

Market discipline and subordinated debt: A review of some salient issues

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Introduction and summary

Academics and regulatory economists have long been concerned that mispriced deposit insurance undermines monitoring of banks by investors and increases incentives for bank risk-taking. Government supervision provides a partial substitute for the private corporate governance services provided by a firm's shareholders and creditors. As financial firms have become more complex, however, government supervisors have found it more difficult to monitor them in a timely manner. This is particularly true of large, complex banking organizations. Accordingly, many analysts—both inside and outside the regulatory agencies—have suggested that supervisors should rely on “market discipline” to supplement their traditional supervisory methods (Meyer, 1999). The Basel Committee on Banking Supervision's consultative paper on capital adequacy (Basel Committee, 1999) asserts that “[m]arket discipline imposes strong incentives on banks to conduct their business in a safe, sound, and efficient manner,” and designates market discipline as one of the three pillars on which future financial regulation should be based. (The other two pillars are minimum capital standards and supervisory review of capital adequacy.)

The Basel Committee's (1999) consultative paper puts forth few concrete proposals for achieving a greater role for market discipline. The paper's proposals were concerned primarily with requiring greater transparency—certainly a *sine qua non* of effective market discipline. However, a more concrete potential market discipline mechanism, in the form of subordinated debt requirements, has long been discussed in academic and some regulatory circles.¹ Such proposals are currently gaining regulatory prominence, particularly in the U.S. A Federal Reserve task force recently investigated whether requiring large banking firms to issue subordinated debt on a regular basis would enhance supervision. The resulting study,

Kwast et al. (1999), includes a summary of 11 different previous proposals (table 1 in their study). In their response to the Basel Committee (1999), the U.S. Shadow Financial Regulatory Committee came out strongly in favor of mandated subordinated debt as a mechanism for realizing enhanced market discipline of banks (see Kaufman et al., 2000). Evanoff and Wall (2000) provide another summary of subordinated debt arguments and address some potential criticisms. The wide-ranging Gramm–Leach–Bliley Act of 1999 mandates that the Treasury and Federal Reserve conduct a study of the advisability and optimal design of a mandated subordinated debt requirement and report back to Congress in 2001. In the interim, the 50 largest nationally insured banks, if nationally chartered, are required to have at least one issue of debt outstanding rated A or better.

Despite its increasing popularity as a potential means for controlling bank risk-taking, the term “market discipline” is commonly used with two importantly different meanings. Bliss and Flannery (2000) argue that the concept of (effective) market discipline incorporates two distinct components: investors' ability to *evaluate* a firm's true condition; and the *responsiveness* of firm managers to the investor feedback impounded in security prices or, alternatively,

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regulatory feedback triggered by changes in security prices. Although the banking literature often fails to distinguish clearly between these components, their implications for regulatory reform differ substantially. Following Bliss and Flannery, this article defines two distinct aspects of market discipline: market monitoring and market influence.

- *Market monitoring* refers to the hypothesis that investors accurately understand changes in a firm's condition and incorporate those assessments promptly into the firm's security prices. Monitoring generates the market signals to which managers are thought to respond.
- *Market influence* is the process by which a security price change engenders firm (manager) responses to counteract adverse changes in firm condition.²

Most studies of market discipline in the banking literature are in fact studies of market monitoring. For market discipline to be effective, it is necessary that both components of market discipline obtain.³ The purpose of market discipline in the context of bank regulation is, after all, to control or effect changes in bank behavior.

The intuition underlying efforts to enhance market discipline of banking firms through mandated subordinated debt issuance is both simple and intuitively appealing. Risky-bond investors can enhance their wealth and welfare by evaluating default risks carefully and demanding adequate compensation for the risks they assume. Shareholders and their agents the firm managers then evaluate the full range of costs and benefits associated with any decision, conscious that increasing asset risk is likely to raise the cost of debt. Ideally, the resulting firm decisions will be socially appropriate.

This article examines this intuition from a number of perspectives. The large literature on corporate governance—the problems that lead to a need for discipline and the mechanisms that markets have evolved to discipline firms—points to many ways that markets in unregulated industries can discipline firms. The central focus of this literature (both theoretical and empirical) is on the manager as the decision-making agent in the firm and on the manager's incentives. Disciplinary mechanisms include boards of directors, hostile takeovers, actions by large stockholders, performance-based compensation, and the managerial labor market. The little evidence on how these factors operate in banking suggests that regulation is accompanied by a weakening of normal market disciplinary mechanisms. In this literature, to the extent that investors play a direct role at all, it is the

equity holders who are presumed to have the strongest ability to influence managers.

A thread running through the subordinated debt literature is that equity holders, while they may be able to influence managers, indeed they are frequently assumed to be the managers, nonetheless have incentives that are opposed to the interests of bondholders and regulators in ensuring that firms avoid undue risk-taking. This presumption leads to downplaying the role of equity holders in potentially enhanced market discipline of banks and of equity prices as signals of bank problems. The appendix discusses the sources for this argument and argues that a more realistic view of equity holders' interests suggests that ignoring this source of discipline and market information might be unwise.

Subordinated debt proposals rely in part on evidence that bond yield spreads reflect bank risk. This has been confirmed in numerous studies. In this article, I raise two important questions. The first question is "What else do bond yield spreads reflect?" As is occasionally noted, bond yield spreads are noisy measures of risk. The noise however is not random, rather it reflects numerous other factors that systematically affect bond yields—stale quotes, liquidity, embedded options, supply–demand factors, and Treasury bond market factors. Given the presence of substantial noise in bond yields, the second question is "Can we therefore use yields to reliably infer risk?" I show that when risk is measured by bond rating (a statistically significant predictor of yield spreads), yields spreads are poor predictors of risk. The underlying source of this failure, the presence of non-risk-related factors in bond yields, is likely to produce the same effects when "risk" is measured in other ways.

My goal is to point out previously underemphasized issues, raise questions, and examine assumptions in order to better inform the ongoing discussion, rather than to offer firm conclusions regarding how best to make market discipline an adjunct to regulatory discipline in banking. My analysis suggests that consideration should be given to examining existing regulatory barriers to the normal corporate governance mechanisms; that an undue emphasis on any single market signal may be suboptimal; and that the assumed superiority of yield spreads as measures of insolvency risk (*vis-à-vis* equity returns and accounting-based models) needs to be assessed empirically.

First, it is helpful to note how subordinated debt proposals differ in structure and rationale. This will provide a context for examining in detail the literature on corporate governance and the informativeness of bond yields.

Overview of subordinated debt proposals

The numerous current subordinated debt proposals vary in their underlying goals and objectives. These can, however, be broken down into three underlying rationales:

- 1) Subordinated-debt holders may *directly influence* banks to prevent them from taking on too much risk.
- 2) Yields on subordinated debt may provide *additional useful information* to regulators to assist in supervision.
- 3) Prompt corrective action (PCA) or automatic bank portfolio changes can be tied to yields on subordinated debt, preventing unwise regulatory forbearance and providing, in effect, a *regulatory fail-safe mechanism*.

Each rationale relies on slightly different definitions of the problem subordinated debt proposals are intended to solve, and each is predicated on different, though not mutually exclusive, assumptions and analysis of the extant evidence. The direct influence rationale seeks to supplement existing regulatory influence with market influence.⁴ The desire to do so is in part motivated by resource limitations of supervisors—markets are thought to provide continuous monitoring and influence, while supervisors examine banks infrequently—and presumed informational advantages of market participants. The evidence that is usually cited to support this rationale includes the observation that risky banks pay higher yield spreads and issue less uninsured debt. Another piece of supporting evidence is the observation that derivatives market participants frequently decline to trade with low-rated counterparties (Greenspan, 2000). The direct influence rationale relies on the operation of market discipline across all banks—preventing sound banks from becoming marginal in the first place and causing marginal or unsound banks to become less so.

The additional information rationale is predicated on the assumption that market participants are able to analyze public, and perhaps private, information in ways not available to regulators—perhaps due to a better understanding of the bank’s operating environment or a better understanding of the valuation of complex positions. The additional information rationale seeks to harness this market information, reflected in subordinated debt prices, to supplement the information obtained through examinations to improve the efficacy of regulatory influence. Extensive evidence supports the hypothesis that markets can effectively identify a firm’s true financial condition, at least on average and on a contemporaneous basis.⁵

The regulatory fail-safe mechanism rationale seeks to address perceived problems in supervisory incentives, which result in costly forbearance. Eisenbeis and Horvitz (1994) analyze the theoretical arguments for and against forbearance and survey the empirical literature on the efficacy of past instances of forbearance. Forbearance may be optimal when there exist market frictions (for example, bankruptcy costs) and information asymmetries, and supervisors have greater ability to assess the viability of a particular bank than the bank’s customers, shareholders, or the market in general. However, Eisenbeis and Horvitz (1994) conclude that “[w]hile some forbearance decisions have worked out, recent research has suggested that ... agencies’ ability to predict is limited at best.” A key example of forbearance and its adverse consequences is the failure of regulators to intervene in a timely manner during the savings and loan crises of the early and late 1980s.⁶ The explicit policy of forbearance applied to the savings and loan industry by the Federal Home Loan Bank Board in 1981–82 was followed by congressionally mandated forbearance in the form of the Competitive Equity in Banking Act of 1987.⁷ Kane (1990), Eisenbeis and Horvitz (1994), Kaufman (1995), and others have argued that this forbearance created perverse incentives for uneconomic risk-taking that substantially increased the eventual cost to the taxpayer. Forbearance also occurs for individual banks—Continental Illinois being the most famous example—both due to too-big-to-fail concerns and because a bank’s failure may be perceived as a supervisory failure, creating incentives to avoid regulatory recognition of problems in the hope they will resolve themselves.

By explicitly tying mandated regulatory intervention to subordinated debt signals, proponents of this approach seek to prevent unwise forbearance, in effect making supervisors the agents of the market.⁸ The regulatory fail-safe mechanism rationale and, to a somewhat lesser degree, the additional information rationale focus attention on marginal, or potentially problem, banks rather than equally across all banks. The information debt yields may provide is clearly most important for banks that are most in need of supervisory intervention.

Agency costs and market discipline

Discussions of market discipline in general, and subordinated debt proposals in particular, frequently assume, without qualification, that market discipline would obtain if only regulatory distortions such as too-big-to-fail were eliminated and transparency increased.⁹ However, the highly idealized view of the

relevant economic agents implicit in these discussions masks critical issues that impact the functioning of market discipline mechanisms (both monitoring and influence).

One major theoretical benefit of choosing subordinated debt to be the market instrument supervisors use to supplement their own examination efforts is that junior debt has a payoff structure closely resembling the payoff facing regulators.¹⁰ Proponents argue that increasing bond market discipline is consistent with regulatory objectives of minimizing risks to the deposit insurance fund and ultimately the taxpayers. Regulators, the deposit insurance fund, and subordinated debt investors all risk losses when bank condition deteriorates. By contrast, none of these groups shares meaningfully in the potential upside rewards of risk-taking that accrue to bank equity holders. Banks are assumed to have incentives to increase the risk of underlying assets to maximize the value of deposit insurance and to increase the value of the residual (equity) claim on the bank's profits. Uninsured creditors, including bondholders, are reasonably thought to prefer less risk in general. While intuitively appealing, this "moral hazard" view of the bank regulation problem is not the only possible perspective. The arguments underlying this analysis importantly make no distinction between banks, bank managers, and bank equity holders, thus ignoring an important element of the corporate governance problem. Furthermore, both equity holders and bondholders are harmed when the banks they invest in make poor investment decisions. (The appendix assesses the evidence concerning these two potential regulatory problems.)

The idealized worldview underlying subordinated debt proposals ignores what are called principal-agent problems, or simply agency problems. These problems and their underlying cause, separation of ownership and control, were noted as far back as Smith (1796 [1776], Vol. III, Book 5, p.124).

The directors of such [joint-stock] companies, however, being the managers rather of other people's money than their own, it cannot well be expected, that they should watch over it with the same anxious vigilance with which partners in a private copartnery frequently watch over their own. ... Negligence and profusion, therefore, must always prevail, more or less, in the management of the affairs of such a company.

A formal theory of agency was first developed by Jensen and Meckling (1976) and applied to the modern corporation by Fama (1980) and Fama and Jensen (1983). Agency costs are created by the separation of ownership, or provision of capital, and control (management) in an environment characterized

by information asymmetries, costly monitoring, and incomplete contracting. These unavoidable costs arise because investors cannot reliably ensure that managers will act in the investors' interest and not the managers'—that is, equity (and bond) holders cannot perfectly discipline managers. There is an extensive empirical literature analyzing the determinants, extent, and magnitude of agency costs in the economy.¹¹ The success of corporate capitalism clearly demonstrates that the benefits of separation of investment and management far outweigh the agency costs that this separation gives rise to.¹² However, it would be incorrect to conclude that agency costs are negligible and that, therefore, market discipline is not significantly affected by these costs.

Agency costs have several important implications for the market discipline/subordinated debt discussion:

- 1) A firm is not a single, rational economic agent, but rather a legal fiction. Modern corporate finance views a firm as a "nexus of contracts" among managers, equity holders, bondholders, workers, and customers, and these are the entities that respond (in their own interests) to economic incentives. Anthropomorphizing firms obfuscates these important issues.¹³
- 2) The principal-agent conflict exists between managers and equity-holders/bondholders. Therefore, managers and equity holders cannot be viewed as a single economic agent whose incentives are opposed to those of the bondholder/regulator.
- 3) The modern capitalist economy incorporates, and has evolved mechanisms to deal with, substantial impediments to outside investors' ability to make managers act in their best interests.

Agency costs can be mitigated by various mechanisms: delegated monitors (boards of directors, regulatory supervision), reducing information costs (required disclosures of relevant information), and reducing managers' incentives to abuse their position (fiduciary, fraud, and insider trading laws; threat of a takeover; and performance incentives such as managerial stock options). However, agency costs cannot be entirely eliminated, thus market discipline of managers is inevitably imperfect.

Equity holders and bondholders can surely influence managers *in extremis*. For example, when money market participants refused to roll over Penn Central's commercial paper in 1971, management was forced to take action. They filed for Chapter 11 bankruptcy protection from the firm's creditors. Equity holders can also vote out management, and poor firm performance increases the likelihood of managerial turnover.

Sufficiently disgruntled equity holders may create an environment that facilitates a hostile takeover.

Direct and reasonably certain discipline of managers is possible only in certain circumstances. The market for corporate control (takeovers) and direct control by large external equity holders who have effective-control blocks are forms of market discipline.¹⁴ Major equity holders can themselves effect changes in board composition or form, at relatively low cost, coalitions to do so; inducing the board to change management. Major investors or other firms can mount hostile takeovers, which if successful will result in a change in management. These situations, while they represent the ultimate sanction against management (other than prosecution for malfeasance), are rare events and affect only the top managers of a few very large firms. Informal or ad hoc restrictions of derivatives dealing to highly rated counterparties are another form of market discipline, by preventing managers from engaging in certain forms of excessive risk-taking if they wish to participate in those markets. Empirical evidence confirms the existence, though not the invariable effectiveness, of all these disciplinary forces.

Labor market discipline is another form of market discipline. For most senior managers, the hope of more lucrative jobs at other firms induces them to work to establish their reputations as value-enhancing agents acting in the equity holders' interests.¹⁵ Examining the post-resolution placement of bank managers following a number of Texas bank failures in the 1980s, Cannella, Fraser, and Lee (1995) find results consistent with the managerial labor market discriminating between managers who were likely to have been responsible for their bank's problems and those who were not. Managers likely to have been responsible for bank failures tended not to be subsequently employed in the industry, while those arguably not responsible were frequently employed by other banks. Farrell and Whidbee (2000) find a similar result for outside directors. In this case, outside directors who were aligned with forcibly removed chief executive officers (CEOs), owned little equity, and made poor choices in replacing the CEO, on average, subsequently lost their positions. Directors who were not aligned with the fallen leader (and/or had large equity stakes) not only kept their current directorships, but also were appointed to additional directorships at other firms.

Policy proposals for using market discipline to enhance banking supervision usually envisage something more commonplace, constructive, and benign than precipitating bankruptcy or replacing management through takeovers. Yet we have virtually no empirical

evidence, outside the managerial labor market literature, concerning equity holder and bondholder market influence in non-extreme situations.¹⁶

The hypothesized form of market discipline underlying subordinated debt proposals is through the prices investors demand in return for providing capital to a firm. The secondary market prices of outstanding securities provide an indication of the rates of return investors will demand when the firm next comes to market. For a firm that can fund investments through internally generated cash flows, such market signals may have little direct effect should the manager choose to ignore them. For firms that have to raise new capital in the market, negative market signals in the form of depressed security prices will eventually translate into an increased cost of funds if price declines for one security class are not offset by price rises in another.¹⁷ This increased cost of funds reduces the return on existing projects the firm invests in and may discourage the firm from investing in marginal projects. However, even if this effect is material, does this prevent managers from taking risks?

There is, of course, no reason to assume that bank investment opportunity set expected returns are identical. Indeed, financial theory teaches us that expected returns and risk should be positively related. If a riskier investment portfolio is associated with a high enough increase in expected return to compensate for the increase in cost of funds, the manager will rationally choose to take the riskier position, bondholders will be compensated for their increased default risk, and equity holders will be better off. Thus, there is no unambiguous disincentive to taking on risky projects per se, as evidence presented in a later section demonstrates. There remain, of course, disincentives to taking on projects, be they very risky or relatively safe, that do not have the required risk-adjusted expected return.¹⁸

Only a few papers look at banking and corporate control (agency cost) issues, and most of the economics of regulation literature (which considers among other things the incentives of regulators) is concerned with market power regulation (for example, utilities) or safety regulation (for example, airlines), rather than firm financial safety regulation. To draw implications from our review of the corporate literature for the problem of bank regulation, we can only make tentative extrapolations of the existing theory and consider the few existing empirical studies.

The theoretical effects of bank regulation, supervision and deposit insurance on agency costs are potentially ambiguous. Examiners are in an excellent position to act as delegated monitors. They have

unparalleled access to information, and they can compel remedial action. Only the board of directors is in as strong a position to monitor and discipline management. Early empirical investigations of this hypothesis found little evidence that the supervisors' theoretical comparative advantage translated into measurable benefits. However, DeYoung, Flannery, Lang, and Sorescu (2001), using an improved research methodology and a unique data set, find strong evidence that exams do reveal information that is not known to the market. Thus, examiners functioning as effective delegated monitors may serve to reduce agency costs.

On the other hand, much of the information examiners develop is confidential, and other aspects of bank regulation may have a negative effect. Deposit insurance obviously eliminates most, if not all, incentives for insured creditors to monitor. However, this may not be material. Insured depositors are unlikely to produce much useful information in any case—they typically have small stakes, reducing incentives to engage in costly monitoring, and are unsophisticated in valuation and risk assessment. Explicit too-big-to-fail policies in the 1980s undermined the incentives of uninsured creditors as well. This effect may have continued even after the passage of the Federal Deposit Insurance Corporation Improvement Act (FDICIA) in 1991, while the credibility of regulators in fore-swearing forbearance remained untested. Even if one can argue that regulators will now let individual banks fail, imposing costs on uninsured creditors, one can also argue that diversified holders of uninsured claims might still rely on regulators' unwillingness to allow a large number of banks to fail. These factors would tend to increase free-riding and, therefore, undermine market discipline.¹⁹

One of the few studies that directly examines the agency cost consequences of bank regulations is Prowse (1997). Prowse examines the frequency of friendly mergers, hostile takeovers, management turnover initiated by the board of directors, and intervention by regulators in U.S. bank holding companies (BHCs) from 1987 to 1992, and compares this with data on the frequency of the first three of these corporate control events in nonfinancial firms. Prowse concludes that

...while market-based mechanisms of corporate control in BHCs appear to operate in the same [broad] fashion as manufacturing firms they may be weakened because hostile takeovers are precluded by regulation and bank boards of directors are not as aggressive in removing poorly performing managers. These weaknesses leave intervention by regulators as the primary force in disciplining management. (Prowse, 1997, p. 525)

This evidence suggests that, whatever the informational benefits of examination, one effect of regulation on banks is to reduce the effectiveness of other corporate governance mechanisms. However, we cannot say anything on the basis of this sparse evidence as to whether regulatory discipline has been effective in *replacing* the market's usual disciplinary mechanisms.

The evidence of bond yields as measures of bank risk

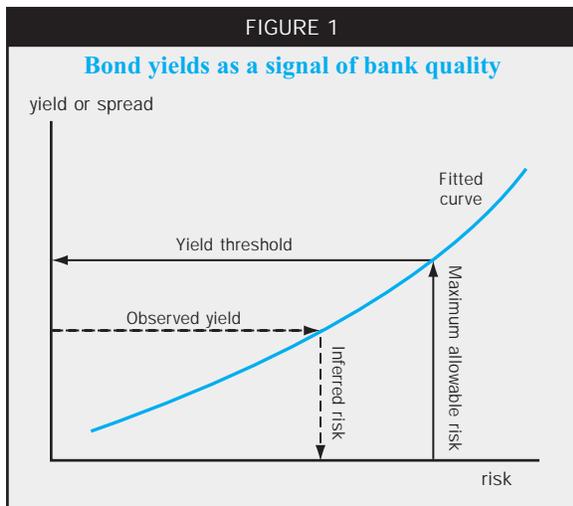
The “additional information” and “regulatory fail-safe mechanism” rationales for subordinated debt proposals are predicated on the informativeness of subordinated debt yields. To be useful for their intended purpose, the yields on the bonds of problem, or potentially problem, banks must provide early and accurate warning of latent problems in sufficient time for supervisors to step in or for PCA triggers to take effect and avert the danger. Flannery (1998) and Kwast et al. (1999) both provide extensive reviews of the evidence on the accuracy and timeliness of the information in various bank and BHC debt yields.

The evidence of bond yield informativeness, needed to support subordinated debt proposals, has several components: the responsiveness of yields to bank risk; the timeliness of this response; the incremental informativeness of bond yield changes as to changes in bank risk; and the relevant sample of banks to be considered when examining these issues.

Cross-sectional studies

The informativeness of subordinated debt yields has generally been measured by regressing yields or yield spreads against various accounting measures of risk. A few studies have also used examiners' ratings as measures of risk. Authors of these studies implicitly assume that if cross-sectional variations in yields or yield spreads reflect issuer risk, then yields or yield spreads can be used as an indicator of issuer risk. Figure 1 illustrates their logic. An upward sloping regression line is seen as evidence that yields respond to risk.²⁰ If the slope is significantly positive, it is assumed that issuer risk can be inferred by observing the yield or yield spread and then, in effect, translating this into the corresponding issuer risk using the regression line. Proposals that contemplate setting a yield-spread threshold would first determine a maximum acceptable level of risk and then the yield-spread/bank-risk regression line would provide the corresponding yield or yield-spread threshold.

Early studies, using data through the mid-1980s, found little relation between measures of bank risk and subordinated debt yields. This is generally considered



to be due to the residual effects of an explicit too-big-to-fail policy in the early 1980s and uncertainty as to the credibility of PCA subsequently mandated under FDICIA. Later studies, including Flannery and Sorescu (1996) and Jagtiani et al. (2000) find a statistically significant relation between bond yields and accounting measures of risk.

These studies are supportive of the hypothesis the bond yields *in general* respond to changes in bank or BHC risk. However, cross-sectional studies by their nature cannot illuminate two key issues: relevance and timeliness of the signals. The banks included in these studies are generally all banks of a certain size with subordinated debt outstanding, together with a few minor qualifications. The additional qualifications are unlikely to be misleading, but the “all banks” sample is problematical. The behavior of bond yields for marginal banks, the ones of regulatory interest, cannot be inferred from cross-sectional studies of all banks. The timeliness of the bond yield signals also cannot be inferred from cross-sectional studies.

None of the cross-sectional studies finds anywhere near perfect agreement between the bond yields and the accounting (and/or examiner rating) measures of risk. For instance, the Jagtiani et al. (2000) paper finds that the accounting measures of risk or rating agency debt ratings or examiner ratings, together with various control variables, explain between 60 percent and 65 percent of the variation in bond yields. It is impossible to say whether the remaining 35 percent to 40 percent is uninformative random variation in bond yields, or informative variation picking up information not available from accounting data, rating agency, or examiner ratings. The unexplained variation between alternative risk measures provides a rough

starting point for thinking about the signal precision of predictors of insolvency.

Furthermore, cross-sectional studies use publicly available accounting information to measure bank risk. It is thus only possible to assess whether bond yields provide *redundant* information. It may well be the case that bond yields provide additional information, as may other sources of public information (for example, news stories), but that cannot be concluded from these studies. Thus, by their nature, cross-sectional studies cannot resolve the issue of whether bond yields provide *additional* information not already available from other sources.

What is in a credit spread?

Credit spreads are defined as the differences in yield to maturity between risky bonds and equivalent risk-free bonds. “Equivalent bonds” are found using one of several methods. The simplest is to use a similar-maturity Treasury bond. A risk-free term structure, estimated using Treasury bonds, can be used to value a fictitious maturity- and coupon-matched risk-free bond. Some mandated subordinated debt proposals advocate looking at spreads over a rating-based index of corporate or bank bonds. It is also possible to account for options embedded in the corporate bond by using option-adjusted spreads, though the methodology for doing so is not standardized, and different researchers may estimate substantially different option-adjusted spreads. In any event, option-adjusted spreads are rarely used. However, default-risk, maturity, coupon, and embedded options are not the only differences among groups of bonds. As a result, any difference that has not been factored into computing the “equivalent risk-free bond” will show up in the credit spread. Many of these factors are not credit-related.

Studies of the determinants of corporate bond spreads find that non-default-risk-related factors are also determinants of average corporate bond spreads. These other priced factors include liquidity (Cornell, 1992), the level of the Treasury term structure (Duffee, 1998), the level and slope of the term structure (Minton, 1997, studying swap rates) and the supply of alternative investment (Sloane, 1963, and Jaffee, 1975). Time and cross-sectional variation in information asymmetries (arising from bank opacity) and perceptions of agency costs are likely to add non-default-risk-related components to individual bond yield spreads (for example, Crabbe and Turner, 1995). Other studies find that short- and long-maturity credit spreads differ significantly and frequently move in opposite directions (VanHorne, 1979, and Fama, 1986). Duffee (1999) concludes that a single-factor model (capturing a single

generalized “default risk”) cannot explain credit spreads. Duffee (1998) argues that changes in interest rate volatility change the value of embedded call options. This can affect measured credit spreads as most corporate bonds are callable and benchmark Treasury bonds are generally not. The opposite situation may complicate the interpretation of mandated subordinated debt yields—benchmark bond indices are based on callable bonds, but most subordinated debt proposals contemplate non-callable subordinated debt issues.

This is not to say that credit spreads are not influenced by default risk. They undoubtedly are. However, the potential presence of a host of non-credit-related priced factors in credit spreads means that changes or cross-sectional variation in credit spreads cannot reliably be interpreted as solely arising from changes or differences in credit risk.

Studies of timeliness

A very few studies have tackled the timeliness issue directly. Berger et al. (2000), using Granger causality tests, find that examiner ratings changes lead both stock returns and bond ratings changes, and that both stock returns and bond ratings changes lead examiner ratings changes. This apparently anomalous result reflects both stock returns and bond ratings changes containing information not contemporaneously available in examiner ratings and vice versa. Berger et al. do not examine the relative informativeness of stock returns versus bond ratings changes. Bond ratings changes are not bond yields and other evidence shows that bond yields tend to lead bond ratings changes. One cannot infer that use of bond yields would have strengthened the lead relation over examiner rating changes, though it is not unlikely.

The Berger et al. (2000) study, like the cross-sectional studies discussed above, compares one risk proxy against another risk proxy. It provides no direct evidence of timeliness vis-à-vis actual bank problems, albeit confidential examiner ratings are likely to carry a great deal of information. The Berger et al. study does, however, address the problem of average versus problem banks. They focus on examiner rating changes from grade 3 (weak but sound) to 4 (marginal), the most critical break in the rating scale. The lowest rating of 5 is reserved for banks in the process of “resolution,” that is, banks beyond help.

Randall (1989) examined the particular circumstances of 40 large BHCs that developed problems between 1980 and mid-1987. Randall first looked for early signs of bank solvency problems in accounting measures—variables such as nonperforming loans and return on assets—and news stories to identify

when, in hindsight, the problem first became apparent in public information.²¹ He then looked at the timeliness of stock returns, bond ratings changes, and examiner ratings changes. He finds that none of these exhibit any marked ability to anticipate events, even though signs of the problems were already in the accounting data. Randall’s study is subject to a number of criticisms, including the possible effects of too-big-to-fail forbearance and whether examiner ratings changes lag examiner awareness of, and informal actions to resolve, problems. Nonetheless, this remains the only study of which I am aware that tackles the crucial question of whether bond markets (or rating agencies in this case) sufficiently anticipate problems to enable timely intervention or merely react when the problem becomes patently obvious and it is too late to avoid costly resolution.²² Absent any convincing conflicting empirical evidence on this issue, one cannot dismiss the Randall result out of hand.

In summary, while the evidence of correlation between bond yields and risk measures used heretofore to support subordinated debt proposals is consistent with their being indicators of bank risk, there are important caveats to this evidence. The current empirical evidence lacks specific information on marginally performing banks and the timeliness of bond yield changes. To this we must add the considerable evidence that so-called credit spreads respond to a number of factors in addition to changes in default risk. This last issue becomes especially critical when we consider using subordinated debt yields as a regulatory fail-safe mechanism.

The interpretation of yield spreads

Even if bond yield spreads only embedded credit-risk-related factors, the interpretation of yield spreads for supervisory purposes would be anything but straightforward.

- Depositor preference causes deposit insurers (supervisors) and bondholders to care about different parts of the distribution of bank asset values. When comparing two theoretically correctly priced bonds, the higher coupon need not be associated with the higher default risk. When these are subordinated bank bonds, the bank with the higher coupon bond need not have the higher probability of incurring losses to the deposit insurer, nor the higher expected losses to the deposit insurer.
- Regulators may also have different attitudes toward risk than bondholders. Systemic risk concerns may make regulators concerned about default per se, while bondholders are clearly concerned about recovery in the event of default. Jagtiani et al.

(2000) argue that examiners focus on default probability, while bondholders are concerned with (their own) expected losses, incorporating recovery in the event of default as well as default probability.

- Subordinated bondholders of firms with little or no economic equity begin to behave like equity holders (Black and Cox, 1976). They will prefer the bank take on risky projects as they are almost certain to suffer losses otherwise, while deposit insurers protected by the remaining buffer provided by subordinated debt would prefer less risk to lock in the protection.
- Covitz, Hancock, and Kwast (2000) point out that yield spreads are based on promised yields. These overstate actual returns bondholders expect to receive after factoring in both the probabilities of default and likely recoveries in the event of default.²³

Consequences of bond yield imperfections

Much of the subordinated debt discussion to date has implicitly assumed that bond yields are nearly perfect indicators of insolvency risk,²⁴ or, alternatively, that the unspecified costs of classification errors are less than the (not quantified) expected gains resulting from imposing the subordinated debt requirement.²⁵ However, evidence presented in the previous section shows that bond yields are less than perfect indicators of insolvency risk.

Explicit in some and implicit in most subordinated debt proposals is the idea that banks must maintain subordinated debt yields at an acceptable level. While the “or else” sanctions needed to give force to the regulation are infrequently discussed, the idea of “an acceptable level” necessarily implies the choice of a discrete trigger point for doing something. This is intentional, as the objective of many mandated subordinated debt proponents is to reduce supervisory discretion. The argument for a rule is that policymakers often made mistakes, because they were overconfident about their assessments or because of the temptation to favor short-term goals over long-term objectives. Conversely, the argument for discretion is that a mechanical rule would ignore pertinent, useful information about the economy’s course.

These same issues are pertinent in the current discussion of how best to incorporate subordinated debt yields into the bank supervisory process. The requirement that supervisors should take PCA steps whenever a bank’s debenture yield rises above some threshold is a fixed rule. Unless one believes that bond yields *perfectly* reflect bank default risk, however, such a rule will potentially penalize some truly

solvent banks, as well as potentially permitting some dangerously undercapitalized banks to remain open. The “additional information” alternative would be for supervisors to evaluate the implications of debenture yield spreads in conjunction with other sources of information. This approach preserves some element of supervisory discretion. Nor does it constitute a policy change for those BHCs with subordinated debt already outstanding. Analysts who feel that supervisors are overly inclined to delay action will find this level of discretion too permissive.

It is beyond the scope of this article to investigate the costs of unnecessarily taking action against a bank erroneously thought to be in danger of insolvency. These depend crucially on the details of how mandated subordinated debt requirements are implemented and the costs of failing to take action against a bank that is in a more precarious position than is thought.²⁶ However, we do know that small amounts of signal noise can produce high frequencies of misclassification when attempting to identify the most risky banks,²⁷ and concrete evidence using actual yields is provided in the section analyzing yield spreads.

“Single-signal solutions” versus “all available information”

Single-signal subordinated debt trigger proposals use the yields or yield spreads on subordinated debt to override information from other sources. Even moderate proposals to (somehow) use subordinated debt yields as input to supervision stress that subordinated debt yields are a preferred or superior measure of bank condition. Reasons cited for doing so include the public nature of the signal, unlike examination results, and the simplicity of interpreting the information to various parties, unlike a sophisticated default-risk model. These are valid points, but using a single signal also has an unavoidable cost—it is likely to result in increased numbers of regulatory mistakes.

Supervisors have a plethora of sources of information available to them. These include confidential examination information (infrequently updated), publicly available accounting information (updated quarterly), various activity information reported electronically to supervisors on a frequent basis, equity returns and market value of equity, insured deposit rates and issuance amounts, uninsured CD rates, and subordinated debt yields. All of these indicators of bank quality will include some noise.

Subordinated debt yields are not the only candidates for a simple, single signal of bank quality. Equity is an obvious alternative. FDICIA originally required that supervisors prescribe a minimum level of the ratio of market value to book value of equity for publicly

traded shares “to the extent feasible.” For instance, the Shadow Financial Regulatory Committee (1992), in discussing this provision, noted that reductions in the ratio of market value to book value of equity could provide a signal to supervisors of declining bank quality. Using equity prices is not, however, without controversy. Equity prices are noisy as tests of equity pricing models invariably find. Kaufman (1992) argues that BHC equity prices embed the effects of mispriced deposit insurance, which complicates their interpretation. A common criticism is that the incentives of equity-holder/managers are not aligned with those of supervisor/deposit insurers, and that, therefore, equity prices are not likely to be informative.²⁸ This idea is formalized in the Merton (1977) model discussed in the appendix. On the other hand, Levonian (2000) shows, using the same model, that equity prices contain the same theoretical information as debt yields, and that the theoretical interpretation of debt yields is no less subtle than the interpretation of equity prices. Several nonbank failure prediction models use traded equity prices as an input variable (see Altman and Saunders, 1998, for a survey of this literature).²⁹ Furthermore, equity markets are generally more liquid than debt markets. Equity is, of course, issued at the bank holding company level and this may complicate interpretation of price information. But then so are most currently issued subordinated bonds, which are considered to be sufficiently informative to make the empirical case for subordinated debt proposals.

Nonetheless, in practice no single signal is likely to be as informative as the simultaneous examination of several sources of information. It is a simple fact of statistics that when we observe a number of more or less independent noisy measures of some unobservable factor, it is usually best to combine the various measures rather than to pick one.³⁰ If the measurement errors in the various signals are not perfectly correlated they will tend to cancel out, resulting in the combined signal having a lower level of noise. This is always true if signals are combined in the correct way: more noisy signals should be given less weight and more accurate signals more weight. Only if one of the signals is perfectly accurate or all of the signals are perfectly correlated does it make statistical sense to disregard the other signals entirely.

In practice one would build, calibrate, and test a model that combines all available information to assess what combination of signals is optimal. Such a study would also provide a measure of the costs of using only one signal: one could compare the optimal-signal-mix results with the results obtained using only the proposed single signal.

Pettway and Sinkey (1980) used abnormal equity returns to predict problem banks, an accounting model to do the same thing, and then examined the results of combining the two forecasts. Each of the two models results in a classification of banks into “good” and “bad.” The Pettway and Sinkey results demonstrate that, for their sample, both accounting information and equity returns contained useful information of subsequent bank problems and that the combination produced even better forecasts. The latter results demonstrate the benefits of combining noisy sources of information, and the former results demonstrate the potential usefulness of equity returns in failure prediction.

Given the evidence concerning the potential informativeness of alternative measures of bank insolvency risk, the sole use of subordinated debt yields contemplated in regulatory fail-safe mechanism proposals is almost certainly trading simplicity for accuracy. To date this tradeoff has not been examined. The potential benefits of using a single, simple, public measure of bank risk are perhaps not quantifiable; however, the costs, in terms of predictive accuracy, of disregarding other information are quantifiable.

Analysis of yield spreads and ratings of newly issued bonds

Kwast et al. (1999) and other authors stress the informational superiority of newly issued bonds. Kwast et al. assert that information revelation by companies increases at the time of new security issuance. Thus, merely requiring regular security issuance, it is hypothesized, may increase transparency. The study considers yields of newly issued bonds to be “market prices,” because money is changing hands in the process.³¹ Secondary market prices for all but the most liquid bonds are apt to be “indicative prices,” set by individual dealers for purposes of marking positions to market rather than firm bids and offers.

Morgan and Stiroh (2000) have compiled a database of financial and nonfinancial bond issues, their ratings by both Moody’s and Standard & Poor’s (S&P), and their yields at time of issue. This database permits us to examine the transparency of information available at time of bond issue by examining agency-rating agreement.³² Ratings are frequently criticized as potential measures of risk because they are frequently stale. However, the Morgan–Stiroh database permits us to study simultaneously determined market yields and agency assessments of default risk.

The rating scales used by Moody’s and S&P are comparable in their definitions, and with slight adjustments for labeling of risk classes, are used

interchangeably. One measure of transparency is the extent to which rating agencies agree on the default risk of bonds. This can only be reliably done when ratings are simultaneously determined, as at time of issue of a new security. Table 1 presents the Moody's and S&P ratings for financial and nonfinancial firms from 1993 through 1998.³³

Earlier, I argued that bonds do not necessarily restrict risk-taking: So long as bondholders are adequately compensated, they will be willing to lend to

risky companies. Using S&P ratings, fully 46 percent of the new nonfinancial bond issues fail the Gramm–Leach–Bliley test of “top three ratings categories,” while 16 percent of newly issued nonfinancial bonds are below investment grade.³⁴ The figures for Moody's ratings are comparable at 44 percent and 14 percent, respectively. Risky-bond issuance by financial institutions is considerably less frequent. Using S&P ratings, 21 percent of new financial bonds failed the Gramm–Leach–Bliley threshold, while only 2 percent were not

TABLE 1

A comparison of Moody's and S&P ratings for newly issued bonds (1993–98)

A. Nonfinancial institutions

S&P	Moody's																
	Aaa	Aa1	Aa2	Aa3	A1	A2	A3	Baa1	Baa2	Baa3	Ba1	Ba2	Ba3	B1	B2	B3	
AAA	175	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	182
AA+	9	7	31	2	-	-	-	-	-	-	-	-	-	-	-	-	49
AA	2	11	34	46	3	-	-	-	-	-	-	-	-	-	-	-	96
AA-	5	5	48	101	29	2	2	-	-	-	-	-	-	-	-	-	192
A+	-	-	18	86	185	83	6	-	-	-	-	-	-	-	-	-	378
A	-	1	5	5	128	358	40	-	10	-	-	-	-	-	-	-	547
A-	-	-	-	7	13	131	196	87	1	-	-	-	-	-	-	-	435
BBB+	-	-	-	-	1	26	62	170	78	8	8	-	-	-	-	-	353
BBB	-	-	-	-	1	5	28	84	214	39	2	-	-	-	-	-	373
BBB-	-	-	-	-	-	1	-	27	96	178	3	2	-	-	-	-	307
BB+	-	-	-	-	-	-	-	1	13	37	18	12	4	1	-	-	86
BB	-	-	-	-	-	-	-	-	2	14	25	17	11	3	3	-	75
BB-	-	-	-	-	-	-	-	-	1	-	6	11	45	22	4	1	90
B+	-	-	-	-	-	-	-	-	-	-	1	6	22	46	37	3	115
B	-	-	-	-	-	-	-	-	-	-	-	1	4	26	82	30	143
B-	-	-	-	-	-	-	-	-	-	-	-	1	1	12	37	58	109
	191	31	136	247	360	606	334	369	414	277	63	50	87	110	163	92	3,530

B. Banks and savings and loans

S&P	Moody's																
	Aaa	Aa1	Aa2	Aa3	A1	A2	A3	Baa1	Baa2	Baa3	Ba1	Ba2	Ba3	B1	B2	B3	
AAA	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
AA+	4	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	6
AA	-	23	19	1	-	-	-	-	-	-	-	-	-	-	-	-	43
AA-	-	1	8	34	14	8	-	-	-	-	-	-	-	-	-	-	65
A+	-	-	2	13	42	42	19	-	-	-	-	-	-	-	-	-	118
A	-	-	-	3	4	70	35	3	-	-	-	-	-	-	-	-	115
A-	-	-	-	-	-	20	63	23	1	-	-	-	-	-	-	-	107
BBB+	-	-	-	-	-	2	16	10	11	1	-	-	-	-	-	-	40
BBB	-	-	-	3	-	-	4	13	5	10	-	-	-	-	-	-	35
BBB-	-	-	-	-	-	-	-	2	7	19	1	-	-	-	-	-	29
BB+	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1
BB	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	1	3
BB-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	2
B+	-	-	-	-	-	-	-	-	-	-	-	-	2	3	-	-	5
B	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	-	2
B-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1
	6	24	31	54	60	142	137	52	25	31	2	1	2	4	2	1	574

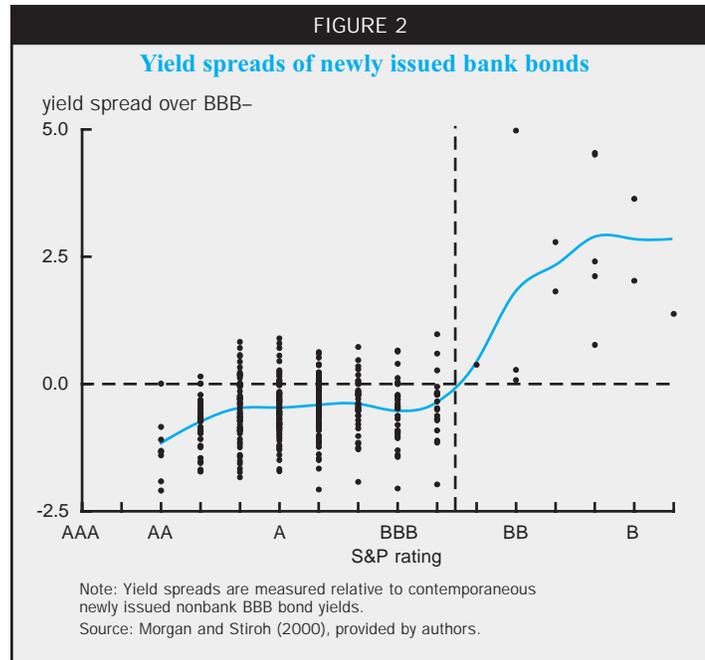
Notes: Ratings agreements indicated in boldface. Moody's ratings totals provided in right-hand column; S&P ratings totals provided in last row. Table is broken into quadrants based on Gramm–Leach–Bliley reference to “top three broad ratings classes.” Source: Morgan and Stiroh (2000); provided by authors.

investment grade. Moody's numbers are again comparable at 20 percent and 2 percent, respectively.³⁵

There are clear differences in the ratings characteristics between financial and nonfinancial institutions. This may reflect in part the incorporation of regulatory supervision into the rating agencies' assessments of default risk; or it may reflect the access that banks have to insured funds, which may make them choose to issue low-rated bonds less frequently. Nonetheless, the bond market does appear to support issuance of debt by risky firms. Nonfinancial firms frequently find that issuing marginal or sub-investment-grade debt, even given the generally higher yields required to do so, is a viable corporate finance decision. This latter statistic suggests that if banks were forced simply to issue subordinate bonds without restrictions on yields or ratings, the bond markets would accommodate their doing so at a price, and the price extracted might not in general be prohibitive.

Exact ratings-agreement occurs 53 percent of the time for nonfinancial issues and 47 percent of the time for financial firms. However, there are slight variations in risk assessment. Ratings differences of two or more sub-categories, for instance from Baa1 to Baa3, occurred 8 percent of the time for nonfinancials and 9 percent of the time for financial bond issues. It is not obvious on the basis of these numbers that financial institutions are more or less transparent than nonfinancial institutions; however, rating agencies differ in their assessments by more than a trivial amount sufficiently often to raise the question whether transparency is adequate at time of bond issuance. Nonetheless, ratings appear to be generally consistent across rating agencies.

However, yields are not very consistent within ratings. To examine the collective impact of the sources of priced non-default-risk factors on bond yields, I examine the yield spreads plotted against S&P ratings for financial firms in figure 2.³⁶ To eliminate the most severe term-structure effects, I only consider issues with five or more years to maturity. To compute spreads, a time-varying BBB benchmark rate was computed by averaging nonfinancial institution yields-at-issue for newly issued bonds each date. These average yield observations were then interpolated between nonfinancial bond issue dates to create a BBB benchmark rate for each financial bond issue date. The yield-spread-at-issue for each financial institution



bond was then computed by subtracting the yield-at-issue from the BBB benchmark rate for that day. This methodology approximates the Calomiris (1999) suggestion of requiring subordinate bonds to have yields comparable to other BBB-rated bonds. Focusing on yields over BBB rather than yields over Treasury bonds eliminates some of the common non-default-risk factors that influence all risky-bond spreads (for example, the level and slope of the Treasury term structure). Ideally one would wish to eliminate industry effects as well by using a financial BBB benchmark rather than a nonfinancial one. Unfortunately, there are insufficient financial institution issues to construct a time-varying "financials only" index, without using illiquid seasoned bond yields (which may not be market prices) and stale ratings.

Ratings-at-issue are not the only measure of risk against which yield spreads may be plotted, but they are certainly plausible. Research already discussed shows that ratings provide some incremental information over examiner assessments. Agency-issued ratings are generally used as measures of risk by portfolio managers, are a major component of proposed revisions to bank capital standards (Basel Committee, 1999), and are enshrined in law (for example, Gramm-Leach-Bliley).³⁷

The continuous line in figure 2 is interpolated from the average within-rating-class yield-spreads. This is the summary information produced by a regression of yields against rating, for example, in Morgan and Stiroh (2000) figure 2 and table 3. This picture has

the advantage of not imposing linearity on the yield-spread/risk relation as is usually done (though not in Morgan and Stiroh). This permits us to see the non-linear nature of the relation between yield spread and risk. While yield spreads are overall increasing in risk, they appear to be more or less flat for a large range of ratings (A+ to BBB–). The relation is strongly upward sloping for sub-investment-grade bonds and for bonds rated AA to A+. In addition, regression results do not reveal the variation of yields about the estimated averages.³⁸ This variation has important implications for the use of yield spreads to infer risk. The yield spreads for similarly rated bonds with ratings between AA and BBB vary by 50–150 basis points above and below their average values. This variation is far greater than the variation in across-ratings-class mean yield spreads. While one would expect that bonds rated higher than BBB would have negative yield spreads (relative to BBB– yields), approximately 25 percent of bonds rated A+ through BBB+ have positive yield spreads. Variation seems to increase for sub-investment-grade bonds—BB-rated bonds have yield spreads ranging from 0 to almost 500 basis points—though there are too few observations for reliable inference.

Critical to the use of bond yields as triggers for PCA is the belief that bond yield spreads can be used to infer bank risk. Using the Calomiris threshold of spread over BBB as an example, figure 2 shows that 100 percent of the bonds with yields below the BBB benchmark are indeed rated BBB or better. Of the bonds with positive yield spreads, only 20 percent are actually rated worse than BBB. This means that in four out of five cases where the “BBB yield or better” requirement would have triggered regulatory actions of some sort, these actions would have been taken against banks with acceptable risk levels. Whether this is an acceptable rate for imposing unnecessary regulatory costs on banks depends on the actions that threshold violations trigger, the resources available to regulators to act (for example, staff to immediately examine threshold-violating banks), and the availability of alternatives for reducing errors in identifying potentially problem banks.

While rating is not the only measure of risk, I believe that it is unlikely that other risk measures will materially improve the picture, though this remains to be tested. Arguably much of the variation of within-ratings yield spreads comes from the non-default-risk factors discussed earlier. It is conceptually possible to construct an “adjusted yield spread” to back out these other factors. However, two problems arise: feasibility and complexity. While models exist for

pricing (and backing out) some factors such as embedded options, these models are not particularly reliable. Models simply do not currently exist for pricing other factors such as liquidity. Building a reasonably effective model to account for a substantial portion of the major non-default-risk factors is highly speculative at this time. Even if such a model were possible, the use of the model would destroy some of the main attractions of bond yields: that they are intuitive, simple, and directly observable. Once the process of building complex models to extract the desired information is begun, the question naturally arises as to whether to include other inputs.

Summary and recommendations

The growing tide of interest in regulatory circles, both in the U.S. and abroad, in bringing market discipline to bear on bank regulation joins an old academic belief that markets provide information and mechanisms for solving corporate control and incentive problems. Strangely though, the regulatory discussion has been devoid of the issues raised in the academic literature on these subjects. To date, the regulatory discussion has begun with the proposition that “markets discipline” and proceeded to discuss practical issues of how best to use that discipline in bank regulation. The result has been two lines of discussion: transparency and mandated subordinated debt issuance.

The corporate governance literature says a great deal that is informative about why market discipline is needed (in non-banking contexts) and what mechanisms markets have evolved to deal with the central agency problems. Market discipline is a complex issue with causes arising in agency problems—the separation of provision of capital (risk-bearing) and decision-making (management). Mechanisms that unregulated markets have evolved to deal with these problems include: the systems of laws and penalties that govern the economic environments, separation of monitoring and decision-making, delegated monitors, managerial incentives either through the labor market or through (usually equity-based) incentive contracts, the market for corporate control, and the voting power of equity holders. Notably absent in the corporate governance literature is any discussion of debt as a disciplinary mechanism.

The corporate governance literature suggests that improvements in direct market influence of managerial decision-making may best be achieved through addressing the relation between regulation and the effectiveness of the usual mechanisms of market discipline. Evidence cited here suggests that these mechanisms may be relatively weak in the banking sector.

Improvements in transparency are almost surely beneficial³⁹ but are nonetheless proving extremely difficult to implement. This article only notes that adequate transparency is the *sine qua non* of any efforts to improve market discipline.

Mandating subordinated debt issuance is the primary specific proposal under wide discussion for altering the supervisory framework to bring market discipline more forcefully to bear on banks, either directly through the bondholders influencing bank risk-taking or indirectly through the information provided through debt yields. The latter route can be broken into relatively vague “additional information” arguments or relatively explicit “regulatory fail-safe mechanism” arguments. The additional information rationale has its roots in the idea that banks are increasingly complex and markets are better able than examiners to analyze them. The regulatory fail-safe mechanism rationale has its roots in the fear that supervisory incentives are not aligned with public goals and that supervisors are apt to forebear closing problem banks even when they are aware of the problems. This was all too painfully evident in the savings and loan crisis (although the contribution of politics should not be overlooked). FDICIA was intended to cure the worst of these supervisory incentive problems, but many remain unconvinced.

My review of the corporate governance literature suggests that we should not put undue reliance on mandated subordinated-debt holders directly influencing bank management. While the additional information and regulatory fail-safe mechanism rationales originate in very different views of the regulatory problem to be solved, and few explicit and detailed regulatory fail-safe mechanism proposals exist, the regulatory drafting process may be drawn toward some form of regulatory fail-safe rule if a mandated subordinated-debt proposal is implemented. This could arise for two reasons: mandated issuance alone may not be sufficient to alter the behavior of managers to avoid undertaking excessive risks; and the necessary regulatory “or else” provision requires clarity regarding when the or-else will be invoked.

Both additional information and regulatory fail-safe mechanism rationales rely on the informativeness of yields. I postulate that the relevant criteria for judging the value of any closely monitored signal of bank quality should be: that it be timely (to intervene before doing so becomes costly); accurate, particularly for potentially insolvent banks (to reduce the frequency and costs of unnecessary interventions); and, if regulatory fiat is required to produce a signal, that signal should be superior to alternative sources of information already at hand.

The existing evidence on subordinated debt yield informativeness does not allow us to reliably ascertain whether these conditions hold. Cross-sectional studies only tell us that *in general* subordinated debt yields respond to contemporaneous measures of bank risk. Because most of the studies cover all banks with subordinated debt outstanding, we cannot determine if the results apply equally well to marginal banks (the more numerous sound banks tend to overwhelm the empirical results). Because these studies use only contemporaneous measures of risk, they cannot establish the relative efficacy of available risk measures. This is not to say that subordinated debt yields are more or less informative than alternatives, only that, excepting the absence of bond yields in bankruptcy prediction models, we have no empirical information or even hint of their relative efficacy; notwithstanding oft-made theoretical arguments that bond yields *must* be informative (and equity prices not).

The key criticism in this article is regarding reliance on any single signal as a (sufficient, though not necessary) basis for regulatory intervention. Numerous alternative sources of information are available. Both empirical evidence and theoretical analysis suggest that these alternatives are not to be dismissed out of hand. The large body of evidence that factors other than default risk are embedded in bond yields suggests that while bond yields respond to default risk, they also respond to many other factors. Hence, inferring default risk from bond yields is apt to be imprecise. While some authors note that yields are noisy, the analysis presented here of actual yields-at-issue of bank subordinated debt provides a quantitative indication of the potential effects of trying to use yields to measure risk. The problem appears to be substantial.

Basic statistics and the analysis in this article argue that where signals are imprecise, it is better to combine available information rather than use any one signal. This argues for optimally combining (existing) subordinated debt yields with equity prices and accounting information into a unified problem prediction framework. Whether in such a context subordinated debt yields contribute enough new information to justify mandating their issuance is yet to be determined and depends also on the costs (direct and indirect) of imposing such a requirement.

Central to the discussion of “why subordinated debt” and “why not equity” is the argument that a moral hazard problem leads equity-holder/managers to invariably attempt to expropriate bondholders and increase the value of their call-option-like claim by increasing asset risk. Concomitantly bondholders,

like deposit-insurer/regulators, have a shared interest in limiting risk-taking. This framework ignores equity holder versus manager agency issues and important differences between bondholders' and regulatory payoffs. This overly simple model can be extended in a number of ways with marked changes in the implications. As the appendix discusses, the unconditional equity-holder appetite for risk conclusion can be mitigated or reversed by considering more realistic multiperiod frameworks in which bank charters are valuable, managers can dynamically adjust asset risk, insolvency may occur continuously or at random times, and the investment opportunity set can vary in expected return as well as risk.⁴⁰

Poor (apparently irrational) investments are as problematic as excessively risky projects (with positive risk-adjusted returns). Evidence suggests that poor investments are likely to be the major explanation for banks getting into trouble, and agency problems readily explain how they may come about (albeit incompetence per se is not an agency problem). The a priori argument that equity prices cannot be informative has been countered using the same model employed (informally) to draw that conclusion.

Recommendations

My first major recommendation is that the central question of optimal bank insolvency prediction be addressed. Failure prediction and econometric methods have advanced since Pettway and Sinkey (1980), and it is desirable to include all available information in an optimal bank failure (or "problem short of failure") forecasting model. The efficacy of an optimal, full-information model can then be compared with single-signal models using subordinated debt yields, equity returns, and other alternatives. Such a study would provide crucial information on the best ways to incorporate available market information into the supervisory process and the potential costs of relying solely on subordinated debt yields as a PCA trigger. The data and econometric techniques are readily available.

My second recommendation is that the discussions of enhancing market discipline take cognizance of the evidence from other literatures and explore a range of approaches. The demonstrated importance of managerial labor markets and the market for corporate control in disciplining managers suggests a need to evaluate the impact of regulation and supervision on the functioning of these mechanisms in the banking sector.

My final recommendation is that if a mandated subordinated debt proposal is implemented, it lean heavily toward solely providing information to supervisors and providing supervisors with incentives to

consider that information. For example, requiring that whenever a large bank's debenture credit spread exceeds some level, the head of the examining agency must either

- 1) Promptly initiate PCA, or
- 2) Report to a national oversight authority such as the Federal Financial Institutions Examination Council why he or she believes that no current supervisory action is appropriate. The oversight authority would have the authority to direct PCA be taken if it was unconvinced.

Such a "rule" would raise the supervisor's cost of forbearance, while maintaining the flexibility to incorporate other sources of information. Thus, highlighting the invoking of, and reasons for, forbearance would address a major source of concern—the temptation for the immediately responsible supervisors to bury a problem.

The temptation to impose yield-spread thresholds and costly related regulatory consequences on banks should be avoided. Either the thresholds will be set so high as to fail to provide timely triggers or, alternatively, will be almost certain to produce many unnecessary interventions. The more meaningful the automatically triggered regulatory interventions are, the more costly the unnecessary interventions will be.

Conclusion

The concerns about the limitations and distortions attendant to the current regulatory environment are well placed, and markets undoubtedly can provide important influences on the safe and sound operation of banks and BHCs. However, the limitations of market discipline are as important as the successes. Ardent advocacy of one possible mechanism for achieving market discipline should not blind us to unresolved issues, countervailing evidence, or the full range of possibilities. While no regulatory or market mechanism can be perfect, we should consider all available alternatives and not simply ask if one proposal is "good enough." I do not advocate pursuit of an unattainable ideal—"making the best the enemy of the good." Rather I advocate not closing our minds to strengths and weaknesses of all approaches—not "making the good the enemy of the better." If these issues are addressed head on, rather than ignored or brushed aside, the resulting policy decision will have a better chance of achieving regulatory objectives and avoiding unintended consequences.

I do not pretend to have shown that mandated subordinated debt is materially worse than alternative approaches to incorporating market discipline into

bank and BHC supervision, or doing nothing for that matter, only that the evidence underlying subordinated debt proposals is incomplete and open to question and to note alternatives. Some readers will feel that the costs of mandated subordinated debt, while not quantified, are unlikely to be high and the likely benefits, while not quantified, are sufficient to proceed immediately. These readers may also feel that there is an urgency to regulatory reform that precludes waiting until open questions have been investigated further. Others may feel that the imposing of regulations

should be done grudgingly and only with the best possible (albeit imperfect) information or that an exclusive focus on subordinated debt may preempt or preclude the investigation of alternative, possibly more efficacious, approaches. These are questions of judgment and belief.

Whether the questions raised in this article are sufficient to justify delaying implementation of a subordinated debt proposal depends on one's priors. I leave the conclusion to the reader.

APPENDIX

Appendix: Is moral hazard the major problem?

There have been more financial institutions ... that have disappeared by getting their strategy wrong than by being overexposed to risk. (Reed, 1999)

Firms can lose money in two ways: bad investments and bad luck. Bad luck can occur with good (positive risk-adjusted expected return) investments. However, bad outcomes may be more likely to occur with bad investments. The discussion of market discipline and subordinated debt proposals has focused almost exclusively on bank portfolio risk. The quality (expected returns) of bank investments has been, for the most part, ignored. This focus on risk is derived from the widespread belief that banks suffer from particularly severe moral hazard problems due to *de facto* (though perhaps past) too-big-to-fail policies and mispriced deposit insurance.¹ This section describes the conceptual framework that underpins most discussions of moral hazard in the subordinated debt literature. The thrust of this analysis is that equity holders have incentives to increase asset risk and thus expropriate bondholders. I then show that more complex and realistic models of incentives lead to less clear-cut conclusions and that in some circumstances equity holders and bondholders may have similar interests in ensuring the long-term viability of the firm. I end by reviewing the few empirical articles that have examined whether bank failures are due to “bad luck” (together with excessive risk-taking) or “bad investments.”

The bank moral hazard argument is simple and intuitively appealing. The essence of moral hazard is the “heads I win; tails you lose” situation created when gains accrue to decision-makers while losses are borne by other agents. The definition of moral hazard used here arises out of equity-holder/manager versus

bondholder conflicts and is a form of agency problem as the bondholders provide capital but do not control asset risk. The equity-holder appetite for risk implications of this form of moral hazard derives from the observation first made in Black and Scholes (1972) that equity can be viewed as a call option on the value of the assets of the firm. A similar framework was used to study deposit insurance moral hazard in Merton (1977).² Under this model, once bondholders have committed their capital at a fixed rate, equity-holders/managers (who are assumed to be identical) can increase the value of their option by increasing the volatility of the value of the firm by taking on riskier projects, thereby expropriating bondholders. The increase in the value of equity for a given increase in asset volatility is proportional to the amount of debt (including insured deposits if any) that the firm has.

This argument is however overly simplistic. The conclusion that equity holders unambiguously prefer more risk depends on the assumptions of the Black–Scholes–Merton framework: that all transactions are concluded when the bonds are (or are not) paid off, that equity is a European-style call option, and that returns to the underlying assets of the firm evolve continuously with normally distributed innovations. Changes in any of these assumptions can weaken or reverse the unqualified “equity holders like risk” conclusion.

It is possible to show that even in the single-period European call option context it is not necessarily the case that equity holders prefer risk if the “log-normally distributed returns” assumption made in most equity option pricing models is dropped. Whether the assumption that all asset prices in fact do follow a log-normally distributed stochastic process is realistic is an empirical question, seldom examined.

Another critical assumption of the Merton model is that the amount and cost of debt are locked in before

equity-holder/managers decide asset quality. Levonian (2000) has shown that the moral hazard incentive is reduced if subordinated debt is repriced after asset volatility is changed. Within the context of the Levonian model, if repricing is frequent, as for example with commercial paper, then the benefits to equity holders of increasing asset volatility are proportional only to the amount of debt that is not repriced (for example, deposits) and not to the total amount of debt. If frequently repriced debt is substituted for equity, leaving deposits unchanged, the moral hazard incentives are actually increased as the change in equity value for a given change in asset volatility remains unchanged, but now accrues to a smaller equity base. If repriced subordinated debt replaces risk-insensitive deposits, the moral hazard incentives are reduced by reducing the amount of debt that is not repriced when asset risk changes. Replacing the same amount of deposits with equity instead of repriced debt produces an even larger diminution in moral hazard incentives by spreading the reduced increase in equity value for a given increase in asset volatility over a larger equity base.

If firms are declared bankrupt as soon as the value of equity declines to zero then the equity holders hold a down-and-out barrier option, not the simple European call option envisioned in Black and Scholes (1972) and Merton (1977). Unlike holders of simple European options who always prefer more risk to less, holders of a down-and-out barrier call option prefer more risk to less only up to a point, after which increased risk reduces the value of their option. The option-value-maximizing level of risk declines as the barrier is approached (the firm approaches insolvency).

The moral hazard bondholder-expropriation argument is a single-period argument, while financing is in fact usually a multi-period problem. Expropriating bondholders in one period will raise the costs of borrowing in subsequent periods as bondholders reassess upwards the moral hazard agency costs they face vis-à-vis equity-holder/managers, thus reducing expected future profits. Merton (1978) modeled bank equity as a quasi-down-and-out perpetual option. The equity holders derive ongoing benefits from risk-insensitive deposit insurance; however, they face random audits (the down-and-out barrier option is equivalent to continuous audits). If during an audit the bank is found to be insolvent, the bank is liquidated and equity holders lose future rents from the mispriced deposit insurance. Merton found that as the barrier is approached (the firm approaches insolvency), the equity-value-maximizing level of asset risk declines. However, if the bank becomes insolvent, equity holders' incentives are to maximize risk in the hopes of re-achieving solvency before the next audit.

Access to debt financing is also made more valuable by the tax code that effectively favors debt financing over equity financing. Leland (1998) shows that tax advantages of debt outweigh the moral hazard agency costs attendant to issuing debt. He argues that equity-holders/managers therefore have incentives to control firm risk to reduce moral hazard/agency costs of debt.

Ritchken et al. (1993) found that permitting equity-holder/managers to dynamically adjust their portfolios prior to expiration of the equity call option also resulted in an optimal level of portfolio risk beyond which equity holders would not wish to go. Their model also included a "charter value," the present value of future profits, that would be lost to the equity holders if the firm becomes insolvent.

Geske and Shastri (1981) examine American options with uncertain (suspendable) discrete dividends. They show that in this case the relation between option value and underlying asset risk is not always monotonically increasing.

Deposit insurance confers benefits on equity-holders/managers—the value of the deposit insurance subsidy and value of the bank charter. Attempts by managers to exploit moral hazard may ignore the potential costs of doing so and may be short-sighted. Only banks already in deep trouble (low charter value) are likely to see "betting the bank" as a viable option.

The moral hazard analysis focuses solely on the incentives of equity-holder/managers to increase risk, implicitly assuming that the portfolio choices do not differ in their expected returns. This is unlikely to be the case. Where equity holders are not the managers, and agency problems are significant, equity holders and bondholders will have the same interests as regulators in higher expected asset returns, holding risk constant. Absent a model of the investment opportunity set faced by banks, it is impossible to theoretically determine the relative magnitude of these conflicting factors. A few papers have, however, examined the issue empirically.

Gorton and Rosen (1995) used a simple theoretical model, tested using bank call report data from 1984 to 1990, to examine the causes of declining bank profitability and increasing bank risk during the 1980s. They conclude that:³

... managerial entrenchment played a more important role than did the moral hazard associated with deposit insurance in explaining the recent behavior of the banking industry. (Gorton and Rosen, 1995, p. 1377)

This is in contrast to the widely held belief that deposit-insurance moral hazard underlay the problems.

Randall (1989) concluded that all but four of the 40 BHC problems he examined were related to the poor credit quality of the loans the bank was making rather than its taking excessive risks that failed to pay off. Both equity holders and bondholders would be equally concerned about poor loan quality. Studies such as Pettway and Sinkey (1980) and Berger et al. (2000) that find equity returns contain information useful in predicting subsequent bank problems are consistent with this result.

It is thus arguable, on theoretical grounds, that agency problems in the form of poor managerial decision-making are a potentially important alternative cause of banks getting into trouble, that moral hazard is not the only problem, and that equity-holder incentives as not clear cut as is frequently assumed. The scant empirical evidence we have on the relative importance of “bad luck” versus “bad investments” suggests that the moral hazard risk-taking problem is usually only operative once banks have become materially impaired. Unfortunately, common examples

of poor managerial decision-making including fraud, self-dealing, lack of internal controls, inadequate/incompetent credit screening, and overpaying for acquisitions are not rare. In these cases equity holders have as strong incentives to monitor and influence managers to avoid excessive risk-taking and poor investment choices.

¹The models most frequently used in the discussion of moral hazard derive from an option pricing framework wherein it is assumed that all investments have the same (risk neutral) expected return. These models do not admit the possibility of “bad investments.”

²Kaufman (1992) has criticized these applications of option pricing models to deposit insurance, noting that the option holder (the equity holder) does not control the timing of the option “exercise.” Rather the effective option writer—the FDIC—controls the timing and manner of bank closures. Kaufman also questions the static nature of asset risk inherent in the Black–Scholes and Merton models (*vide infra* the discussion of Ritchken et al., 1993).

³Gorton and Rosen do not deny the plausibility of moral hazard arguments for banks with low levels of capital; however, they suggest that it is unclear that moral hazard arguments can explain how banks got into low-capital positions in the first place.

NOTES

¹Subordinated debt proposals would require banks to issue bonds that are subordinate to all other claims, excepting only equity and preferred stock. These bonds would not be covered by guarantees explicit or conjunctural.

²This taxonomy differs from the more usual one of “direct market discipline” and “indirect market discipline” (see, for example, Kwast et al., 1999; and Covitz, Hancock, and Kwast, 2000). The usual terminology essentially defines market discipline in terms of incentives, while the definition proposed here requires that incentives translate into desired managerial actions.

³Regulatory discipline triggered by market signals relies on market monitoring and not market influence and hence is not market discipline per se.

⁴No subordinated debt proposal suggests actually *replacing* regulatory supervision with market mechanisms. Other proposals to do away with both regulatory oversight and the deposit insurance safety net have been long discussed, though they have made little headway.

⁵See the recent survey by Flannery (1998) and earlier papers by Gilbert (1990) and Berger (1991).

⁶See Kane (1990), Eisenbeis and Horvitz (1994), and Kaufman (1995) for detailed discussions.

⁷In both cases accounting standards were redefined in violation of generally accepted accounting practices (GAAP) to allow institutions that were plainly insolvent to report positive net worth and remain open.

⁸It is important to note that no mandatory subordinated debt advocate is suggesting that examiners cannot or should not act on alternative information sources when bond yields fail to signal a problem.

⁹Subordinated debt proposals are aimed in part at overcoming the too-big-to-fail distortions by designating a class of securities that will absolutely, positively not be bailed out in the event of problems (caveats to this rule somewhat undermine its intent). However, subordinated debt proposals generally do not discuss the need for resolving transparency issues as a necessary precondition for the proposals to work.

¹⁰This is not strictly true, *vide infra* the discussion on interpreting bond yield spreads.

¹¹Shleifer and Vishny (1997) and Short (1994) provide useful introductions to this literature.

¹²It was not always thus. Adam Smith continues the previously quoted discussion saying “They [joint-stock companies] have, accordingly, very seldom succeeded without an exclusive privilege [legal monopoly]; and frequently have not succeeded with one.” One might hypothesize from this contrast between then and now that well-disciplined markets are not a natural state of economic nature, spoilt only by the intrusiveness of modern regulation.

¹³To talk of incorporeal firms acting or having incentives can be a convenient shorthand for managers’ actions (in the name of the firm) or managerial incentives. Where these simplifying assumptions are innocuous, it matters little that they may be counterfactual and may be necessary to clarify a particular unrelated question. For instance, capital budgeting theory is concerned in part with what managers should do if they are acting in shareholders’ interests. The assumption that managers are acting in the shareholders’ interests leads to the desired prescriptive conclusions and is harmless in this context. However, if we design a policy predicated on the assumption that managers’ and equity holders’ incentives are aligned, when in fact they may not be, that policy is apt to be less efficacious than one that acknowledges the full complexity of interactions and incentives of the parties involved.

¹⁴Managers, on the other hand, can sometimes protect (immunize) themselves against involuntary replacement through golden parachutes and antitakeover amendments. Fama (1980) notes that adversarial resolution of manager/investor conflicts is very expensive. While golden parachutes apparently reward outgoing managers for failure, they may constitute the least costly means of removing managers who are willing to use the firm's (investors') own resources to contest their removal.

¹⁵This labor market discipline is an important source of managerial discipline; indeed Fama (1980) argues that "[t]he viability of the large corporation with diffuse security ownership is better explained in terms of a model where the primary disciplining device comes through managerial labor markets, both within and outside the firm,"

¹⁶Bliss and Flannery (2000) and Calomiris and Powell (2000) are two exceptions. Bliss and Flannery find little clear evidence of equity or bond market influence on U.S. bank holding companies, while Calomiris and Powell purport to find evidence consistent with bondholder influence in Argentina under very different circumstances.

¹⁷See the appendix discussing moral hazard and theoretical reasons why equity and debt prices may or may not react differently to changes in total asset risk. Other financial theories suggest that equity prices respond to changes in systematic risk, while bond prices respond to changes in default risk, which is related to total asset risk.

¹⁸Myers and Majluf (1984) argue that managers will underinvest even in profitable risky projects that require outside financing.

¹⁹Park (2000) develops a formal model in which senior-debt holders monitor firms for moral hazard problems and junior-debt holders free-ride. This is consistent with observed debt priority, ownership, and maturity structure in nonbanks. The reasons that junior-debt holders do not monitor (benefits accrue first to senior claimants) carry over to subordinated bank debt. It is less clear that Park's arguments for why senior-debt holders do monitor (gain full benefit of their monitoring efforts) would carry over to bank supervisors, who are agents rather than principals with their own funds at risk. On the other hand, Park argues that senior-debt holders will tend to have lower monitoring costs, an observation that carries over to supervisors who are *paid* to monitor.

²⁰Most studies use multiple measures of risk and impose linearity on the risk–yield (–spread) relation and then test for significantly positive coefficients. A few studies, such as the first part of Morgan and Stiroh (2000), use methodologies that do not impose linearity or monotonicity on the risk–yield relation.

²¹Since most of these measures lag when problems develop—poor lending procedures take time to show up as nonperforming loans—these measures provide a conservative estimate of when problems actually began.

²²Pettway and Sinkey (1980), *vide infra*, find evidence that equity returns do anticipate problems. They do not test bond returns.

²³This important point has been generally ignored in studies of the informativeness of yield spreads.

²⁴A notable exception is the Kwast et al. (1999) report, which notes several of the non-credit-risk priced factors discussed above, and advises that subordinated debt yields be interpreted with caution.

²⁵Equivalently the subordinated debt literature has assumed that the cost–benefit tradeoffs under a mandated subordinated debt proposal would be superior to the cost–benefit tradeoffs under the current regulatory approach. This certainly is a key question, on which we have little concrete evidence.

²⁶The “costs of subordinated debt requirements and related supervisory actions” question has, to my knowledge, not been investigated in detail in any of the subordinated debt proposals. Kwast et al. (1999) and Kaufman et al. (2000) address the costs of misclassification issue only in passing and present no quantitative estimates.

²⁷This can be shown with simple simulations (available from the author on request).

²⁸Black and Cox (1976) show that for banks approaching or actually in insolvency, subordinated debt holders, like equity holders, *ceteris paribus* prefer more risk to less.

²⁹Curiously, I could find no studies that employed bond yields as inputs to failure prediction models for either banks or nonfinancial corporations.

³⁰Levonian (2000) also makes this point.

³¹It is worth noting that a large literature on initial public offerings of equities suggests that equities are offered at prices substantially removed from their post-offering equilibrium levels. (My thanks to S. Ianotti for this observation.) Little evidence exists as to whether similar factors are or are not present in fixed-income primary markets, though liquidity-related factors such as on-the-run premia in Treasury bonds and seasoned versus newly issued pricing differentials in corporate bonds are known to exist.

³²This analysis can say nothing about the *relative* transparency discussed in Kwast et al. (1999).

³³For comparison with the Gramm–Leach–Bliley Act, I broadly define A-rated bonds to include A– (A3). Other authors suggest “investment grade” as the threshold. For this purpose, I include BBB– (Baa3) in the range of qualifying ratings.

³⁴These numbers probably understate the frequency of low- and sub-investment-grade bond issuance. The Morgan–Stiroh database contains only rated bonds. Unrated bonds are frequently issued and these tend to be from more risky companies, though this is not invariably the case.

³⁵Where ratings agencies disagree, it may be presumed that the higher rating will suffice for meeting the Gramm–Leach–Bliley requirements (16 percent of newly issued financial institution bonds failed on both Moody's and S&P ratings). Furthermore, the act requires that only one adequately rated bond be outstanding, which may be a senior or seasoned issue.

³⁶Using Moody's ratings does not alter the results materially.

³⁷Alternatives to ratings are apt to be complex. Studies discussed earlier of the risk-sensitivity of bond yields use numerous accounting variables to collectively proxy for risk. It is conceptually possible to construct an econometric model that produces a single measure of risk. Though how to calibrate such a model without having another measure of risk as a “true value” is somewhat problematical. Examiner ratings are not publicly available and are apt to be stale.

³⁸Standard errors of the fitted bond yield spreads are rarely reported and would apply in any case to the aggregate across all ratings.

³⁹There are some concerns that forcing information revelation, for example, risk exposures, will cause banks to modify their models, thus degrading the quality of the information they produce.

⁴⁰See, for example, Merton (1978) and Ritchken et al. (1993).

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