declines in the capital level given that the declines are often caused by an increase in default rates on outstanding loans. A decrease in loan demand by itself causes a short- and long-run decrease in loans, a short-run increase in securities, but no long-run change in securities holdings.

Reducing Risk Exposure. Banks may reduce their actual risk exposure in a variety of ways, including reducing the volume of risky financial activities and investing in financial instruments with low or negative correlations with their existing portfolio (that is, engaging in diversification or hedging). In order to improve their regulatory capital ratios, however, banks must reduce their volume of risky financial activities. Risk reduction through greater diversification and hedging is not explicitly incorporated into the capital standards.

The literature on risk reduction to enhance regulatory capital ratios focuses on banks' reducing the size of their asset portfolios, especially their lending portfolios. Banks may reduce their portfolios either directly by selling off existing loans with other financial intermediaries or indirectly by first converting loans into securities (a process called securitization). Alternatively, banks may shrink their portfolios by refusing to make new loans that have a positive net present value and allowing loan repayments to shrink the portfolios. From a social perspective, it is likely that some type of loan sale is preferable to banks' refusing to make positive net present value loans.

Loan Sales. Loan sales have the potential for improving banks' regulatory capital ratios.²⁰ Potential loan buyers must worry, however, that the selling bank will sell loans that are of lower quality than the buyer expects and will not adequately monitor the loan after it has been sold. One way of alleviating buyers' concerns is for the seller to retain the risk exposure via a recourse agreement or by having the seller retain a junior claim on a fraction of the loan. The regulatory capital requirements are structured, however, so that a selling bank's capital requirement is not reduced to the extent that the sale of a loan does not reflect a reduction in the seller's credit exposure. For example, if a bank sells 80 percent of a loan but retains 99 percent of the credit risk then the bank will get little or no reduction in its capital requirement.

Gary B. Gorton and George G. Pennacchi (1995) suggested that the incentive for sellers to cheat loan

buyers may be reduced if the seller retains a fractional interest in the loan and desires to maintain a good reputation so that it can engage in future loan sales. Sellers will face reduced capital requirements if the credit risk that is transferred is proportionate to the amount of the loan; for example, if a bank sells 80 percent of a loan with the buyer assuming 80 percent of each dollar of credit losses, then the selling bank need only include the remaining 20 percent of the loan amount in its regulatory capital ratio calculations.

Most of the theoretical analysis of the implications of capital requirements for loan sales focuses on the choice of retaining or selling newly originated loans. Charles T. Carlstrom and Katherine A. Samolyk (1995) suggested that bankers will sell loans even if they cannot precommit to good behavior if the gains from selling are large enough. Kathleene K. Donahoo and Sherrill Shaffer (1991) showed that small changes in capital requirements will not cause banks to start loan sales programs but may increase the volume in existing programs. Large increases may cause banks to enter the market as loan sellers. Flannery (1989) argued that the type of loan sold may depend in part on how regulators treat it. His particular focus was the effect of the supervisory evaluation of loan quality on the incentive to make and retain certain types of loans. However, he noted that his argument also applies to banks' choice of which loans to sell.

Empirical evidence from Christine Pavel and David Philis (1987) suggested that banks subject to binding capital regulation are more likely to sell loans. Katerina Simons (1993) documented the effectiveness of alternative mechanisms in preventing sellers from taking advantage of buyers. She found that the proportion of the loans retained increases monotonically as the ex post quality of the loan declines.

Reducing the Amount of New Loans. Most analyses of reductions in bank lending have focused on the period in the late 1980s and early 1990s that is sometimes called the credit crunch. A major issue in the credit crunch literature is whether binding capital constraints (induced by higher standards or weakened capital bases) resulted in a reduction in bank lending, especially to customers with limited nonbank alternatives. Early analysis identified, and in some cases tested, a variety of possible explanations for the decline in lending, including a reduction in loan supply due to (1) adverse shocks to capital combined with binding regulatory requirements, (2) adverse shocks to capital combined with market pressure for higher capital, (3) an increase in regulatory capital requirements, and (4) less favorable treatment of loans for

the purpose of calculating regulatory capital requirements. Other explanations for the lending declines might be reductions in loan demand due to (1) a perceived decrease in expected loan repayments, (2) a weaker economy, (3) a secular decline in bank's market share, and (4) banks' higher capital levels.²¹

Determining which of the above factors contributed to the credit decline is impossible a priori because all of them can be supported by changes in the economic environment in the early 1990s. One complication for empirical analysis is that the explanations are not mutually exclusive, so the real question is not which explanations are true but rather what were their relative contributions to the decline. Recent empirical work has focused on multivariate, cross-sectional studies to sort through the various explanations to the extent permitted by the data. Several studies document the shocks to capital in the early 1990s. For example, Diana Hancock, Andrew J. Laing, and James A. Wilcox (1995) showed that the capital shocks for their sample of large banks were twice as large in the early 1990s. Studies by Shrieves and Dahl (1995) and Hancock, Laing, and Wilcox (1995) found that bank portfolios were more sensitive to these shocks in the early 1990s than in the late 1980s. Thus, capital shocks appear to have played at least a partial role in the decline in lending.

While loan losses appear to have contributed to the decline in lending, the impact of the shocks may have been increased if banks' target capital levels rose because of regulatory or market pressure. One source of possibly increased regulatory pressure was the imposition of risk-based capital guidelines in the late 1980s in addition to a leverage (capital to total assets) standard. The risk-based capital standards focused on credit risk, imposing full capital charges on most types of lending to private firms and individuals but smaller charges (in some cases no charge) for many types of securities. Thus, these standards could have caused banks to reallocate their portfolios from loans to securities. While the imposition of risk-based capital guidelines could provide a partial explanation, empirical analysis by Berger and Udell (1991) found little support for a drop in lending related to risk-based capital.

While the imposition of risk-based capital standards does not appear to be an important factor, an increase in market or regulatory leverage targets appears to have occurred in the early 1990s. Shrieves and Dahl (1995) calculated mean target capital ratios for banks using (1) parameters estimated using 1985-89 data and mean values of the explanatory variables in 1990 to 1991 and (2) parameters and mean values of explanatory

variables from 1990 to 1991. They found that the capital targets were higher using the parameters estimated from the 1990-91 data. Thus, the evidence suggests that in 1990-91 banks had higher capital targets and their loans adjusted more rapidly to capital shocks (including any reduction in lending demand).

However, Steven A. Sharpe's (1995) critical review raised a number of questions about what conclusions may be drawn from this literature. One especially important issue he pointed to is that the capital shocks resulted from loan losses, and these loan losses in turn may signal a decline in the profitability of lending. Thus, Sharpe found it difficult to develop an unambiguous interpretation of the credit crunch papers he surveyed. Consistent with this critique, one could ask,

Because banks may respond to binding regulations in a variety of ways, regulators need to consider what response they want to elicit when formulating new regulations.

If the problem was due solely to capital constraints, why did the banks not use the loan sales market to fund the loans?

If regulatory capital requirements played an important role in the credit crunch, then an important question is whether the changes in capital targets were due to changes in regulatory or market pressure, an issue that is outside the scope of the above credit crunch papers. Evidence that regulatory pressure was the dominant factor for at least some banks comes from Joe Peek and Eric S. Rosengren (1995), who focused on lending by banks in New England that were subject to a formal regulatory mandate to improve their capital ratios. Their findings suggest that banks subject to formal orders sought to increase their capital ratios by reducing their loan portfolio significantly faster than banks that were not under a formal order, even after allowing for differences in capital ratios. Two types of additional evidence come from Wall and D. Peterson (1995). First, as previously noted, they found that most banks in their sample had a high probability of coming

from the regulatory regime. Further, they found evidence, consistent with Peek and Rosengren's, that banks subject to a formal regulatory order to improve their capital adjusted toward their capital targets at a faster rate than did banks not subject to an order.

Increasing Capital Levels. The other way that banks may effectively increase their capital cushion is by increasing their regulatory capital. Banks can do so by increasing their retained earnings or issuing new securities. An efficiently run bank is already maximizing its profits given its risk level, so the only way it can increase its retained earnings is by taking more risk (which would initially decrease its effective capital cushion) or reducing its dividends. The types of securities a bank can issue to satisfy its regulatory capital requirements have varied over time. The capital standards have given full weight to common and preferred stock issues, including them in their most limited definitions of capital (core capital). The 1981 standards also counted a type of debt security called mandatory convertible debt (debt that had to be refunded with common or preferred stock) as an element of core capital (called primary capital). More recent standards consider mandatory convertible debt an element of total capital (tier one plus tier two capital), not as an equity issue in core capital. Subordinated debt has been included as an element of total capital but not as an element of core capital in the various post-1981 standards.

An understanding of banks' decision to increase regulatory capital comes from two types of studies: (1) those that examine banks' decision to increase their capital and (2) those that focus on stock market reactions to banks' announcements of plans to issue new capital. Connecting the results of these two types of studies is difficult because the studies of decisions to issue new capital focus on banks whereas the stock market reaction studies focus primarily on bank holding companies. Banks that issue capital directly to the market are generally too small to have widely traded stock issues. In contrast, larger banks typically issue capital to their bank holding company parent, which may or may not have issued a capital instrument to fund the purchase.

Dahl and Shrieves (1990) analyzed 753 equity capital issues occurring during 1986 and 1987. They divided their sample along two dimensions: (1) adequately capitalized (a total capital ratio greater than 7 percent) versus undercapitalized banks (a ratio below 7 percent) and (2) independent banks versus banks affiliated with one-bank holding companies versus banks affiliated with multibank holding companies. The sample of holding company banks was subdivided be-

cause independent banks issue securities to the market whereas affiliated banks often issue securities to their parents as noted above, and holding company banks may be managed as part of an integrated unit rather than as stand-alone entities. Not surprisingly, Dahl and Shrieves found that, by regulatory standards, undercapitalized banks are more likely than adequately capitalized banks to issue capital. Further, to gauge the importance of regulatory pressure they calculated, using an equation estimated with only adequately capitalized banks, the probability that an undercapitalized bank will issue capital. They found that undercapitalized banks issue equity more often than would be predicted for similar yet adequately capitalized banks.

Dahl and Michael F. Spivey (1995) examined banks during the 1981-88 period that were undercapitalized according to standards used to implement the prompt corrective action provisions of FDICIA. Their goal was to determine which actions were most likely to result in the bank reaching an adequate capital level by the end of 1989. The study found that less than one-quarter of undercapitalized banks, pre-FDICIA, paid dividends and that dividend payments were not statistically significantly related to the probability of recovery. In contrast, a bank's survival was significantly related to capital injections into the bank, a decision that is under the control of the firm's managers. As Dahl and Spivey pointed out, owners are unlikely to inject capital into banks that will probably be closed by the regulators. Dahl and Spivey's results also suggest that expense control (salary and occupancy expense and interest expense) is significantly related to whether, but not how quickly, a bank becomes adequately capitalized.

Analyzing stock market reactions to bank capital issuance decisions may provide more insight into the private costs of raising new capital. Wall and Pamela P. Peterson (1991) reviewed bank holding companies' decisions to issue several types of new securities between 1982 and 1986. They found significantly negative abnormal returns for common stock but not for preferred stock, convertible debt, mandatory convertible debt, and subordinated debt. They found that the common stock returns were significantly lower than those for mandatory convertible debt (at the 5 percent level) and preferred stock (at the 10 percent level). After further analysis of the characteristics of the issuing firms and the abnormal returns, Wall and Peterson concluded that their results are best explained by a Myers and Majluf-type (1984) model.

The hypothesis that common stock issues may signal adverse private information is supported by Slovin,

Sushka, and Polonchek (1992), who analyzed the effect of the issuance announcement on the stock returns of the issuing bank holding companies' competitors. The researchers focused on the issuance decision by money center banks in the United States during the period from 1975 to 1988 and analyzed three groups of competitors: other money center banking organizations, a sample of regional banking organizations, and a sample of investment banking firms. They found that all three groups of competitors showed significantly negative abnormal returns in the wake of the securities issuance announcement. In contrast, similar analysis of the stock returns of the competitors of industrial firms revealed no significant market response on the part of the competitors. These results suggest that the decision to issue common stock may have signaled the market that it overvalued the assets of large financial firms.

Marcia Million Cornett and Hassan Tehranian (1994) suggested another way to look for evidence that bank holding companies' common stock issues signal adverse information. They compared the abnormal stock returns of issuing bank holding companies that have capital ratios below regulatory requirements with those of issuing bank holding companies that have adequate regulatory capital ratios. Bank holding companies with capital ratios above the regulatory requirements are likely to be voluntary issuers that could avoid issuing new capital if their managers thought their stock was undervalued. In contrast, bank holding companies with capital levels below the regulatory requirements may have been involuntary issuers of capital in the sense that the regulatory costs of not issuing new capital would exceed any losses from issuing stock that management believed was undervalued. Cornett and Tehranian's results support the hypothesis that voluntary common stock issues had significantly lower abnormal returns than did involuntary issues. The abnormal returns associated with other types of capital issues are insignificant for both the voluntary and involuntary samples.

Summary of Effective Increases in the Capital Cushion. Banks can increase their regulatory capital ratios and their true capital cushions by shrinking their loan portfolio. One way to shrink the portfolio is to sell loans to other financial intermediaries. A possible problem with such sales is that the buyers will discount the loans to reflect the possibility that the seller may be trying to unload its weaker loans. To offset this concern, banks selling loans tend to sell more of their higher-quality loans. Another way of shrinking the portfolio is to refuse to make good new loans while

accepting repayment on outstanding loans. The extent to which this practice has occurred is difficult to measure, however, because banks that have had adverse shocks to their capital may also be in markets with few good lending opportunities. Banks may also increase their regulatory capital ratios by issuing new capital instruments.

One theme that arises in both the discussion of cosmetic changes and the discussion of new capital instruments is that of the stock market's reaction to different ways of meeting the capital regulations. The market rewards banks that can meet capital requirements through profits from ordinary operations without relying on cosmetic accounting changes. On the other hand, banks that must resort to accounting gimmicks or new capital issues are viewed as signaling weak future profitability, and their stock prices drop to reflect that adverse signal.

Conclusion

Bank capital ratios have become a primary measure of banks' financial condition as a result of international efforts to achieve a degree of harmony in bank supervisory rules across countries and the inclusion of prompt corrective action in FDICIA. If this focus on bank capital is to continue, then a better understanding of banks' responses to binding capital regulation would be valuable.

One question about which little is said in this article is, What determines banks' choices from the menu of alternatives when they are confronted with binding regulation? Given that banks are likely to choose the option that has the lowest long-run costs, a better way of stating the question is, What determines the relative magnitudes of cost associated with each of the alternatives? More research on this topic would be desirable.

Because banks may respond to binding regulations in a variety of ways, regulators need to consider what response they want to elicit when formulating new regulations. Presumably the regulations are being imposed to reduce the risk of a systemic problem and the expected losses of the deposit insurance agency. If so, then regulations that encourage cosmetic responses are, by definition, unlikely to accomplish regulatory goals. Whether regulators should care whether banks meet the regulations by reducing the volume of their risky activities or by increasing their capital is less obvious. On the one hand, one could easily imagine circumstances under which a reduction in bank lending would be considered undesirable in the short run. However, pressing banks to undertake the alternative of increasing capital might be even more costly in the long run. A third alternative, which is not feasible under the current guidelines, would be to allow banks to reduce risk exposure by increased diversification or hedging. This option could prove to be the least costly to banks and society in many instances.

Notes

1. For a long-term perspective on bank capital levels, see Kaufman (1992).
2. For a broader discussion of capital regulation see Berger, Herring, and Szegö (1995).
3. For a survey of systemic risk issues both prior to and after the passage of the Federal Deposit Insurance Corporation Improvement Act of 1991, see Wall (1993).
4. Marcus (1983) argued that regulators were successful in preventing any one bank from reducing its capital ratios substantially below the industry average yet were unable to prevent the industry as a whole from ratcheting their capital ratios downward.
5. For a review of the 1981 capital standards, see Wall (1989).
6. For a discussion of the 1988 risk-based standards, see Wall (1989).
7. See Wall (1993) for a discussion of the act.
8. Selling an asset that has appreciated in value may reduce the economic capital of a bank by accelerating the tax the bank pays on its earnings from the asset.
9. See Miller (1995) for a discussion of the relevance of Modigliani and Miller's propositions to banking.
10. For example, see Modigliani and Miller (1963), DeAngelo and Masulis (1980), and Masulis and Trueman (1988) on income taxes and Baxter (1967) and Kraus and Litzenberger (1973) on bankruptcy costs.
11. Diseconomies of scale exist if an increase in volume results in an increase in average unit costs. Dead-weight losses of bankruptcy are costs that arise solely because of the bankruptcy and provide no social value. An example of a dead-weight cost would be the legal costs arising from a bank's failure.
12. See Jensen and Meckling (1976), Barnea, Haugen, and Sabet (1981), and Jensen (1986) for a discussion of agency costs in more general settings.
13. However, even with the setting of numeric targets, the regulatory requirements were not perfectly transparent because supervisors could set higher requirements on a case-by-case basis.

14. Cargill (1989, 357) analyzed the contribution of CAMEL ratings in explaining bank certificate of deposit (CD) rates. (CAMEL [capital, assets, management, earnings, and liquidity] ratings are an index used by examiners to summarize their evaluation of a commercial bank.) He concluded that “confidential CAMEL ratings assigned to banks on the basis of on-site examination are largely proxies for market information.” However, CD rates cannot be used to determine whether CAMEL ratings reflect the results of confidential, on-site examinations because by definition this information would not be known to the market. All that can be said is that CAMEL ratings do not contain publicly available information that is not already incorporated in Cargill’s other explanatory variables.
15. Bank holding companies and banks are treated separately because some of the factors influencing the two capital ratios may be different. For example, a bank holding company’s consolidated capital ratio is likely to influence the firm’s tax liability, whereas a subsidiary bank’s capital ratio may not influence the bank holding company’s overall tax liability. For example, a bank holding company may issue debt and pass it along to a subsidiary bank as equity or issue equity and pass it along as debt.
16. Management may not choose riskier portfolios even if they increase shareholder wealth if managers and shareholders have divergent interests. Noe, Rebello, and Wall (1996) showed how a combination of regulatory policies for bank closure and management compensation may be used to discourage management from following higher risk strategies, even when these strategies are optimal for shareholders.
17. Studies of troubled nonbank firms suggest that managers may make judicious choice of accounting treatments either to avoid violations of debt covenants or to win concessions from unions or the government. Several studies indicate that the closer a firm is to violating its debt covenant restriction, the more likely that the firm’s management will select income-increasing accounting choices (Christie 1990, DeFond and Jiambalvo 1994, Skinner 1993, and Sweeney 1994). There is some evidence that firms in financial difficulty may make income-decreasing choices if the lower income increases the likelihood of winning concessions from unions or the government (DeAngelo, DeAngelo, and Skinner 1994).
18. For example, see Smirlock and Kaufold (1987), Bruner and Simms (1987), and Mansur, Cochran, and Seagers (1990).
19. A recent decision (FAS 115) by the Financial Accounting Standards Board effectively requires banks to mark most of their securities portfolio to market for the purposes of determining their capital as measured by generally accepted accounting principles.
20. See Berger and Udell (1991) for a more extensive review of the securitization literature.
21. For a review of many of the issues associated with the credit crunch see Federal Reserve Bank of New York (1994).

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