

Market Discipline: The Role of Uninsured Depositors and Other Market Participants

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Moral hazard, engendered by the safety net of government-provided deposit insurance, tends to increase the probability and cost of bank failures. Uninsured depositors, by far the largest group of bank creditors, can bring market discipline to banks that should reduce their propensity to take excessive risks. However, three important objections to reliance on depositors for this purpose have been raised: (1) uninsured depositors may be unable to monitor banks or to do so in a timely fashion; (2) even if they could evaluate bank performance, the additional interest rate they could charge would be insufficient to affect bank behavior materially; and (3) in any event, uninsured depositors are likely to withdraw their funds rapidly (run) rather than monitor banks, thereby causing costly disruptions to other banks and the economy. Each of these objections is evaluated here, including a review of relevant empirical studies. The conclusion of this analysis is that the objections to allowing uninsured depositors to serve as market disciplinarians are not valid.

Several means of limiting deposit insurance coverage are described next. These include coinsurance, limited insurance, and depositor preference. The coinsurance proposal would increase monitoring by depositors, but would also increase the probability of runs. Limiting insurance to transactions accounts has some merit, but also some important shortcomings. Depositor preference reduces the risk faced by uninsured depositors and the Federal Deposit Insurance Corporation, but the effect may be offset by weak banks collateralizing nondeposit debt.

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This paper concludes that the objections to uninsured depositors serving as effective monitors of banks' risk-taking activities are not valid; still, banking supervisors and legislators are likely to bail out uninsured depositors, in large banks particularly. Hence, alternative sources of market discipline are considered. Subordinated debt has properties that make its holders excellent monitors and restrainers of bank risk. Equity capital holders also have incentives to monitor bank performance, but they gain from risk-taking when their bank's capital is low. Higher required capital that includes subordinated debt fully as meeting this requirement, together with structured early intervention and resolution, are seen as the preferable means of imposing market discipline on banks.

Moral Hazard and the Need for Market Discipline

Moral hazard refers to the adverse incentive engendered by a guarantee or contract that does not account for all contingencies, or by a safety net that fully or partially compensates people for some outcomes. The adverse incentive is that people take actions or risks that they would not otherwise have taken, had they expected to bear the full cost as well as the benefit from their actions.

Debtors to limited liability firms are subject to the moral hazard that equity holders will act differently than they promised, once the debt holders have committed their resources to the firm. In particular, equity holders might assume greater risks and remove assets from the firm that the debt holders could attach. In effect, corporate equity holders have an option that they can put to the debt holders if losses from risky firm activities exceed the assets remaining in the firm (Black and Scholes 1973).

As agency theory emphasizes (see, for example, Jensen and Meckling 1976), the cost of the put option is borne by the equity holders rather than by the debt holders, since the debt holders can either withhold their funds or charge a price for their funds that includes the expected cost to them of the option. Alternatively, equity holders can offer debt holders assurances that the put option will not be exercised. These assurances include covenants that restrict equity holders' opportunities to increase risk (such as limitations on new investments), collateral that reduces the debt holders' cost of default as well as equity holders' incentives to default, and monitoring of equity holders' activities (such as periodic presentation of financial statements audited by respected independent public accountants).¹ Debt obligations also might include a put option that the debtors could exercise.

¹ See Smith and Warner (1979) for a review of such restrictions in corporate bonds.

Deposit Insurance and Moral Hazard

Deposit insurance removes the need to be concerned about moral hazard from depositors whose funds are fully protected. Hence, they have no reason to monitor the activities of banks, nor do banks have to pay these depositors a premium that reflects the risks the banks might take with the depositors' funds. Rather, the risks are shifted to a government-sponsored and backed deposit insurance agency, the Federal Deposit Insurance Corporation (FDIC). This situation would not present a problem if it could be assumed that the FDIC had the same incentives and ability as private debt holders do in dealing with bankers' moral hazard incentives to take greater risks. However, such an assumption must be questioned, for two important reasons.

First, government officials have incentives to overrestrain banks, because the officials do not get the full benefit of risks that bankers take but are criticized for the bankers' failures. Customers and bankers who lose when banks fail might blame the officials, but those who are well served are not likely to praise them. Bankers who are conservative, though, tend to praise officials for "reining in" their more adventurous brethren, particularly when these often more imaginative bankers take away some of the conservative bankers' customers.

Second, government officials have incentives to put off closing down banks that are in danger of failing. As Kane (1988, 1992, and elsewhere) has pointed out, these officials can maximize their own welfare by permitting insolvent or weak banks to continue operations in the hope that the banks' fortunes will improve. Or, at the least, the banks' closings will be put off until after the officials have moved on to other opportunities. This forbearance is particularly desirable for bank regulators when a troubled bank is large, because many people might be hurt should it be closed. An exception to this expectation occurs with a change in regime. Then the new regulators tend to "clean out" the mistakes of those they displace.²

Government officials also fear runs on other banks, even though detrimental effects on the money supply and runs on solvent banks almost certainly can be offset and contained by Federal Reserve open market operations. For the officials, "almost certainly" is not good enough, as they bear the immediate cost of the runs (should these occur) and get few benefits from other banks' more prudent operations to avoid future runs.

Hence, government officials are unlikely to operate as would private debt holders whose personal fortunes (or those of their employ-

² The initial forbearance by the Federal Home Loan Bank Board and the zealous cleanup by its successors, the Office of Thrift Supervision and the Resolution Trust Corporation, are illustrative.

ers) are at stake. The question is whether depositors and other bank debt holders are likely to act in the same manner as would holders of nonbank corporate debt.

Market Discipline by Uninsured Depositors

The general argument in favor of using uninsured depositors to impose market discipline on banks is fairly straightforward. These debt holders are expected to act like the holders of the debt of other corporations, which is not government-insured. As described above, they are subject to moral hazard costs imposed by equity holders, and should act accordingly.³ The major difference between banks and nondepository corporations is that demand deposits, most banks' major liability, are redeemable on demand. Although this situation can result in rapid withdrawals (runs), which might give rise to externalities (as discussed below), it is also seen as a benefit for reducing the costs of moral hazard. As Flannery (1994) points out, banks can change the risk structure of their assets very rapidly, thereby changing the conditions under which they obtained funds from debt holders. Banks' offer of liabilities repayable on demand is an effective means for assuring these debt holders that the banks will not change their risk structure.

Alternatively, if banks did assume more risk, the debt holders could readily demand higher compensatory rates of interest. Calomiris and Kahn (1991) similarly suggest that liabilities that can be withdrawn on demand restrain bankers with low ratios of equity to assets from engaging in inefficient actions, such as taking on high-risk, negative present value projects or withdrawing funds in the form of high dividends and salaries. Such bankers must be concerned that depositors will run if they have reason to fear that their bank might become insolvent. Hence, deposits that can be withdrawn on demand, or on short notice, serve as a means of restraining bankers and assuring depositors that bankers will not take advantage of them.

Those who believe that uninsured depositors cannot be relied on to monitor and restrain excessive risk-taking by deposit-insured banks, and that they should not be used for this purpose, emphasize three concerns: (1) uninsured depositors are unlikely to be able to monitor banks or to do so in a timely fashion; (2) even if they could evaluate bank performance, the additional interest that uninsured depositors might charge would be insufficient to affect bank behavior meaningfully; and (3), in any event, uninsured depositors are likely to withdraw their

³ See Benston and others (1986, Chapter 7), and Macey and Garrett (1988) for extended discussions and additional references.

funds rapidly (run) rather than monitor banks.⁴ Each of these concerns is analyzed in the following sections.

Ability to Assess Risk in a Timely Fashion

Randall (1990, p. 65) argues that “[m]arket analysts, whether they represent bank stock investors or creditors, have relatively little to go on in forming a judgment on the potential for major losses in a bank’s loan portfolio.” Consequently, they cannot monitor bank performance in a timely fashion. Even if a run by uninsured depositors were desirable as a means of disciplining bankers, Randall would argue (and Garten 1986 emphasizes) that it would come too late to affect bankers’ behavior.

Randall supports his conclusion with a careful study of 87 New

⁴ Several recent articles appearing in *The Yale Journal on Regulation* (Garten 1986; Macey and Garrett 1988; Garten 1988; and Mantripragada 1992) discuss the case for and against depositor discipline in some detail. Because the best expression of the case against relying on depositor discipline of which I am aware is given by Randall (1990), the sub-section of my paper on bank runs relies importantly on his article.

Garten (1986) bases her doubts about the usefulness of depositors to constrain bank risk-taking on the three reasons given above. Her long article (54 pages and 209 footnotes) is well summarized in her reply to a comment by Macey and Garrett (1988):

First, since a significant portion of uninsured deposits are maintained for reasons that have little to do with the risk and return associated with investments in particular banks, the majority of even uninsured depositors will not continuously monitor bank risk. Second, the structure of the deposit market provides strong incentives for all depositors to rely on the liquidity of their deposits, rather than analysis of bank disclosure, to protect themselves against risk. Third, for the same reasons, depositors as a group are unlikely to develop effective contractual mechanisms that will limit the inclination of bank management to take excessive risks. Finally, empirical studies of depositor behavior not only have failed to demonstrate that depositors will exert effective market discipline, but cannot explain why market discipline is not already working to constrain bank risk-taking (Garten 1988, pp. 241–242).

Her proposal for improving the situation is discussed later in the present paper.

Macey and Garrett (1988) criticize her 1986 article, emphasizing the ex ante effect of possible depositor withdrawals on banks’ propensity to take risks. In only 25 pages and 108 footnotes, they point out that it is not necessary that all depositors assess risks—marginal depositors are sufficient. In a reply of but 11 pages and 42 footnotes, Garten (1988) restates her original position and disputes (correctly, I believe) Macey and Garrett’s suggestion that depositors could protect themselves by obtaining contractual guarantees from banks to limit their risk-taking and banks could similarly protect themselves from depositor runs by contractually limiting depositors’ right to withdraw funds. However, she pays little heed to their valid points about ex ante effects and the role of marginal depositors.

Mantripragada (1992) reviews the well-known defects of the federal deposit insurance system, restates Garten’s concerns, and suggests that depositor discipline could be made effective if the policy were “to set insurance coverage limits in terms of the maturity of the deposits rather than to set dollar limits for coverage of all types of deposits. Under such a policy, deposit insurance will essentially be extended to all short-term or transactions deposits. . . . Deposits of longer maturities are actually financial investments and the government should not insure those investments . . .” (p. 571, emphasis in original). This proposal is considered below.

England commercial and savings banks that failed in the period from 1989 through 1992. In this study (Randall 1993), he examines the portfolios of the failed mature and new commercial and savings banks and compares them with banks that did not fail. He finds that "[c]ommercial real estate loans were the dominant factor in recent New England bank failures" (p. 14), particularly loans for construction and development.

Randall examines these banks' investments in commercial real estate loans for years before and after their nonperforming real estate loans exceeded 1 percent of total assets, which he defines as the "normal level." From this analysis, he concludes: "When nonperforming loans began to exceed normal levels, most banks had already ceased making commercial real estate loans and commercial and industrial loans or, if not, they pulled back at the first sign of credit problems" (p. 15). He finds that "[s]ubstantially all of the loans that caused the failures of the 87 banks in the study were on the books before the credit problems began to appear. No evidence was found of efforts to 'grow out' of lending problems" (p. 16). Furthermore, he states that "when credit problems first appeared, bankers either were already shrinking loan portfolios, both in total and in troublesome categories, or quickly began to do so" (p. 19).

This evidence supports Randall's previously expressed conclusion that "a sudden deterioration in such indicators [nonperforming loans, provisions for bad debts, and charge-offs] has little predictive value since it is seldom clear whether it is the result of a housecleaning, or the tip of an iceberg. . . . [Rather,] the best evidence of a potential credit problem is a rapid growth in a particular loan category with high inherent risk characteristics" (1990, p. 65). This leads Randall to conclude:

While greater emphasis on this type of analysis should help in timely evaluation of risk, standardized data pertinent to concentrations are limited. It is usually only in the later stages of risk-taking that the sophisticated market can clearly distinguish irresponsible overconcentrations from reasonable specialization. The typical depositor, and even the large depositor with analytical resources, has little potential for making timely judgments on bank risk-taking in loan portfolios.

Additional evidence seems to support this conclusion. Randall (1989) examines stock price movements, stock analysts' warnings, and bond rating changes for 40 large bank holding companies from 1980 through mid 1987, in the years before they revealed serious credit problems. About one-half of the cases were Southwestern banks that suffered losses when oil prices declined; most of the rest suffered real-estate-related losses. He finds that stock market participants were

unable to detect the problems before they were revealed by the banks' disclosures of high levels of nonperforming loans and loan loss provisions.

Simons and Cross (1991) examine the stock prices of 22 New England banks that were downgraded by examiners to a 4 or 5 CAMEL rating between 1981 and 1987.⁵ They compute cumulative stock-return residuals from the market model over the 52 weeks prior to the bank examination. Although the cumulative residuals are consistently negative in the aggregate and for 12 of the banks, the aggregate is not significantly different from zero and the cumulative residuals are consistently positive for 10 banks. A similar pattern is found for a control sample of 15 bank holding companies. Thus, they (like Randall) conclude that there is "no reason to believe that the prices of bank holding company stocks can be monitored [by uninsured depositors, among others] to improve the supervision of commercial banks" (p. 55).

However, several earlier studies (Pettway 1980; Pettway and Sinkey 1980; Shick and Sherman 1980) find that unexpectedly low stock price returns provide early warnings of serious bank problems. Gilbert (1990) reviews seven additional studies of bank equity share prices (see his Table 3, reproduced as an Appendix to this paper) from which he concludes (p. 17): "The only useful information from the empirical studies is that investors in bank stocks, who have the strongest incentives to be sensitive to the risk assumed by banks, are able to differentiate among banks on the basis of risk."

The distinction between the two groups of studies appears to be the severe and apparently unexpected decline in real estate values and oil prices experienced by the New England and Southwestern banks in the 1980s, as opposed to the bank-specific operating problems and general credit problems experienced by the banks in the 1970s. In his detailed examination of New England bank failures, Randall (1993, p. 15) reports: "Available evidence suggests that most decisions to discontinue lending were initiated by bank management rather than the supervisory authorities." Thus, the credit problems that resulted in the New England banks' severe problems in the 1980s appear to have been unexpected by both the bankers and their supervisors. As noted by Gilbert (1990, p. 16), a similar situation occurred with the Southwestern banks: "We cannot expect the participants in the market for bank stocks to have greater foresight in predicting the decline in the price of oil than the participants in the market for oil."

⁵ Banks are rated by supervisors on five factors: Capital, Asset quality, Management, Earnings, and Liquidity, giving rise to the acronym CAMEL. Each individual component, as well as a composite rating of all five factors, is assigned a score from 1 (strong) to 5 (likely to fail).

Furthermore, stockholders benefit when banks take risks (Benston 1984). Investments in risky real estate loans offer high returns as well as high losses. Indeed, considering that the FDIC takes up losses that exceed equity, stockholders (who can diversify their investments) should prefer banks with low levels of equity to take risks that offer even negative expected present values. Hence, Simon and Cross's (1991) finding that the stock prices of New England banks that took high credit losses did not decline until these losses were recognized should not be interpreted to mean that investors were not aware of the risks.

Some analysts (for example, Merton and Bodie 1993) also argue that it is difficult for depositors to assess the riskiness of banks' assets because such assets are inherently opaque. The essence of banking, they point out, is making loans to firms and people who cannot communicate clearly and publicly the risk of their enterprises (Diamond 1984). How, then, could depositors assess this risk? Four responses answer this question. First, banks disclose a considerable amount of information about their financial condition, such as call reports that include nonperforming loans and earnings statements that include loan loss provisions. Second, several private financial reporting services make comparisons among banks, giving details of their financial structures. Third, banks are examined in detail by federal agencies. The examiners' reports (or summaries thereof) could be made public.⁶

Finally, compare the information made available by banks with the information about most other corporations. The financial statements of other corporations often exclude important intangible assets (such as research and development, patents, advertising, and customer goodwill) and include fixed assets and inventories valued at cost numbers that diverge considerably from market values. Furthermore, unlike banks, few other corporations are directly comparable to each other. These corporations' financial statements are much more difficult to interpret than are those presented by banks. Yet, nonbank corporations regularly issue debt that is not guaranteed by the government.

The risk of uninsured lending to banks, however, is often greater than the risk of lending to nonbank corporations. Banks presently hold much lower ratios of equity capital to assets than do other corporations. Uninsured bank creditors thus have a much smaller equity cushion on which to rely. Hence, they must be concerned with decreases in asset values to a greater extent than holders of nonbank corporate debt, who usually must be concerned only that the corporations have sufficient net cash flow to pay the debt as promised.

⁶ See Garten (1986, pp. 141–47) for additional discussion and citations to supporting publications. Jordan (1993), President of the Federal Reserve Bank of Cleveland, strongly urges this disclosure.

Garten (1986), though, bases her conclusion—that noninsured depositors cannot effectively assess the risk to which their funds are subject—on the depositors' difficulty in determining the amount of loss they might take, should their banks fail. This problem is exacerbated, she says, by the uncertainty of predicting which banks the regulators will close. She proposes that banks' assets be stated at market values and that the regulators adopt a clear rule as to which banks they will close and the extent to which losses will be imposed on uninsured depositors. The structured early intervention and resolution procedure developed by Benston and Kaufman (1988) and essentially adopted in the Federal Deposit Insurance Corporation Improvement Act of 1991 (FDICIA) could provide such assurance, in large part because (if it were implemented) it is unlikely that a bank will fail with losses imposed on depositors.

Therefore, I conclude that depositors could assess the risks taken by their banks. At the least, they could make such assessments as effectively as can creditors generally.

Are Interest Charges Insufficient to Affect Bank Behavior?

In his comprehensive article, "Market Discipline of Bank Risk: Theory and Evidence," Gilbert (1990, p. 4) points out: "Proposals for the reform of deposit insurance that rely on market discipline assume that market participants can differentiate among banks on the basis of risk, and that market yields on bank debt reflect that risk." He reviews six studies on the market for uninsured deposits and six studies on the market for subordinated debt.⁷ He reports (p. 16):

The findings about the relationship between risk and interest rates on uninsured deposits and on subordinated debt are more mixed. Three of the six studies of bank CD rates report no evidence that higher CD rates are paid by banks that assume more risk. Four of the six studies of the determinants of rates on the subordinated debt of banks find no significant effects of risk measures on interest rates.

In addition to the studies reviewed by Gilbert, four other papers analyze the risk premia on large certificates of deposit (CDs). Cargill (1989), Hirschhorn and Zervos (1990), Keeley (1990), and Ellis and Flannery (1992) find that the interest rates on these largely uninsured deposits reflect the risk of the banks that issued them. Furthermore, Cook and Spellman (1991) find that the CD rates paid by savings and loan

⁷ Gilbert (1990), Table 3, reproduced as an Appendix to this paper. Nine studies on the market for bank equity also are reviewed.

associations responded to the market's perception of the insolvency of the Federal Savings and Loan Insurance Corporation (FSLIC).

Considering the reasonable assumption by uninsured depositors during the period examined in the studies that the FDIC was very likely to bail them out by arranging for the assumption of all deposits held by an insolvent bank, it is surprising that these studies find any relationship between risk and the interest rate paid to largely uninsured depositors. As Gilbert (1990, p. 16) notes, most of the banks studied are large banks that, for most of the periods studied, were considered to be "too-big-to-fail"—that is, too large for the losses to be imposed on their depositors.

Garten (1986, p. 134) raises an additional issue: "in order for market discipline to be effective, depositors must view their accounts as investments, in which case risk and return are the primary considerations in choosing a bank." She concludes (p. 134):

[F]or most depositors, a deposit account is less an investment than a product purchased for reasons that have little to do with either risk or return. These "involuntary depositors" . . . may be large uninsured depositors who use their accounts for other investment purposes . . . [I]nvestor-depositors are concentrated in the large national banks, making market discipline a possibility only for this relatively small group of institutions [footnotes omitted].

Although many (perhaps most) depositors may keep their funds in particular banks because these banks offer them services and convenience, it is difficult to accept her assertion that depositors have no or little regard for the possibility that their funds might be at risk of nonrepayment. If depositors (or any creditors) really believed that their funds were at risk, it is implausible that they would not demand rewards (for example, higher interest rates or "free" services) that reflect that risk, or assurances that their funds were not at risk.⁸

Hence, I find little merit in the assertion that uninsured depositors and other bank creditors could not, or would not, charge banks an interest rate that reflected the risk to which they were exposed. In addition, there is no reason to believe that banks would differ from other firms, in that they also would take the charge imposed by uninsured creditors into account in determining the level of risk that they would assume.

⁸ See Macey and Garrett (1988) for a more extensive discussion and critique of Garten's argument.

Runs by Uninsured Depositors

Demand depositors can almost immediately remove their funds from a bank they fear might have insufficient assets to repay their balances. The direct cost to uninsured depositors of withdrawals is very small, as demand depositors with accounts over \$100,000 usually have accounts in several banks and can transfer funds among these accounts. However, these depositors also tend to have borrowing and other financial relationships with their depositories. Hence, they bear the cost of disrupting and possibly severing these relationships, should they mistakenly run when their bank actually is solvent.

Time depositors and holders of certificates of deposit (CDs) cannot remove their funds until the maturity dates without incurring a penalty charge. However, banks almost never prevent time and savings depositors from withdrawing their funds, for fear of starting a run by demand depositors. Most banks that issue large (over \$100,000) CDs must roll them over almost continuously. Hence, banks can experience a slow run, should investors be unwilling to renew or newly purchase CDs that replace those that mature.

Randall (1990) expresses well the concern about runs, particularly on large banks. He says (pp. 67–68) that a run that causes “the isolated closure and liquidation of a single very large bank with well-known problems at a time when the domestic and international banking systems are in unquestioned good health . . . [would result in a considerable transitory disruption] with limited systemic effects and no prolonged negative impact from a macroeconomic point of view.”⁹ This is serious, he states, particularly if it were to be “taken as a precedent and result in instability at a later time when several large banks were in trouble.” The major policy issue, however, “would involve several large banks in danger of failing at about the same time, including some money center banks and perhaps a few major foreign banks.”

Because paraphrases cannot do justice to his specific and well-expressed concerns, I quote his explanations of them in their entirety (p. 68–69). My brief responses to the issues he raises follow each of his paragraphs.

Problems would likely stem from the impact of some economic event on several banks, and banks could be adversely affected by more than one economic event because of a coincidence in timing. There would likely be a

⁹ The Federal Reserve could use open market operations to offset a reduction in base money that would occur should depositors run to currency or redeposit funds in banks with reserve ratios that are higher than those of the original banks. The “health”—good or bad—of the domestic and international banking systems is irrelevant for the purpose of avoiding a negative macroeconomic impact.

high degree of public uncertainty as to the depth of the underlying economic problems and the timing of recoveries. Most uninsured depositors and other bank creditors would be concerned about the possible failure of particular banks, and would be prone to hasty reaction to rumors and misinterpretation of information. Adverse developments in one bank could cause instability in other banks perceived to have similar problems.

The situation described is based on several important assumptions. One is that banks have insufficient capital to absorb expected losses. A related assumption is that banks are insufficiently diversified, such that the negative effect of the economic event alluded to would render banks insolvent. However, if depositors believed that their funds were at risk, it is likely that most, if not all, banks would increase their capital or diversify their risks and take steps to assure their customers that their funds were safe, similar to the actions taken by nonbank corporations.

Supervisors would face similar uncertainties, even though they had much more information on the weaknesses of specific banks. While the depositor need only decide that the situation warrants pulling funds from one bank and putting them into another, the supervisor must determine if a particular bank is likely to fail, quantify the degree of any potential insolvency, and devise and execute a strategy for resolving the institution. A careful evaluation of the credit exposure of a troubled major bank involves a significant portion of the available examiner resources, and evaluations must be updated frequently as conditions change. When a number of large banks are in trouble at once, the supervisors will not necessarily be in a position to know the viability of a particular major bank when a deposit run develops. In a chaotic situation where depositors are rapidly shifting deposits from bank to bank, and creditors of banking concerns are refusing to roll over notes, the authorities must decide whether to seize particular institutions or support them, in some cases without a current evaluation.

In addition to the assumptions given above, Randall is assuming that the supervisors do not employ a system of automatic intervention when a bank's capital declines below prespecified levels, as is now required by FDICIA. With structured early intervention and resolution, it is doubtful that bank examiners and supervisors would have the heavy caseload described. Furthermore, FDICIA also established a continuous, on-site regulatory presence for large (over \$10 billion in assets) institutions. This means that, at least for this group of banks, a "current evaluation" will always be available.

The consequences of seizing an institution that is damaged, but still viable, are fairly serious, so the temptation will be to support banks in questionable condition until a reassessment can be made. Such support may involve heavy discount window lending on increasingly uncertain collateral.

This problem should be mitigated, but will not be eliminated, by prompt resolution techniques.

I agree with the final sentence, except that I would have said, "almost entirely mitigated." With structured early intervention and resolution, a seriously weak institution would not be permitted to continue operations without increasing its capital. Even without it, the actuality, as well as the possibility, of runs would force the supervisory authorities to take action expeditiously, even though they might prefer to wait and hope that conditions would improve, as Randall suggests. In addition, FDICIA restricts discount window borrowing to undercapitalized institutions.

In the payments area, sudden runs on a number of major institutions could place great pressure on banks and the Federal Reserve System to limit daylight and overnight exposure to other banks and customers. It is not hard to visualize scenarios in which the payments system would cease to function efficiently for an extended period while multiple runs on large banks continued. This could produce a snowballing of defaults and delinquencies, and lead to failures of weak firms and disruption of business generally. The effect could be to depress economic activity for a number of months.

Numerous borrowers would abruptly be forced to try to find other lenders as their usual banks experienced major deposit runs and were forced to suspend lending activities. Defaults could occur on bank and bank holding company debt as well as that of other firms, leading to a flight to quality and likely disruption in various markets. Some funds could flow to foreign banks in search of safety, disrupting normal intermediation patterns even where the funds continued to be denominated in dollars.

The disasters Randall sketches are possible, perhaps even plausible, if one assumes, as he does, that banks would not structure themselves to avoid runs. I believe not only that they would do so, if they believed it were necessary, but also that they would differentiate themselves from banks that were not prudently structured and operated, so that they would not be subjected to misinformed runs. Then, the specter of simultaneous runs raised by Randall would be unlikely to occur. He goes on to say:

The contagion of uncertainty could cause runs on any major foreign banks that were believed to be in difficulty, further adding to the general confusion. Bank supervisory, deposit insurance, and discount window personnel could become overwhelmed by the combination of failures of nonviable banks and liquidity crises in viable banks. This could result in delays and misjudgments that increased the costs to the insurance fund, the banking industry and the public, and prolonged the period of disruption.

Structured early intervention and resolution would work to keep supervisory personnel from being overwhelmed by failures. Indeed, very few failures would occur, as banks would have strong incentives to raise additional capital or merge with strong banks or even liquidate, rather than become progressively weaker until the bank supervisors took over or uninsured depositors decided to withdraw their funds rather than risk taking losses.

It is probably true that, even in a chaotic situation such as that described above, the total volume of deposits of the banking system would not be substantially reduced by direct conversion to currency or foreign-denominated balances. The amount of funds available for loans, however, could be substantially reduced. As deposits run from weak banks to stronger banks, the banks receiving the sudden influx of deposits cannot be expected to increase loans quickly, taking on customers squeezed out of other banks. Much of the influx would be considered temporary funds and invested accordingly. Capital adequacy considerations and the time necessary for information gathering, credit analysis, and loan approval would also limit the ability of healthy banks to absorb the lending activity of the weak and failing banks. Thus, a period of significantly reduced bank lending would result, with negative implications for the level of economic activity.

The failure of a bank does, indeed, disrupt its borrowers' economic situation, particularly for those borrowers who use only one bank. But the failure of any large company is disruptive to its customers and to its employees and their dependents. As is the situation for companies generally, customers and employees are likely to consider the possibility that a firm might not survive when deciding whether and how to establish and maintain a relationship with it. Unlike many nonbanks, though, banking products (for example, loans) have close substitutes offered by other banks and by nonbanks (although difficulty in transferring credit information might cause temporary dislocations). Thus, the failure of a bank, even a large one, is likely to be less disruptive than the failure of many other companies. Banks are special in that they are not very special.

The banking system is central to the payments mechanism and the provision of short-term credit, and also affects the financial markets and the transmission of Federal Reserve open market operations. The discussion above suggests that the level of disruption to the banking system and bank customers and creditors that could result from a crisis of confidence in the major banks could significantly depress the level of economic activity. It could also increase the losses to be absorbed by the banks, increasing the risk that the banking system itself could be overwhelmed and unable to support the deposit insurance fund.

Banks are indeed central to the payments mechanism. But many ways can be found to protect the payments system without protecting individual banks from runs. First, banks could limit their exposure with bilateral credit limits and net debit caps. They also might be required to hold capital or collateral sufficient to cover net uncleared funds. Or, participants could (and do) protect themselves much as they do when dealing with their other customers and correspondents or respondents, by refusing to extend credit to banks that are undercapitalized. Second, the legal obligations of all participants in the payments system can be clearly specified, in order to reduce the cost of litigation. Third, participants in the system could agree to guarantee the obligations of a defaulting institution, with each assuming a pro rata share of its settlement obligation. These procedures are employed by CHIPS, the multilateral payment netting and settlement system operated by the New York Clearing House Association. Federal Reserve charges for overdrafts give participants further incentives to reduce the amount of uncleared funds outstanding. Or, the Federal Reserve System could permit only transfers against funds known to be in place.¹⁰

Banks are not central, however, to the transmission of Federal Reserve open market operations. These need not be conducted directly through banks; about one-half of the security dealers the Fed trades with are not banks. Lack of public confidence in major banks would not affect the efficiency with which open market operations could be conducted or cause a financial or economic crisis.

Finally, there is little evidence that bank runs have been contagious, causing the failure of solvent banks. Kaufman (1994) reviews studies of the effect on other banks of the failures of six large banks in the United States between 1973 and 1988, three bank failures in Hong Kong between 1982 and 1985, two bank failures in Canada in 1985, and the unexpected announcement of suspended debt repayments by Mexico, Brazil, and other Latin American countries in 1982, 1983, and 1987. These studies found no failures of similar banks and little evidence of deposit outflows. Most of the studies examined the stock prices of other banks to determine whether the failure or lesser problems of a large bank affected the economic value of similar banks. Kaufman (1994, p. 141) reports that "[w]ith only rare exceptions, these studies report strong evidence that contagion of share returns occurred only for banks in the same market or product area as the initially affected bank. Investors successfully differentiated among banks. Strong shocks to one

¹⁰ See Gilbert (1989) for a description of payments system risk, the Federal Reserve's procedures, and an analysis of the effect of the Fed charging for daylight overdrafts.

bank or group of banks did not spill over to other banks randomly or to all banks."¹¹

Dwyer and Gilbert (1989) review the evidence on bank runs and the methods adopted by banks to cope with them in the period before enactment of deposit insurance. After analyzing a considerable amount of data on banking panics between 1857 and 1933, they state (p. 55):

In sum, two things seem to be clear from these data. First, some holders of bank liabilities did bear significant losses during periods with runs. These losses were not necessarily caused by the runs themselves. . . . Second, before the creation of the Federal Reserve, depositors' loss rates from failed banks were declining over time.

They conclude (p. 60):

While several runs on the banking system took place before the formation of the Federal Reserve System in 1914, banks took actions that limited their effects. By issuing clearinghouse loan certificates that other banks accepted to clear checks, banks operated temporarily with relatively low reserve ratios. In the more severe runs, bankers jointly restricted payments but continued operating. Moreover, even prior to the creation of the federal safety net in the United States, runs on the banking system were infrequent. The banking system can operate for many years without runs on the banking system, even in recessions.

Although I believe that Randall overstates the seriousness and frequency of the problems that might result from the failure of large banks, many of his concerns are plausible, given two important assumptions. One is that banks have such a low level of capital for absorbing losses that uninsured depositors have reason to believe that their funds would be in danger if they did not withdraw them immediately. The second is that the situation described does not consider bankers' behavior if they had reason to fear runs by depositors.

Both of these related assumptions describe the present situation, where uninsured depositors (and their bankers) have reason to believe that they are not at risk. As long as banks are considered to be "too-big-to-fail" (or, rather, too big to have their costs inflicted on uninsured depositors), the scenario painted by Randall might best be described as a self-created crisis, where the regulators believe they must intervene

¹¹ Further, although Garten (1986, footnote 9, p. 130) states: "Even now, few—if any—depositors count on the protection afforded by federal intervention to prevent bank failure, as is vividly demonstrated by the frequency of bank runs," I could find only one citation to a bank run in her paper. She reports that depositors ran on a New York City Chinatown bank "following rumors that a bank officer had been identified at an organized crime hearing as the 'godfather' of Chinatown's underworld" (p. 137, and footnote 32, p. 133).

because they have established a situation where banks, rationally, have not taken actions that would make such intervention generally unnecessary. Furthermore, with structured early intervention and resolution implemented as suggested by Benston and Kaufman (1988) and outlined below, it is unlikely that the authorities would have to intervene to prevent uninsured depositors from having to take losses.

Limiting Deposit Insurance Coverage: Coinsurance, Limited Insurance, and Depositor Preference

This section will consider briefly some proposed and enacted methods of limiting the claims of depositors and other creditors to the deposit insurance fund.

Coinsurance

Coinsurance is an often-used means by which insurers reduce moral hazard costs that might be imposed by insureds. Two forms may be distinguished. One, modeled on the system used in the United Kingdom, would pay depositors a fraction of their deposits, perhaps up to some limit. In the United Kingdom, depositors may receive 75 percent of their deposit balances up to £20,000, or a maximum of £15,000 (approximately \$22,000). The second, suggested by the American Bankers Association (1990), would impose an automatic "haircut," or reduction in the amount of the uninsured deposit balance, equal to the average loss incurred when a bank failed (approximately 10 percent).

Randall (1990, p. 69) points out that partially insured depositors still would have incentives to withdraw their funds before their bank was declared insolvent, thereby saving them the coinsurance amount that otherwise would be lost. Thus, if runs are a concern, these proposals would be less acceptable, as they would put all deposits at risk and hence give all depositors incentives to run.

Limited Insurance

Deposit insurance might be limited to short-term deposits, which would be fully insured (Furlong 1984; Mantripragada 1992). Thus, depositors who could run would have no incentive to do so. Deposits that could not be withdrawn before some specified time period, presumably at least through the period between bank examinations plus some additional time for the authorities to act (in all, perhaps two years), would be entirely uninsured. In effect, time deposits (including CDs) that could not be repaid before the authorities had time to close an insolvent or unsafely managed bank would serve to absorb losses, much

as capital and subordinated debt absorb them. Furthermore, holders of such deposits would have strong incentives to monitor banks' activities and to demand assurances that banks would not take excessive risks or change their risk profiles or would pay compensatory interest rates.

Four possible problems with this proposal should be mentioned. First, the status of deposits with remaining maturities of less than approximately two years is not clear. These deposits might be insured to prevent slow runs. In this event, however, banks would have considerable incentive to offer only time deposits with maturities of less than two years. As a result, many banks would subject themselves to interest-rate risk, since they would shorten the duration of their liabilities.

Second, banks would probably collateralize many, if not most, of their uninsured time deposits. While this of itself is not an undesirable move, it would serve to obviate the role of uninsured time depositors in bringing market discipline to bear on banks' activities. It also would shift a considerable amount of banks' assets from loans to Treasury and other market instruments.

Third, banks would have to be prevented from directly or indirectly repaying uninsured time-dated deposits in advance. If this were not done, the goal of preventing runs would not be met. However, if the possibility and actuality of runs were considered to be desirable (as is suggested above), there is an advantage in allowing banks to redeem time-dated deposits early at a discount (as they now do). If banks refused such redemptions, they would be signaling the supervisory authorities that they were suffering financial difficulties.¹²

Fourth, even though time-dated deposits were said to be uninsured, it is likely that holders of these deposits would seek protection if their banks failed with losses imposed on the depositors. The depositors probably would claim that they did not realize that these bank deposits, unlike demand deposits and time deposits with maturities of less than two years, were not insured. As is noted below, it would be difficult for legislators and the banking authorities to deny such claims, particularly if the uninsured time-dated deposits were in amounts of less than \$100,000.

Depositor Preference

The Omnibus Budget Reconciliation Act of 1993 includes a provision that gives preference to depositors and the FDIC over other creditors in the event that a bank is insolvent. This presumably was enacted as a means of reducing the costs to the FDIC. The cost savings would be reduced, however, if banks gave the nonpreferred creditors

¹² This might be considered a form of Wall's (1989) "puttable subordinated debt" proposal.

(or they demanded) effective 100 percent insurance by collateralizing their debt. The assets used as collateral thus would no longer be available to the FDIC. Uninsured depositors also would no longer benefit from the collateralized assets, but they would gain by obtaining a preference over noncollateralized, nondeposit creditors.

The consequences of federal depositor preference can be inferred from the experience of thrifts in the 23 states with depositor preference laws (as of December 31, 1987). Hirschhorn and Zervos (1990, p. 119) find that thrifts "adopting depositor preference would increase the average proportion of total (both secured and unsecured) nondepositor claims that are collateralized from 47 percent to 60 percent. This would represent a collateralization of 25 percent of currently unsecured nondepositor claims." Furthermore, they find that "the effect is significantly larger for institutions that are more likely to fail. Thrifts with negative net worth would collateralize 99 percent of unsecured nondepositor claims, and thrifts with net worth between 0 and 3 percent would collateralize 54 percent of such claims" (pp. 119-120). They also find that interest rates on partially insured large CDs would decrease by 6 to 14 basis points for solvent thrifts, and by 8 to 18 basis points for insolvent thrifts, the amounts increasing with the maturities of the CDs (p. 122).

It should be noted that banks could raise funds by selling assets rather than by engaging in collateralized borrowing. The result would be a similar loss to the FDIC and uninsured depositors of these banks' best assets. Indeed, banks with low capital-asset ratios would be better advised to reduce their assets rather than borrow. It also should be noted that thrifts probably used collateralized borrowing because a major source of their funds has been advances from Federal Home Loan Banks, which make only collateralized loans.

Consequently, depositor preference should make little difference in the amounts absorbed by the FDIC when banks fail, with one exception. It should be more difficult for bank creditors who are not explicitly identified as depositors to make claims on the deposit insurance fund.

Conclusions with Respect to Uninsured Depositors

I find that the objections to uninsured depositors serving as effective monitors of banks' risk-taking activities are not generally valid. First, uninsured depositors can assess credit risk at least as well as can creditors of nondepository corporations. Indeed, there is reason to believe that the risks taken by banks are easier to estimate than are the risks taken by other corporations. (However, given the present low level of banks' equity capital, uninsured lenders to banks have little scope for measurement errors.) Although the evidence suggests that the large losses absorbed by banks that loaned to commercial real estate devel-

opers and oil producers were not predicted by the stock market, it appears that these losses were also not predicted by bank managers or by the regulatory authorities.

Second, evidence shows that holders of *de jure* partially insured CDs and *de jure* uninsured debt differentiate among banks with different degrees of risk. They make this assessment even though partially insured depositors and even uninsured debt holders have had good reason to believe that they would be bailed out by the deposit insurance agencies. Aside from this evidence, there is no reason to believe that bank creditors who were actually at risk would not behave as do creditors generally, by demanding assurances and interest rates that compensate them for expected losses.

Third, the well-expressed concerns about bank runs delineated by Randall (1989) are considered and largely rejected. Indeed, if it were accepted that bank runs could occur, it is likely that banks would hold sufficient capital and organize their activities so as to assure depositors that their funds were not at risk.

Nevertheless, the banking authorities appear to believe that runs on large banks could be severely disruptive, as does Randall, despite evidence and reasoning to the contrary. As Kane (1988, 1992) has emphasized, and as is discussed above, the authorities have considerable incentives to avoid bank runs and few incentives to permit large banks to fail, even though such failures probably would reduce future costs to the FDIC and uninsured depositors. The experience of the United States and many other countries indicates that depositors will rarely be permitted to absorb losses from bank failures.¹³ Consequently, despite my previous conclusion that uninsured depositors can be effective monitors and controllers of bank risk, I suggest that we must look to other sources of market discipline. The two remaining sources are subordinated debt and equity capital.¹⁴

*Subordinated Debt*¹⁵

Subordinated debt should be considered fully as bank capital, as it serves to absorb losses that would be imposed on the FDIC as much as does equity capital. It differs from other debt in that it cannot be collateralized or redeemed, directly or indirectly, before the authorities can act to

¹³ See Benston (1994) for a review of this evidence.

¹⁴ Much of the material on subordinated debt and equity capital is taken from Benston (1992).

¹⁵ See Benston and others (1986, Chapter 7, section IV) for a more complete description and Osterberg and Thompson (1991) for a formal analysis and additional references to much of the relevant literature.

reorganize or close a bank. Hence, subordinated debt ought to have a remaining maturity of at least two years, and the bank or its subsidiaries should not be permitted to purchase it at any time. Because holders of subordinated debt are not depositors and cannot expect to be reimbursed by the FDIC, they should serve well as monitors over banks' activities.

Subordinated debt has at least six important advantages over deposits and equity capital. First, subordinated debt holders cannot run; hence authorities should have no concern about the disruptive effects of runs should they close a bank. Second, subordinated debt promises an asymmetric payoff. Should a bank do well, debt holders collect only the interest promised. Should a bank do badly, the debt holders will absorb losses that exceed the equity holders' investment. Third, the interest on subordinated debt serves as a risk-adjusted deposit insurance premium, because the debt holders stand to lose should a bank engage in risky activities; hence, they will have to be reimbursed for this perceived ex ante risk or they will not purchase the debentures.

Fourth, when subordinated debt is publicly traded, the authorities are provided with an early warning signal in the form of the interest rate demanded on the debt and any difficulty a bank has in replacing maturing debt. Fifth, subordinated debt probably can be sold by closely held banks at a lower cost than that of obtaining additional equity. Owners of such banks may not want to invest more of their personal wealth (thereby subjecting themselves to undiversified portfolios, particularly when they also work for these banks); outside investors rarely are interested in being minority shareholders. Closely held banks and banks with thinly traded securities can, however, sell subordinated debentures to the public or to institutional investors such as pension funds and other banks, which are capable of monitoring the banks' activities. Sixth, interest on subordinated debt is a tax-deductible expense; hence, this debt is no more costly (with respect to taxes) to a bank than are deposits. Indeed, subordinated debt differs from time deposits only in that the debt is explicitly and implicitly not government-insured.

Note that should losses deplete or wipe out a bank's equity capital, subordinated debt holders become partial or full equity holders. To the extent that they become equity holders, they have incentives to increase the put option value of deposit insurance by increasing risks. Therefore, unless the bank supervisors reorganize or close a bank before this occurs, an important advantage of subordinated debt will be lost.

Equity Capital

Equity holders clearly have incentives to monitor bank performance. However, they can benefit from a high degree of risk-taking because they get all the returns from successful outcomes but absorb

losses only to the extent of their investments in the bank. In effect, equity holders have a "put option" on the bank, with the exercise price the amount owed to depositors. As noted above, the option usually has value to bank equity owners because, unlike most other creditors, the FDIC does not price its deposit insurance to account sufficiently for the risks taken by banks.

The value of the "deposit-insurance put option" to a bank managed to maximize the wealth of its owners increases with the variance of returns and the time it takes the authorities to take over a failing bank. As a bank's capital declines towards zero, the value of this put option increases because the equity holders have less to lose.¹⁶ Once the value of the equity goes below the point where the option might be exercised, equity holders have incentives to increase its value. They can do this by increasing the riskiness of the bank's investments and operations, withdrawing funds from the bank, and delaying actions by the FDIC to displace them. (They may be constrained, however, by their managers, who are subject to severe civil monetary penalties and possible criminal prosecution for operating the bank in an unsafe manner.)

The value of the deposit-insurance put option, and hence the incentive for bank owners to increase risk as their economic capital declines towards zero, can be reduced, if not entirely eliminated, by higher capital requirements and a system of structured early intervention and resolution.

Higher Capital Requirements and Structured Early Intervention and Resolution

Structured early intervention and resolution was first proposed by Benston and Kaufman (1988) and has been largely (if insufficiently) adopted in FDICIA in 1991.¹⁷ A brief description should provide the key elements of the system.¹⁸

Bank capital should include both equity and subordinated debt. Capital should be measured in terms of the economic market values of a bank's assets and liabilities. However, the proposed scheme also can be effective when capital is measured according to traditional accounting

¹⁶ See Merton (1977) for a formal analysis and Marcus and Shaked (1984), Ronn and Verma (1986), and Pennacchi (1987) for applications.

¹⁷ The intellectual history of structured early intervention and resolution is described in Benston and Kaufman (1993a, Chapter 1). A complete description of the system, an analysis of its advantages and shortcomings, and a comparison with the system adopted in FDICIA can be found in Benston and Kaufman (1993b).

¹⁸ The description is taken largely from Benston (1994) and is based on Benston and Kaufman (1993b) and Shadow Financial Regulatory Committee (1989).

values, particularly when the Financial Accounting Standards Board's requirements for stating financial instruments at market values are fully adopted. Four explicit, predetermined ranges or tranches of capital-to-asset ratios are specified. Assets and liabilities include off-balance-sheet accounts. Assets are not classified according to risk because of the difficulties in measuring *ex ante* risk accurately.

- (1) Banks are considered to have *adequate capital* when it is 10 percent or more of their total assets, measured in terms of market or current values.¹⁹ Banks falling into this first tranche would be subject to minimum regulation and supervision.
- (2) Banks with capital-to-asset ratios of 6 to 9.9 percent are at the *first level of supervisory concern*. A bank in this second tranche is subject to increased regulatory supervision and more frequent monitoring of its activities. It is required to submit a business plan to raise more capital. At its discretion, the bank supervisory authority could require the bank to suspend dividend payments and to obtain approval before transferring funds within a holding company system; the authority could also restrict the growth of bank assets.
- (3) The third tranche is the *second level of supervisory concern*; it is reached when a bank's capital ratio falls below 6 percent but is at least 3 percent. Banks in this range are subject to intense regulatory supervision and monitoring. The supervisory authority is required to suspend dividends, interest payments on subordinated debt, and unapproved outflows of funds to the bank's parent or affiliates. The institution must submit an emergency plan for its immediate recapitalization to the tranche one level.
- (4) Finally, when a bank's capital falls below 3 percent of its assets, it is in tranche four—*mandatory recapitalization and reorganization*. The supervisory authority is required to quickly recapitalize the bank, merge it, or liquidate it in an orderly fashion by the sale of individual assets. The present owners and subordinated debt holders (who might, by then, be the owners) have the options of implementing more quickly the emergency plan they submitted when the institution moved into tranche three, or of electing not to inject additional funds into the bank. If the owners and debt holders elected not to recapitalize the bank, any residual value from its sale or liquidation of its assets would be returned to them, after allowing for costs incurred.

¹⁹ The percentages are suggestive; they should be based on research findings. If book values are used, the percentages should be higher.

Conclusions

With a system of structured early intervention and resolution in place, deposits could be fully (100 percent) insured. Even though depositor runs do not pose a serious problem to the banking system or the economy, but rather can be beneficial for motivating and rewarding banks to operate prudently, a reason for 100 percent deposit insurance remains. At present, very large banks are seen as being “too-big-to-fail”—that is, to have costs imposed on depositors, should these banks fail. As a result, smaller banks are disadvantaged, giving rise to an inequity. Additional inequities are the imposition of deposit insurance premiums on all domestic deposits, even though only the first \$100,000 is explicitly insured, and the exemption from deposit insurance of foreign-branch deposits, even though these deposits are de facto covered. These inequities could be eliminated with 100 percent explicit deposit insurance coverage. Of course, such coverage removes depositors as monitors and market disciplinarians of banks. But, as described above, the use of subordinated debt as part of capital, higher capital requirements, and structured early intervention and resolution would impose a more effective means of market discipline. It also would eliminate almost entirely the need for deposit insurance premiums and, for adequately capitalized banks, it would provide relief from close supervision by the banking authorities and from almost all current restrictions on assets and on banking activities.

Appendix Table²⁰
 Implications of Empirical Studies for the Effectiveness of Market Discipline
 of Bank Risk

Authors	Relationships estimated	Results	Results consistent with the effectiveness of market discipline
MARKET FOR BANK EQUITY			
Beighley, Boyd and Jacobs (1975)	Share prices of bank stocks estimated as a function of (1) capital ratios, (2) earnings and growth of earnings, (3) asset size, and (4) loss rates.	Holding constant the influence of earnings, banks with higher capital ratios and lower loss rates tend to have higher share prices.	Yes
Pettway (1976)	Betas for individual banks (a measure of risk derived from stock prices) estimated as a function of the capital ratios of individual banks.	The coefficient on the capital ratio is negative for one year but insignificant for other years. The negative coefficient on the capital ratio indicates that investors consider banks with higher capital ratios to be less risky.	Yes
Pettway (1980)	For several large banks that failed, returns to shareholders are simulated for several years prior to their failure. Simulations are based on returns from holding stocks of large banks that did not fail.	On average, returns on the stocks of banks that failed declined relative to simulated returns two years before failure.	Yes
Brewer and Lee (1986)	Betas for individual banks are estimated as functions of ratios from balance sheets and income statements used by bank supervisors to reflect risk.	Some of the measures chosen to reflect risk have positive, significant regression coefficients.	Yes
Cornell and Shapiro (1986)	Returns to shareholders of 43 large banks are estimated as functions of the composition of their assets and liabilities in the years 1982-83.	The percentage that Latin American loans was of total assets had a significant, negative impact on returns in 1982. Energy loans had a negative impact in 1982-83. Loans purchased from Penn Square Bank had a negative impact on returns in the month in which that bank failed.	Yes

²⁰Table 3, reproduced from W. Alton Gilbert, "Market Discipline of Bank Risk: Theory and Evidence," Federal Reserve Bank of St. Louise Review, January/February 1990, pp. 13-15.

Appendix Table continued
 Implications of Empirical Studies for the Effectiveness of Market Discipline
 of Bank Risk

Authors	Relationships estimated	Results	Results consistent with the effectiveness of market discipline
MARKET FOR BANK EQUITY continued			
Shome, Smith and Heggstad (1986)	Prices of bank stocks are estimated as a function of its earnings and capital ratios.	The coefficient on the capital ratio is positive and significant for some years, insignificant for other years.	Yes
Smirlock and Kaufold (1987)	Changes in stock prices of large banks at the time of the announcement by Mexico in 1982 of its moratorium on debt payments as a function of the ratio of Mexican debt to equity capital at individual banks.	Coefficient on the ratio of Mexican debt to equity capital is negative and significant. Banks were not required to disclose their Mexican debt at the time of the 1982 moratorium.	Yes
James (1989) and Cargill (1989)	Returns on holding the stock of BHCs estimated as a function of the change in the market value of the BHCs' loans to less-developed countries and dummy variables for individual banks and individual time periods.	The change in the market value of loans to less-developed countries has a positive, significant coefficient which is not significantly different from unity.	Yes
Randall (1989)	This is a case study of 40 BHCs that reported relatively large losses in the 1980s. For each BHC, a time period is designated when it began assuming relatively high risk and a time period when problems became public knowledge. Stock prices are compared to market averages before and after the problems became public knowledge.	Stock prices of the BHCs that reported relatively large losses declined relative to market average stock prices only after the problems became public knowledge, not during the periods in which the banks began assuming relatively high risk.	No
MARKET FOR UNINSURED DEPOSITS			
The interest rate on large denomination certificates of deposit is the dependent variable in each study.			
Crane (1976)	Identifies the determinants of the CD rate using factor analysis.	The factor that reflects profit rates and capital ratios is not a significant variable in explaining the CD rate.	No

Appendix Table continued
 Implications of Empirical Studies for the Effectiveness of Market Discipline
 of Bank Risk

Authors	Relationships estimated	Results	Results consistent with the effectiveness of market discipline
Herzig-Marx and Weaver (1979)	Estimates CD rates as a function of variables used by bank supervisors to reflect risk.	Of bank risk variables, only the liquidity measure has a significant coefficient. Capital and loss ratios have insignificant coefficients.	No
Baer and Brewer (1986)	CD rate estimated as a function of variables used by bank supervisors to reflect risk, and separately, as functions of level and variability of the prices of bank stocks.	Coefficients on risk measures used by bank supervisors are not significant. Measures of the level and variability of stock prices help explain CD rates.	No
James (1987)	The average interest rates paid by 58 large banks on their large denomination deposits are estimated as functions of leverage, loan loss provision divided by total loans and the variance of stock returns.	Each of these measures of risk have positive, significant coefficients.	Yes
Hannan and Hanweck (1988)	CD rate is estimated as a function of (1) the variability of the ratio of income to assets, (2) the capital ratio and (3) bank assets.	These three variables have significant coefficients. CD rates tend to be higher at banks with more variable income and lower capital ratios, holding constant the influence of total assets.	Yes
James (1989)	Interest cost on large CDs estimated as a function of risk measures: domestic loans/capital, foreign loans/capital and the loan loss provision/total loans.	Interest cost positively related to the ratio of domestic loans to capital and the loan loss provision. The negative relation between interest cost and the ratio of foreign loans to capital is interpreted as evidence of an implicit government guarantee of foreign loans.	Yes

Appendix Table continued
 Implications of Empirical Studies for the Effectiveness of Market Discipline
 of Bank Risk

Authors	Relationships estimated	Results	Results consistent with the effectiveness of market discipline
MARKET FOR SUBORDINATED DEBT:			
In each study the measure of the interest rate on the subordinated debt of banks is the rate on the subordinated debt minus the rate on long-term U.S. Treasury securities, called the rate premium.			
Pettway (1976)	The rate premium is estimated as a function of the capital ratio of banks and other independent variables.	The coefficient on the capital ratio is not significant.	No
Beighley (1977)	The rate premium is estimated as a function of several measures of risk, including a loss ratio and a leverage ratio.	The coefficients on the loss and leverage ratios are positive and significant.	Yes
Fraser and McCormack (1978)	The rate premium is estimated as a function of the capital ratio and the variability of profits divided by total assets.	Neither independent variable has a significant coefficient.	No
Herzig-Marx (1979)	The rate premium is estimated as a function of several measures of risk assumed by banks.	None of the risk measures have significant coefficients.	No
Avery, Belton and Goldberg (1988)	The rate premium is estimated as a function of risk measures derived from balance sheets and income statements and of the asset size of banks.	Coefficients on the risk measures derived from balance sheets and income statements are not significant.	No
Gorton and Santomero (1988)	Use data in Avery, Belton and Goldberg (1988) to derive a measure of the variance of assets of banks implied by a contingent claims valuation model. The measure of the variance of assets is estimated as a function of the risk measures derived from balance sheets and income statements.	Some of the risk measures derived from the balance sheets and income statements have significant coefficients.	Yes

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