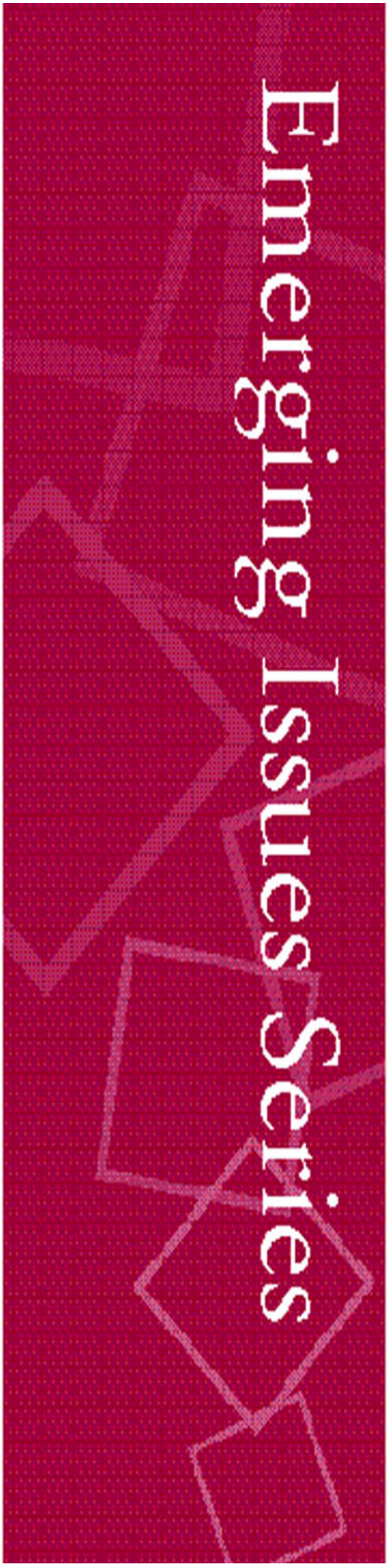

Do Markets Discipline Banks and Bank Holding Companies? Evidence From Debt Pricing

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Do Markets Price Banks and Bank Holding Companies' Risk? Evidence From Debt Securities

Abstract

Whether the federal safety net under banks is viewed by the market as being extended beyond *de-jure* deposits to other bank debt and even the debt of bank holding companies (BHCs) has important public policy implications for the ability of market forces to monitor and discipline banks and, in particular, for current proposals to require commercial banks or bank holding companies to issue a minimum amount of subordinated debt. Securities perceived with certainty to be covered by the safety net would not be priced by the market according to the riskiness of the issuer. The weaker the perception, the greater is the relationship between the market yields on the security and the risk characteristics of the issuer and the greater is the ability of creditors and the market to discipline banks.

This paper extends the empirical research of previous investigators in two directions. One, it uses observations for U.S. banks for the post-FDICIA period, in which the breadth of the safety net may be more restricted than before. Two, it is the first to examine the risk-return relationship of bonds issued directly by banks, not only by BHCs as did previous studies.

Our paper provides evidence that both U.S. bank and BHC bonds are priced by the secondary market in relation to their underlying credit risk, particularly for less-capitalized issuers. Moreover, risk appears to be priced similarly for both types of bonds. This suggests that proposals requiring banks or BHCs to issue subordinated debt may enhance market monitoring and discipline and be useful in supplementing regulatory discipline.

Do Markets Price Banks and Bank Holding Companies' Risk? Evidence From Debt Securities

I. Introduction and Objective

The relative roles of market and regulatory discipline in banking have long been a subject of controversy. Most recently, the effectiveness and desirability of government regulation have been increasingly questioned, in part because the increasing operating complexity of large banks has both reduced faith in the ability of regulators to accurately measure and monitor their risk exposure and increased greatly the costs of attempting to do so. As a result, many banking analysts have advocated increasingly the role of market discipline to supplement regulatory discipline. For example, the recent consultative paper on "New Capital Adequacy Framework" issued by the Basel Committee on Banking Supervision (1999) proposed a modification of the existing risk-based capital adequacy standards for large internationally active banks. Market discipline has been added as a third pillar for banking regulation to supplement the two regulatory pillars of supervisory review and minimum capital requirements. To implement such discipline, some have proposed that banks be required to issue a minimum amount of subordinated debt, that cannot be protected by government guarantees in case of the failure of the issuing bank. The pricing of such debt would provide additional publicly available information about the market's evaluation of the financial strength of the issuing institution and help discipline potentially excessively risky behavior.[1]

The effectiveness of market monitoring and discipline in banking, however, is also in dispute, particularly when government-sponsored safety-nets may stretch beyond their *de-jure* boundaries and

[1] See Board of Governors (1999), Benston et al (1986), Calomiris (1997), Evanoff (1993), Evanoff and Wall (2000), and U.S. Shadow Financial Regulatory Committee (2000).

de-facto protect other banks claimants, so that they do not perceive themselves at risk. This paper provides new evidence on the ability of the financial market in the U.S. to price *de-jure* noninsured subordinated debt of U.S. banks and bank holding companies (BHCs) according to the perceived risk of default of the issuer. If markets cannot or do not price these securities in relation to their credit risk, the markets cannot be expected to either monitor or discipline the issuing banks adequately. The analysis is restricted to U.S. banks and U.S. markets, although the results may be applicable to banks and markets in other countries with similar institutional structure.

As currently structured in the U.S., the federal deposit insurance provides both a narrow explicit and a potentially broader implicit guarantee. The explicit guarantee is in the form of a *de-jure* federal guarantee on the par value of the first $100,000 of deposits per account at insured institutions. The implicit guarantee exists if the safety net is extended beyond its *de-jure* boundaries to protect uninsured depositors, bank debt holders, bank holding company (BHC) debt holders, or BHC shareholders *de-facto*.[2] Before enactment of the FDIC Improvement Act (FDICIA) in 1991, the *de-facto* federal safety net often extended beyond insured deposits. This was due to the FDIC's practice of protecting in full uninsured depositors and many other creditors, e.g. fed funds sellers, as well as insured depositors in the process of resolving the majority of failed banks (Benston and Kaufman, 1997 and 1998). These implicit safeguards reduced the credit risk of most if not all bank liabilities, not just insured deposits. In addition, this implicit coverage may have allowed banks to raise funds at a cost lower than the market would have required on riskier securities if, as the evidence suggests, the insurance was underpriced in

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[2] See Nelson and Lemieux (1997) and Kwast and Passmore (1998) for discussion of the extension of the federal safety net.

much of this period.[3] This study examines whether or not the market currently perceives that the protection is passed through beyond explicitly insured depositors to either or both debt holders of the issuing bank and its parent BHC since the enactment of FDICIA in 1991 and affects the interest rate paid on such debt.

The less the market perceives that the protection is passed through to non-*de-jure* insured debtholders of the bank or parent BHCs, the more these debtholders perceive themselves at risk. As a result, it is more likely that the debt will be priced according to the underlying credit risk characteristics of the issuing banks or BHCs and the more effectively will the debt holders and the private market be able to monitor the banks or BHCs. In this paper, we investigate empirically whether the market prices the debt of banks and BHCs for credit risk by testing the relationship between the yields on these securities and accounting measures of the issuer's credit quality. The results of this paper have important policy implications for evaluating 1) whether market discipline can effectively supplement regulatory discipline and 2) proposals requiring banks to issue subordinated debt to enhance their sensitivity to market discipline. [4]

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[3] Standard and Poor's recognizes this possibility and notes that:

> "For commercial banking, the regulatory framework has been a critical component on Standard & Poor's assessment of the industry, effectively boosting its creditworthiness. Without this regulatory support, the industry's high leverage alone would rank it lower than the current assessment. Moreover, Standard & Poor's believes that commercial banking systems, as key instruments in implementing monetary policy, as well as their vital role in providing business credit, receive consideration in the formulation of monetary policy. On the other hand, where regulatory restrictions inhibit geographic and business diversification, they can cap the creditworthiness of many of the banks rated by Standard & Poor's. In looking at the industry's regulatory framework, several support mechanisms are beneficial to creditworthiness, including: deposit insurance in those systems where it exists; access to central banks as lender of last resort; the examination process; capital and asset restrictions; and regulation of relationships among the bank and its affiliates and holding company" (Standard and Poor's, 1996, page 1).

[4] The paper does not consider whether the market provides sufficient discipline on bank risk taking (see Bliss and

II. Literature Review

A large number of previous studies have examined the relationship between the credit risk characteristics of banks and BHCs and the pricing of *de-jure* uninsured deposits and other debt -- see, for example, Avery, Belton, and Goldberg (1988), Baer and Brewer (1986), Cargill (1989), Cook and Spellman (1994), DeYoung, Flannery, Lang, and Sorescu (1997), Ellis and Flannery (1992), Flannery and Sorescu (1996), Gorton and Santomero (1990), Hall, Meyer, and Vaughan (1997), Hannan and Hanweck (1988), James (1988 and 1990), Keeley (1990), and Park and Peristiani (1998) and Morgan and Stiroh (2000). Most of these studies have been carefully reviewed by Flannery and Sorescu (1996), among others, and more recently by Flannery (1998). On the whole, the results of the earliest studies were inconclusive, although overall they suggested a stronger relationship than is sometimes reported for three reasons. One, the studies that examine BHC bonds tend to find a significant relationship more often than those that examine the pricing of uninsured deposits, particularly for more recent periods. Because the bonds have lower *de-jure* or *de-facto* priority in case of liquidation of the bank than uninsured deposits, one would expect their prices (yields) to be more sensitive to risk. Two, a number of the studies that report little or no relationship find a significant relationship between the market interest yield and the credit rating assigned to the instrument by private rating agencies, such as Moody's and Standard and Poor's. This suggests that these studies may have failed to identify the more important risk characteristics included by the rating agencies or misspecified them. Lastly, most of the studies were limited to observations before 1992, when the market's perception of the coverage of the federal safety net may have been broader than in the post-FDICIA environment. Thus, they are less relevant to the current policy issues.

Flannery (2000a and 2000b) and Morgan and Stiroh (2000).

Flannery and Sorescu (1996) report that the yields on subordinated debt of large BHCs were significantly affected by accounting measures of the issuers' risk characteristics for their entire 1983-1991 sample period, and that this relationship intensified through time as actions by the bank regulatory agencies appeared to narrow the scope of the safety net beyond *de-jure* insured depositors. The authors concluded that their evidence "soundly rejects the hypothesis that investors cannot rationally differentiate among the risks undertaken by the major U.S. banking firms" (Flannery and Sorescu, page 1347).

Our paper extends the literature in two important directions. One, in contrast to the earlier studies, we examine the behavior of the market in the post-FDICIA period since 1991 in which the breadth of the safety net beyond *de-jure* insured deposits has been greatly restricted, at least to date (Benston and Kaufman, 1997 and 1998). The Flannery and Sorescu (1996) observation period ends in 1991 prior to the enactment of FDICIA. Moreover, since 1993, all bank-issued bonds are subordinated in liquidation to the claims of the FDIC and uninsured domestic depositors (Kaufman, 1997).[5] Thus, their prices may be expected to be more sensitive to the risk characteristics of the issuing bank than before 1993. Two, we examine the risk factors affecting the pricing not only of debt issued by BHCs, as did most of the earlier studies, but also of the bonds issued by the commercial banks themselves. Many of the current proposals for increasing market discipline on banks through requiring subordinated debt apply to bank debt

only. However, in their sample of 422 bonds, Flannery and Sorescu (1996) include only three

[5] Before the enactment of the Depositor Preference Act in 1993, subordinated bank debt holders were generally treated as general creditors with equal standing in liquidation with the FDIC. This legislation did not effect BHC debt. Under FIRREA, the FDIC (but not bondholders) may apportion resolution losses among the surviving banks within a multibank holding company in the event that not all of the related banks fail and some have positive net

bank debt issues (all by the same bank). The remaining 419 bonds were issued by BHCs. The difference between bonds issued by banks and BHCs is important, as they have different legal standing in case of the failure of the bank. Bank-issued bonds have a higher priority claim on the bank's assets in liquidation than the bonds of the BHC, whose primary claim on the bank is equity. In addition, to the extent that the parent holding company owns other banks and permissible nonbanks, the prices of BHC bonds reflect the risk of more than just the subsidiary bank that issued its own bonds. On the other hand, BHCs, particularly in the period studied before the full implementation of interstate branching and the Gramm-Leach-Bliley Act, were able to engage in a somewhat broader range of activities and operate in a wider geographical area through out-of-state subsidiary banks than could banks. Therefore, BHCs could reduce their risk through greater diversification. Nevertheless, unless the perception of the safety net is expanded beyond bank bonds, one would reasonably expect the prices of BHC bonds to be more sensitive to the risk of the issuer than bank-issued bonds.

The remainder of the paper is organized as follows. Section III presents the model and the empirical methodology. Section IV provides definition of the variables. Section V describes the data. The results are discussed in Section VI. The conclusions and policy implications are presented in Section VII.

III Model Specification and Methodology

The model developed in this paper relates the interest rate spread (*SPREAD*) on bank or BHC bonds in the secondary market over a Treasury security of equal maturity to a number of the issuer's accounting measures of the probability of default (default risk). The greater the risk measures, the larger

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worth.

should be the spread charged by the market on the issuer's bonds. However, the spread reflects not only the probability of default, but also the expected magnitude of the loss if there is a default. Similar to the earlier studies, we do not account for this latter component in the model. However, to gauge the reliability of the accounting risk measures specified, a similar model specifying alternatively only the bond ratings assigned by private credit ratings agencies (Moody's and Standard and Poor's) and the bank rating assigned by federal regulators is also estimated. These ratings may reasonably be assumed to include greater in-depth analysis of the appropriate risks involved, including personal, first hand and on-site inspection of the operations, than is feasible in statistical models that rely on only secondary accounting data.

The basic model is of the following general form:

$$\boldsymbol{SPREAD}_{it} = a_{it} + \Sigma_m b_{mit} \boldsymbol{X}_{mit} + \Sigma_n b_{nit} \boldsymbol{Y}_{nit} + e_{it}, \qquad \textbf{(1)}$$

where $\boldsymbol{X_m}$ and $\boldsymbol{Y_n}$ are matrixes of credit risk variables and control variables, respectively, for institution i in time period t.

Four accounting measures of credit risk of the issuing institution are specified -- 1) the leverage ratio, 2) the ratio of non-performing loans (including loans past due over 90 days whether accruing or not and real estate owned by the issuer as a result of defaulted loans) to total on-balance sheet assets, 3) the return on assets, and 4) the percent of total deposits *de-jure* insured. These variables are defined in the next section. In addition to these accounting measures of credit risk, asset size is specified as a control variable, and intercept and slope dummy variables are included to differentiate BHC-issued and bank-issued debt.

To standardize the results, the bonds issued by banks and BHCs are specified in the same

equation. This limits the risk measures specified in the model to those that are available for both banks and BHCs. To examine whether the market prices the bonds of the two sets of issuers differently, we allow both the intercept and slope coefficients to differ between banks and BHCs by using dummy variables. Theory as well as previous studies suggest that the risk measures may not affect the market's pricing of bonds, as indicated by the interest rate spread over Treasuries, linearly. Rather, the market may price perceived riskier values of the risk measures proportionately more unfavorably than less risky values, so that interest rate spreads are nonlinearly related to the risk characteristics of the issuers. That is, spreads may increase at an increasing rate with increases in the riskiness of the issuers. For example, the market may view a given ratio of non-performing loans to assets or of insured to total deposits more adversely at poorer capitalized institutions than at better capitalized institutions. Thus, the accounting risk measures are specified both *per se* (stand alone) to capture linear relationships and interactively (multiplicatively) with the issuer's leverage ratio to capture nonlinear effects. Alternative interactive specifications were also estimated, but the results did not vary greatly.

The basic model specifying both the stand-alone and interactive risk and control variables is as follows (for institution *i, b*ond *j, at* time *t*):

$$SPREAD_{ijt} = a + ß_1 LOGTA_{it} + ß_2 INSURED_{it} + ß_3 MKTLEV_{it} + ß_4 NPLOAN_{it} + ß_5 ROA_{it} + ß_6 XINSURED_{it} + ß_7 XNPLOAN_{it} + ß_8 XROA_{it} + ß_9 BKINSURED_{it} + ß_{10} BKMKTLEV_{it} + ß_{11} BKNPLOAN_{it} + ß_{12} BKROA_{it} + ß_{13} DUMBANK_i + e_{ijt} \quad (2)$$

The variables are defined in the next section.

In addition, primarily to check whether the accounting risk measures specified in the equation (2) account for most of the impact on spread, alternative specifications using ratings by credit rating agencies and by bank regulators are modeled in equations (3) and (4) respectively:

$$SPREAD_{ijt} = a + b_1 LOGTA_{it} + b_2 SPMOODY_{ijt} + b_3 DUMBANK_i + e_{ijt} \quad \textbf{(3)}$$

$$SPREAD_{ijt} = a + b_1 LOGTA_{it} + b_2 REGRATE_{it} + b_3 DUMBANK_i + e_{ijt} \quad \textbf{(4)}$$

It may be expected that the *SPMOODY* ratings in equation (3) would explain spread more completely than the accounting risk measures used in equation (2), as these agencies evaluate the expected value of loss from default (which is not specified in equation 2) as well as the probability of default and spend considerable resources at this task. The variable *REGRATE* in equation (4) represents the composite *BOPEC* rating for BHCs and composite *CAMEL* rating for banks. Although the regulatory agency ratings for individual banks are not released publicly, it is of interest to see whether they are related to the market's evaluation of the financial condition of the institution as reflected in the yield spread. In addition, some private vendors, such as Sheshunoff, attempt to replicate the agency ratings and provide it for their clients on a current basis. However, bank examination ratings reflect the primary regulator's evaluation of the condition of the issuing institution, rather than the bonds themselves. Thus, bank examinations focus only on the probability of failure, which may differ from the probability of loss on a specific bond.

The above equations are estimated using a version of the Fuller-Battese Feasible Generalized Least Square (FGLS) model to fit our unbalanced, time-series, cross-section dataset. For this data set, there are four sources of variation outside of the risk and control variables specified in the equation -- time-specific variations, firm-specific variations, issue-specific variations, and the normal random disturbances. Failure to control for the first three sources of variation would cause these factors to be aggregated in the estimated error term potentially leading to bias estimates of the coefficients. To

control for these variations, one can either assume that these variations are fixed or random. Our random-variation assumption provides greater flexibility through imposing fewer constraints. The Fuller-Battese procedure eliminates the need for bank and time dummies because the estimator segregates the impact of these factors from the random error term. Therefore, the estimate of the coefficients is unbiased. This procedure has the added benefit of allowing the impact of firm specific and time-specific factors to vary across observations and eliminates the need for time- and organization-specific dummies. However, our model specification still includes dummies to control for the issue-specific variations related to legal standing, i.e. bank versus holding company bonds.

IV. Definition of Variables

The above models hypothesize that bank and BHC debt are priced by the market relative to credit risk factors of the issuer that may be captured in accounting measures, S&P and Moody's ratings, and the regulators' CAMEL or BOPEC rating. To isolate the factors that affect only that part of the market interest rate which reflects only the credit risk of the securities and not general market conditions, we compute the yield spread above Treasury securities of the same maturity. The dependent variable, *SPREAD*, is calculated by subtracting the estimated yield on a U.S. Treasury security with the same term to maturity from the concurrent yield on the observed option-free bank or BHC subordinated bonds on the secondary market. The comparable maturity Treasury yield is obtained from yield curves as of each yearend estimated by straight-line extrapolation from yearend market yields reported by Bloomberg for 3, 6, and 9 month and 1, 2, 3, 5, 7, 10, 15, and 30 year

Treasury securities.[6]

The independent variables specified are defined as follows:

MKTLEV is the leverage ratio. For BHCs, this is the ratio of book value of total consolidated liabilities to the sum of the market value of the BHC's common stock and the book value of its preferred stock. For banks, since all but one of the banks in the sample are subsidiaries of BHCs, their shares are not traded in the secondary market. Therefore, the market value of these banks' common stock is proxied by the ratio of each bank's assets to the respective parent BHC's consolidated assets scaled by the market value of the BHC's common stock.[7] The higher the leverage, the more likely bondholders will incur losses and demand larger bond spreads. Thus, a positive coefficient is expected.

NPLOAN is the ratio of the sum of non-performing and defaulted bank loans plus other real estate owned, which represents collateral obtained through foreclosure, to total on-balance sheet assets (using consolidated figures for BHCs). Non-performing loans include loans past due over 90 days that may be accruing or nonaccruing. The larger the non-performing loan ratio, the greater the likelihood of loss and the larger the required bond spread. A positive coefficient is expected.

ROA is the ratio of annual net income to year-end, on-balance sheet assets (consolidated figures for BHCs). The more profitable is the firm, the less likely default, and the smaller the bond spread.

SPMOODY is the average credit rating specific to the security assigned by S&P and Moody's.

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[6] Spread and the accounting risk characteristics are both observed on December 31 of each year, even though the market generally cannot observe the reported risk measures on bank financial statements until they are publicly released a few weeks later. We also estimated the regressions with the spread observed on January 31 of each following year, but the results were weaker and are not reported. This suggests that the market may correctly anticipate the issuers' financials.

[7] This assumes that all of the BHC's subsidiaries are equally risky and that proportionately equal capital is assigned to each subsidiary. Book value leverage was also specified, but yielded poorer results.

Following Jewell and Livingston (1998), the ratings are cardinalized as shown in Appendix 1. The higher the *SPMOODY* rating, the higher the credit quality, and the lower is the cardinalized number. Thus, a positive coefficient is expected.[8]

REGRATE is regulator's credit rating (*CAMEL* for banks and *BOPEC* for BHCs). These ratings are assigned by the primary federal regulator for banks and the Federal Reserve, which has sole regulatory responsibility for BHCs.[9] The ratings range from a high of 1 to a low of 5. Thus, a positive coefficient is expected. Because CAMEL and BOPEC ratings are not assigned on the same date across the sampled banking firms, there is a problem of aging. Large banks and BHCs are examined annually. Thus, at any given point in time, the ratings could be as long as 12 months old. Older ratings may be expected to contain less accurate information about the BHC's current situation than more recent ratings. To adjust for this, we average the ratings that were assigned immediately prior to and immediately after the associated observation date. It should also be noted that S&P and Moody's ratings are issue specific, while CAMEL and BOPEC ratings are firm specific.

INSURED is the ratio of insured deposits to total deposits at banks and at all the BHC's subsidiary banks. The greater the bank's reliance on insured deposits, the less likely the bank will be subject to market discipline and the greater the potential for moral hazard behavior. Billet, Garfinkel, and O'Neal (1998) report that BHCs shifted to greater use of insured deposits to fund their banks as their financial condition deteriorated, and Jordan (2000) has recently documented such behavior by

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[8] The S&P and Moody's ratings may not represent a linear progression of the firm's creditworthiness. To permit nonlinearity, we use dummy variables to group the bonds into three groups (A- or better, BBB or BBB+, and below BBB) in an alternative specification. The results are unchanged from those reported here.

[9] *CAMEL* for banks is the acronym that stands for **C**apital, **A**sset quality, **M**anagement, **E**arnings, and **L**iquidity; and *BOPEC* for BHCs stands for **B**ank(s), **O**thers, **P**arent, **E**arnings, **C**apital.

banks that failed in New England in the early 1990s. Thus, the greater a bank's reliance on insured deposits, the riskier is the bank and the higher the required spread. A positive coefficient is expected.[10]

Because issuer size may affect the market's perception of its credit risk and thus the spread, the log of total consolidated on-balance sheet assets (*LOGTA*) is specified as a control variable. This may also pick up any "too-big-to-fail" perceptions by the market. Another control variable is *DUMBANK*, which takes the value of 1 for bank bonds and 0 for BHC bonds.

In addition, to capture any non-linear risk relationships, several interactive terms are included in the model. The variables *XINSURED*, *XNPLOAN*, and *XROA* are *INSURED*, *NPLOAN*, and *ROA*, respectively, scaled by *LEVMKT*. The variables *BKINSURED*, *BKLEVMKT*, *BKNPLOAN*, and *BKROA* are bank-interactive slope dummies, which are the multiplicative terms of each of the stand-alone risk measures and *DUMBANK* (0 or 1). A summary description of the variables appears in Table 1.

V. The Data and Sample

Our sample is derived from the largest 100 U.S. commercial banks and their parent bank holding companies at yearend 1997. For these banks and BHCs, we collected detailed information on their outstanding bonds from Bloomberg Data Services. We selected one representative subordinated bond for each bank and one representative subordinated bond for each BHC. To be included in the sample, the selected debt securities had to meet the following seven criteria: 1) publicly traded in the

[10] To the extent that banks decide between funding with insured and uninsured deposits on the basis of the interest rate spread between the two types of deposits, ***INSURED*** and ***SPREAD*** may be simultaneously determined. Our specification does not account for this simultaneity.

secondary market (in order to be able to trace historical prices and yields), 2) in issues of at least $100 million, 3) U.S. dollar denominated, 4) issued and traded in the U.S. capital market, 5) rated by either or both S&P and/or Moody's, 6) straight bonds with no callable, putable, convertible, or other option features, and 7) outstanding on December 31, 1997. The sample is restricted to option-free bonds for two reasons -- first, in order obtain a more homogeneous group of bonds, and second, to avoid excessive noise introduced by the models used for computing option adjusted spreads, which vary substantially among market participants. If issuers had more than one qualifying bond issue outstanding, we picked the issue that had been outstanding for the most years. Because all of the sampled bank bonds were issued in 1992 or later, the results reported in this paper are based on bond price data from only 1992 to 1997 for both banks and BHCs. The few bank bonds issued prior to 1992 had matured by 1997, and their historical prices are not available on Bloomberg. Thus, all observations are for the post-FDICIA and, with only a few exceptions, also the post-depositor preference period.

The final sample includes 19 subordinated bond issues for 19 banks and 39 subordinated bond issues for 39 BHCs.[11] The banks and BHCs in the sample are identified in Appendix 2. As noted earlier, all except one of these sampled banks are subsidiaries of sampled BHCs. No more than one bank subsidiary is included in the sample for each of the sampled BHCs. We observed the market prices of these securities outstanding at yearend 1992 through 1997.[12] Issuers did not necessarily have bonds outstanding in each year. The overall sample includes 203 observations for BHCs and 65 observations for banks for a total of 268 observations. Bond yields were computed from the prices of

[11] The number of bank subordinated debt issues included in the sample is small in part because many of these issues are held entirely by the bank's parent holding company, and thus not publicly traded.

[12] Bloomberg reports BGN bond prices, which are a volume-weighted average of transaction prices in each day. When securities are not traded in a day, quoted prices by a number of pricing providers are used. All bond prices

the bonds on December 31 of each year.

Information on the accounting risk characteristics of the security issuers is obtained from the Report of Condition and Income (Call Report) for banks and Federal Reserve Y-9 and Y-9LP Reports for BHCs. Regulator's CAMEL and BOPEC ratings are from the National Examination Database (NED). S&P and Moody's bond ratings are obtained from Bloomberg or directly from S&P and Moody's, if not reported by Bloomberg.

VI. Empirical Results

Summary statistics for the sample observations at yearend 1997 are shown in Table 2. The sampled BHCs have average assets of $84 billion as of yearend 1997, with about 61 percent of the deposits of their affiliate banks insured. They are rated between 1 and 2 by the composite *BOPEC* measure (average of 1.41), while their S&P ratings range from AA to BBB- and average around A/A- or 6.8.

Characteristics of the sampled banks are shown in the middle panel of Table 2. Their average size is approximately $55 billion. About 58 percent of their total deposits are insured. They are rated between 1 and 2 by the composite *CAMEL* measure (average of 1.44), while their S&P ratings range more widely from AA+ to BBB+ (average around A+/A or 5.9). The bottom panel of Table 2 indicates that the market requires a higher yield spread on BHC subordinated debt than on bank subordinated debt. This may reflect less risk for banks than BHCs because of the lower priority claim of BHCs on bank assets or the perceived extension of the federal safety net beyond bank deposits to cover bank debt holders, but not BHC debt holders.

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reported by Bloomberg are a weighted average based on at least two price sources, and must be within a tight range.

The regression estimates for the accounting risk characteristics specified in equation (2) are reported in Table 3. Results are shown for a number of alternative specifications of the risk and control measures. When only the accounting risk measures per se (without interactive terms), control variables, and the intercept dummy (*DUMBANK*) are specified (Column 1), three of the four risk measures are statistically significant with the expected signs. The higher the issuer's return on assets (*ROA*), the lower is the bond spread over comparable Treasuries. The greater the issuer's non-performing loan ratio (*NPLOAN*) and reliance on insured deposits (*INSURED*), the higher is the spread. Only issuer leverage is insignificant. The larger is the issuer (measured by on-balance sheet assets), the smaller is the spread. The insignificant coefficient on *DUMBANK* indicates that, holding measured risk constant, BHC subordinated debt and bank subordinated debt trade at approximately the same spread. However, the risk measures add little explanatory power to that provided by the two control variables alone (column 1, Table 4). The adjusted R^2 is about 60 percent in both models. Nonetheless, a marginal F-test performed to test the robustness of the incremental predictive power contributed by the four risk measures specified as a group over the control variables alone is significant at the 5 percent level[13]. The R^2 may not be higher in part because the risk variables specified proxy only the probability of default and not the expected loss in case of default, which is also reflected in the observed spreads.

The results are basically unchanged when the leverage-scaled risk variables are substituted (Column 2, Table 3) for the stand-alone risk variables. All three interactive risk measures (*XNPLOAN*, *XINSURED*, and *XROA*) are significant with the expected signs. Again, BHC-issued and bank-issued subordinated debt trade at a yield spread that is not statistically different from each other when controlling for risk. A marginal F-test to test the robustness of the incremental predictive power

[13] The calculated F-statistic is 7.10 compared with the critical F-statistic of 2.37.

contributed by the three leverage-scaled risk measures (Column 2, Table 3) over the control variables alone (Column 1, Table 4) is again significant at the 5 percent level.[14] The adjusted R^2 for this specification is higher than for the earlier stand-alone specification, suggesting that the nonlinear specification is a better fit.[15] This suggests that the market charges a higher interest spread for equal risk exposures at less-capitalized issuers than at better-capitalized issuers.

The results for specifying both the risk measures per se and leverage-scaled risk variables in the same equation are reported in Column 3 of Table 3. Two of the four stand-alone risk measures -- leverage and non-performing loans (*LEVMKT* and *NPLOAN*) -- are statistically significant with the expected sign, as are two of the three leverage-scaled risk measures (*XINSURED*, and *XROA*). This suggests that market impounds information on the non-performing assets and leverage of all issuers in pricing their bond spread and, in addition, penalizes further highly-leveraged issuers with lower earnings and that rely more on insured deposits by requiring higher interest rates than for comparable better-capitalized institutions. A marginal F-test of the robustness of the incremental predictive power contributed by the leverage-scaled interactive risk measures as a group (Column 3) over the stand-alone specification (Column 1) is significant at the 5 percent level. [16] This suggests that leverage is important in the pricing of bank and BHC bonds over and above the stand-alone risk measures. The adjusted R^2 is slightly higher for this specification than for the two previous ones.

Because an increase in *ROA* reduces spread only for less-capitalized institutions, a higher return

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[14] The calculated F-statistic is 24.62 compared with the critical value of 2.6.

[15] We also compute alternative goodness of fit measures, such as the Schwartz's Bayesian Criterion and the Akaike's Information Criterion. On the whole, they both provide the same relative ranking of the alternative specification as do the adjusted R^2.

[16] The calculated F-statistic is 17.68 compared with the critical value of 2.6.

on assets appears to be perceived by the market as a signal of good performance, rather than reflecting higher returns from greater risk taking. Surprisingly, the coefficient for leverage-scaled non-performing loans (*XNPLOAN*) is negative and weakly significant (at the 10 percent level), suggesting that the market demands a lower interest spread at less-capitalized institutions with more non-performing loans than at comparable better-capitalized issuers. However, the coefficient is very small. When evaluated at the mean, a one percentage point (100 basis points) increase in the proportion of non-performing loans to assets would reduce the spread by approximately only 3 basis points.

Slope dummies (i.e. bank-interactive terms between *DUMBANK* and the risk variables) are introduced in addition to the intercept dummy in the specification with the stand-alone risk measures in Column 4 of Table 3 and the specification with the leverage-scaled risk measures in Column 5 in order to test whether required spread differences between bank and BHCs debt is associated with risk-specific variables. In Column 4, the same three stand-alone risk variables as before -- *ROA*, *INSURED*, and *NPLOAN* -- remain significant with the expected signs. None of the slope dummies are significant. Together with the insignificant DUMBANK intercept coefficient, this provides additional evidence that spreads on BHC subordinated debt are not significantly different from that on bank subordinated debt during the sample period, when controlling for the risk characteristics of the issuing firms.

When the slope dummies are included in the leverage-scaled risk specification (Column 5), the results also remain basically unchanged from the specification without these slope dummies (Column 2). Spread is again significantly affected by all three leverage-scaled risk measures in the expected directions. None of the slope dummies or the intercept dummies are significant, reinforcing the previous

results that the market does not differentiate greatly between the risk characteristics of bank and BHC debt during our sample period.[17] When all of the risk measures, dummies, and interactive risk variables are specified (Column 6), the results are basically consistent with those discussed earlier. One per se (*NPLOAN*) and all three interactive risk measures are significant and no dummy variables are. The adjusted R^2 also remains basically unchanged. Thus, the market prices the credit risk of both banks and BHCs, and particularly of those poorly capitalized, but does not distinguish between the types of issuer.

The interest rate spreads are regressed on *SPMOODY* in Column 2 of Table 4. The estimated coefficient is highly significant in the expected direction. The lower the credit rating, the higher is the interest spread. Asset size remains significant, so that spreads are smaller for larger issuers than for equally rated smaller issuers. Unlike in the earlier specifications in Table 3, *DUMBANK* is significant at the 1 percent level with a positive sign. Bank subordinated debt trades at a higher spread on the secondary market than comparably rated BHC subordinated debt. This suggests that S&P and Moody's ratings, which usually rate bank-issued bonds one notch better than the parent BHC-issued bonds, may overestimate the perceived FDIC protection to banks' bondholders when compared with the market's view. The marginal F-test indicates that the credit ratings contribute significantly in explaining the variation in the yield spread across the sampled bonds.[18] The adjusted R^2 for this specification is in the same range (60 to 65 percent) as the earlier specifications that include only accounting measures of risk. This suggests that the earlier models captured most of the causes of the observed interest spread differentials.

The regulatory rating REGRATE (*CAMEL* for banks and *BOPEC* for BHCs) is included in the

[17] When the model is specified to include only the slope dummies and exclude the intercept dummy (DUMBANK), the results remain the same.

specification in Column 3 of Table 4. The coefficients for these ratings are significant with the expected sign. The regulatory agencies' examination ratings explain the risk spreads to about the same extent as either the accounting risk variables or the rating agencies' ratings, as reflected in the adjusted R^2. This suggests that the market relies on some of the same information on evaluating the financial strength of banks and BHCs as do the regulatory agencies. This is consistent with the findings of Berger, Flannery, and Davies (forthcoming) that both the regulators and the market use some information available to the other and some that is unique to themselves.

VI. Robustness Tests

Three additional series of empirical estimates were computed to test the robustness of the above results to alternative specifications. To expand the sample size, we estimated equations (1) to (3) using BHC senior debt as well as subordinated debt (no senior debt was issued by the sampled banks). This increases the number of observations from 268 to 319. However, the estimation is subject to a double counting of senior and subordinated debt issued by the same BHC. All BHCs that had qualifying senior debt outstanding also had subordinated debt outstanding. A dummy variable (*DUMSUB*) is defined to differentiate BHC-issued senior from subordinated debt. *DUMSUB* takes the value of 1 for BHC subordinated debt and 0 for BHC senior debt and bank debt. The results are presented in Appendices 3 and 4, and are similar to those for the smaller sample discussed above. The market prices accounting measures of risk. The adjusted R^2s are also comparable with the earlier results. In most specification, the BHC senior debt trade at some 7 basis points lower than either BHC or bank subordinated debt, which, as before, trade at about the same rates.

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[18] The calculated F-statistic is 77.43 compared with 3.84 critical value.

To increase the comparability of the banks and BHCs, the models are also fitted to a subsample of 18 BHCs, whose subsidiary banks issued qualifying subordinated debt (Appendix 5). The BHCs, whose subsidiary bank did not issue publicly traded bonds, are excluded. This reduces the number of observations to 180. The results are again basically the same as for the original and expanded samples. The bonds of both banks and BHCs are priced by the market according to the credit worthiness of the issuer, and the market penalizes the less-capitalized firms more severely for the same amount of increased risks, such as lower earnings or more reliance on insured deposits as a funding source. BHC senior debt trades at some 12 basis points below bank and BHC subordinated debt. The adjusted R^2s are somewhat higher than before, reflecting the greater comparability of the sample.

Lastly, we estimated separate equations for banks and BHCs. This permits us to specify variables, in addition to the risk variables used in the earlier models, that were available only for either banks or BHCs, but not for both. For BHCs, we included maturity gap (*GAP*) to reflect interest rate risk and the level of nonbank activities in the BHCs (*BANKBHC*). *GAP* was not available for banks and *BANKBHC* was applicable only to BHCs. *GAP* was measured by the ratio of the absolute difference between assets maturing (or repriced) within one year and liabilities maturing (or repriced) within one year to total assets. However, because it does not incorporate hedging or market-making activities through futures, options, or swaps, and other off-balance sheet activities, *GAP* may not accurately measure interest rate risk exposure.[19]

BANKBHC was measured by the ratio of the parent company's investment in banking units to total investment in all bank and nonbank units. Investment in the banking units includes equity and nonequity investments in and receivables due from bank subsidiaries and subsidiary bank holding

companies. Total investment includes investment in banking units plus equity and nonequity investment in and receivables due from nonbank subsidiaries and associated nonbank companies. An income-based measure, rather than the asset-based, would have been preferred but is not available. As can be seen from Table 2, banking activities in 1997 as a proportion of the overall bank holding company activities, as measured by the relative investment in bank- and nonbank-subsidiaries, range from 41 to 100 percent, with an average of 86 percent. The expected coefficient of *BANKBHC* is uncertain. It may be negative as the claim on the subsidiary bank is more junior. The converse may be true if either the nonbank activities are perceived to be less risky than the bank activities or the covariances reduce total risk or the safety net is perceived to spill over to BHC debt.

The results obtained for the two separate equations are similar to those reported above for the single equation model. The required spreads for both bank and BHC debt are statistically related to most of the accounting measures of risk specified in the expected directions, and are proportionately greater for a given degree of risk the more highly leveraged is the issuer. Neither *GAP* nor *BANKBHC* were statistically significant.

VII. Conclusions and Policy Implications

Whether, in light of the safety net under banks, the private market prices the riskiness of the debt liabilities of commercial banks and BHCs is a subject of much controversy. Thus, an understanding of how the market prices bank debt is important in evaluating a number of current policy proposals for improving the safety and efficiency of the banking system, including proposals for requiring banks and BHCs to issue subordinated debt. Doubts about the ability of investors to accurately price

[19] See Jagtiani, Saunders, and Udell (1995 and 1997) for more detail.

bank and BHC debt arise because, unlike other issuers, some liabilities of banks are insured by the federal government, and there is uncertainty as to how far the guarantee extends. *De jure*, in the U.S., the insurance of par value extends only to deposit accounts of $100,000 or less. But, because in the past the guarantee has at times been extended to uninsured depositors, other creditors, including bank bond holders, and even, in the Continental Illinois Bank rescue in 1984, to bondholders of the holding company, there is uncertainty about the *de facto* coverage of the federal safety net in the future.

More recent previous studies have found that the market did price debt issued by BHCs according to the credit risk of the issuer. However, no studies have examined the pricing of subordinated debt issued by the banks themselves. This study is the first to extend the previous literature by examining bank debt as well as BHC debt. In addition, our study utilizes more recent data since the enactment of FDICIA, which may be expected to have narrowed the implicit coverage of FDIC insurance, and depositor preference legislation, which lowered the liquidation standing of bank subordinated debt.

The interest spread between the market interest rate on option-free bonds issued by large banks and bank holding companies and the rate on Treasury securities of the same maturity is modeled as a function of the issuer's accounting credit risk characteristics. The models developed are comparable to those in previous studies, particularly Flannery and Sorescu (1996). The sample includes 19 subordinated debt issues of the 19 of the largest 100 commercial banks that had publicly traded issues outstanding at yearend 1997, and 39 subordinated debt issues of 39 BHCs that were parents of one of the 100 largest banks and that were publicly traded at yearend 1997. The observation period is annually from 1992 through 1997. The models were fitted by multiple regression analysis using the

Fuller-Battese Feasible Generalized Least Square (FGLS) technique, for yearend secondary market yield observations.

Overall, the results suggest that the market prices, at least, credit risk for the debt of both banks and BHCs according to the accounting risk characteristics of the issuer. The riskier the institution, the higher is the interest spread that the market requires over Treasury securities of equal maturities. Additionally, the risk-spread relationship appears to be nonlinear. The market tends to price risk more severely at less-capitalized institutions. The accounting risk measures specified in the model explain the interest spread differentials among issuers about as well as do both the Moody's and S&P's credit ratings and the regulatory agencies' bank examination ratings. They do this despite the fact that both the rating and the regulatory agencies spend considerable time and effort on- and off-site in analyzing factors beyond the limited number of accounting variables specified in our model and that the rating agencies take into account the loss on the bonds in case of default as well as the probability of default, the only factor that is captured in our model. The results are robust to alternative specifications. Moreover, the results may be even stronger if greater disclosure and transparency of current bank financial information, which are widely considered poorer in banking than in most other industries, were required.

These findings suggest that requiring, at least, larger banks or BHCs to issue a minimum amount of subordinated debt is likely to reveal additional information about the financial condition of the issuing bank or BHC and supplement prudential regulatory discipline. It should be noted that most proposals for subordinated debt specify bonds with a homogeneous set of characteristics (Evanoff and Wall, 2000 and U.S. Shadow, 2000). This effectively reduces the number of omitted variables in our model and

should improve the estimated relationship between the measures of credit risk and the market yield spreads. Because the market appears to penalize more poorly capitalized issuers with the same credit risk exposures as better capitalized issuers, the results also support the emphasis bank regulators put on capital in evaluating the financial health of banks and BHCs, particularly for poorly capitalized institutions. Importantly, most of the specifications do not find a significant difference in the sensitivity of interest rate spreads to the risk of the issuer between subordinated debt issued by banks and BHCs. Thus, at least in terms of potential market discipline, it appears to matter little whether the debt requirement is imposed on banks or BHCs. Since most banks were performing strongly in the sample period examined in this paper, further research extending the analysis to the time periods where the banks were under great financial stress would provide a more complete picture about how the market prices the debt of banks and bank holding companies.

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Table 1

Variable	Summary of Variable Description
SPREAD	*Bond yield minus maturity matched U.S. Treasury yield (%)*
LOGTA	*Log of total assets*
INSURED	*Total insured deposits divided by total deposits (%)*
MKTLEV	*Total liabilities (book) divided by (market value of common stocks plus book value of preferred stocks (%)*
NPLOAN	*The ratio of non-performing loans (past due over 90 days accruing and nonaccruing plus other real estate owned (OREO)) to total assets (%)*
ROA	*The ratio of annual net income to year-end to total assets (%)*
SPMOODY	*Average S&P and Moody's bond ratings (See the cardinalization in Appendix1)*
BOPEC	*Average of the two BOPEC ratings assigned by regulators (around the relevant year-end date), where B=Bank, O=Others, P=Parent, E=Earnings, C=Capital.*
CAMEL	*Average of the two CAMEL ratings assigned by regulators (around the relevant year-end date), where C=Capital, A=Asset quality, M=Management, E=Earnings, L=Liquidity.*
DUMBANK	*Dummy for bank-issued bonds (DUMBANK=1 for bank bonds, 0 for BHC bonds).*
XINSURED, XNPLOAN, XROA	*Leverage-Scaled Interactive Terms, equal to MKTLEV multiplied by each of the risk variables.*
BKINSURED, BKMKTLEV, BKNPLOAN, BKROA	*Bank-Interactive Slope Dummies, equal to DUMBANK multiplied by each of the risk variables.*

Table 2
Summary Statistics

39 Sampled Bank Holding Companies (Consolidated) as of Dec 31, 1997				
	Mean	**Std. Dev.**	**Minimum**	**Maximum**
Total Assets ($ Mill)	***$83,980***	***$89,929***	***$8,093***	***$365,521***
INSURED	***60.92%***	***21.28%***	***0.67%***	***82.68%***
MKTLEV	***4.313***	***2.140***	***2.369***	***12.176***
GAP	***24.15%***	***10.62%***	***1.27%***	***39.46%***
BANKBHC	***85.81%***	***14.51%***	***40.78%***	***100.00%***
NPLOAN	***0.642%***	***0.353%***	***0.216%***	***1.848%***
ROA	***1.19%***	***0.26%***	***0.56%***	***1.84%***
BOPEC	***1.410***	***0.498***	***1.000***	***2.000***
SPMOODY (Sub Debt)	***6.846***	***1.338***	***3.500***	***9.500***
19 Sampled Banks as of December 31, 1997				
	Mean	**Std. Dev.**	**Minimum**	**Maximum**
Total Assets ($ Mill)	***$55,458***	***$76,979***	***$10,672***	***$297,062***
INSURED	***57.65%***	***20.73%***	***0.68%***	***81.12%***
MKTLEV	***4.281***	***3.574***	***1.323***	***17.018***
NPLOAN	***0.607%***	***0.219%***	***0.325%***	***1.064%***
ROA	***1.22%***	***0.32%***	***0.51%***	***1.73%***
CAMEL	***1.444***	***0.511***	***1.000***	***2.000***
SPMOODY (Sub Debt)	***5.861***	***1.173***	***2.500***	***7.500***
Sampled Banks and Bank Holding Companies (1992-1997) Mean (Standard Deviation)				
	SPREAD	***SPMOODY***	***REGRATE***	***OBS NO.***
BHC Subordinated	***0.7508% (0.2710%)***	***7.1133 (1.5731)***	***1.5665 (0.5211)***	***203***
Bank (Subordinated)	***0.6940% (0.1497%)***	***5.7846 (1.5612)***	***1.4692 (0.4750)***	***65***

Table 3
Panel Regressions Analysis
Subordinated Debt *SPREAD* on Issuer's Risk Characteristics
Period: 1992-1997

The dependent variable is ***SPREAD***, which is regressed against the various risk factors (described in Table 1). The ***SPREAD*** and the risk factors are measured as of December 31 of each year. The variables ***BKINSURE***, ***BKLEVMKT***, ***BKNPLOAN***, and ***BKROA*** are the multiplicative terms of ***DUMBANK*** multiplied by the risk variables, as written in equation (1). The variables ***XNPLOAN***, ***XINSURED***, and ***XROA*** are the multiplicative terms of ***LEVMKT*** and the risk variables, as written in equation (1). P-Values are reported in parentheses. Significance at the 1, 5, and 10 percent level is indicated by ***, **, and * respectively.

Independent Variables	***1***	***2***	***3***	***4***	***5***	***6***
Intercept	***160.4012*** (0.0019)***	***145.9035*** (0.0020)***	***150.0750*** (0.0045)***	***162.8331*** (0.0030)***	***148.1996*** (0.0023)***	***159.6949*** (0.0056)***
LOGTA	***-5.7176*** 0.0001)***	***-4.3207*** (0.0019)***	***-5.3247*** (0.0005)***	***-5.5742*** (0.0002)***	***-4.3176*** (0.0029)***	***-5.5091*** (0.0005)***
INSURED	***0.2827*** (0.0001)***		***-0.1055*** (0.4348)***	***0.2892*** (0.0004)***		***-0.1268*** (0.4237)***
LEVMKT	***0.0071*** (0.2047)***		***0.0184** (0.0995)***	***0.0055*** (0.4520)***		***0.0139*** (0.3115)***
NPLOAN	***4.9862*** (0.0014)***		***9.0137*** (0.0075)***	***5.1003*** (0.0025)***		***10.2936*** (0.0055)***
ROA	***-9.5120** (0.0244)***		***8.9341*** (0.2275)***	***-13.3695** (0.0221)***		***4.7269*** (0.5981)***
BKINSURE				***-0.0605*** (0.6913)***	***-0.0046*** (0.9736)***	***0.0347*** (0.8198)***
BKLEVMKT				***0.0003*** (0.9742)***	***0.0087*** (0.3360)***	***0.0053*** (0.6372)***
BKNPLOAN				***-2.1986*** (0.6792)***	***-0.2008*** (0.9678)***	***-4.6671*** (0.3772)***
BKROA				***9.6930*** (0.2696)***	***5.8331*** (0.4089)***	***6.0797*** (0.4794)***
XNPLOAN		***0.0021** (0.0905)***	***-0.0053** (0.0661)***		***0.0022** (0.0848)***	***-0.0058** (0.0645)***
XINSURED		***0.0004*** (0.0001)***	***0.0005*** (0.0007)***		***0.0004*** (0.0001)***	***0.0005*** (0.0015)***
XROA		***-0.0165** (0.0031)***	***-0.0300*** (0.0065)***		***-0.0199*** (0.0018)***	***-0.0281** (0.0134)***
DUMBANK	***1.9287*** (0.4743)***	***2.5681*** (0.3354)***	***2.7781*** (0.2974)***	***-4.7677*** (0.7744)***	***-8.4692*** (0.5188)***	***-5.9720*** (0.7251)***
N	*268*	*268*	*268*	*268*	*268*	*268*
Adjusted R-Square	*0.6071*	*0.6488*	*0.6558*	*0.6182*	*0.6461*	*0.6538*

Table 4
Panel Regressions Analysis
Subordinated Debt *SPREAD* on Issuer's Credit Ratings
Period: 1992-1997

The dependent variable is ***SPREAD***, which is regressed against the various risk factors (described in Table 1). The ***SPREAD*** and the risk factors are measured as of December 31 of each year since the bond was issued through December 31, 1997. P-Values are reported in parentheses. Significance at the 1 and 5 percent level is indicated by *** and ** respectively.

Independent Variables	*1*	*2*	*3*
Intercept	***197.4628*** (0.0004)***	***70.9169** (0.0444)***	***191.3718*** (0.0007)***
LOGTA	***-6.8249*** 0.0001)***	***-2.0767* (0.0962)***	***-7.0374*** (0.0001)***
SPMOODY		***6.1121*** (0.0001)***	
REGRATE			***6.3895** (0.0138)***
DUMBANK	***-2.2009 (0.3990)***	***6.9759*** (0.0079)***	***-2.0627 (0.4214)***
N	***268***	***268***	***268***
Adjusted R-Square	***0.6099***	***0.6418***	***0.6328***

Appendix 1
Cardinalization of S&P and Moody's Bond Ratings

S&P Rating	MOODY's	*SPMOODY* Cardinalization
AAA	*Aaa*	*1.00*
AA+	*Aa1*	*2.00*
AA	*Aa2*	*3.00*
AA-	*Aa3*	*4.00*
A+	*A1*	*5.00*
A	*A2*	*6.00*
A-	*A3*	*7.00*
BBB+	*Baa1*	*8.00*
BBB	*Baa2*	*9.00*
BBB-	*Baa3*	*10.00*
BB+	*Ba1*	*11.00*
BB	*Ba2*	*12.00*
BB-	*Ba3*	*13.00*
B+	*B1*	*14.00*
B	*B2*	*15.00*
B-	*B3*	*16.00*
CCC+	*Caa1*	*17.00*
CCC	*Caa2*	*18.00*
CCC-	*Caa3*	*19.00*
CC+	*Ca1*	*20.00*
CC	*Ca2*	*21.00*
CC-	*Ca3*	*22.00*
C+	*C1*	*23.00*
C	*C2*	*24.00*
C-	*C3*	*25.00*

Note: *SPMOODY* is defined as an average of the cardinalized ratings by S&P and Moody's (Jewell and Livingston, 1998). For the few institutions that are rated by only one agency, the variable *SPMOODY* takes the cardinalized value of the assigned rating.

Appendix 2
List of Sampled Banks and BHCs (Assets as of Yearend 1997)

Banks	Assets ($ millions)	BHCs	Assets ($ millions)
Chase Manhattan Bank	297,061	Chase Manhattan Corporation	365,521
		Citicorp	310,897
Morgan Guaranty Trust Co of NY	196,794	J.P. Morgan & Co. Incorporated	262,159
Bnk of America Natl Trust & Savings	236,982	Bankamerica Corporation	260,159
		Nationsbank Corporation	264,562
First Union National Bank	124,995	First Union Corporation	157,274
		Bankers Trust New York Corp	140,102
The First Natl Bank of Chicago (95-97)	58,483	First Chicago NBD Corporation	114,096
		Banc One Corporation	116,182
Wells Fargo Bank, N.A.	89,156	Wells Fargo and Company	97,456
		Norwest Corporation	88,540
Fleet National Bank	63,884	Fleet Financial Group, Inc.	85,690
Keybank National Association	69,708	KeyCorp	73,624
PNC Bank, National Association	69,710	PNC Bank Corp.	75,101
U.S. Bank National Association	67,597	U.S. Bancorp	71,295
BankBoston, National Association	64,954	BankBoston Corporation	69,268
		Bank of New York Company,Inc	59,961
		Republic New York Corporation	55,638
		Southtrust Corporation	57,981
National City Bank	16,540	National City Corporation	54,684
		Wachovia Corporation	65,397
Mellon Bank, National Association	38,802	Mellon Bank Corporation	44,947
Comerica Bank	28,936	Comerica Incorporated	36,453
Mercantile Bank Natl Association	15,706	Mercantile Bancorporation	30,020
		Suntrust Banks, Incorporated	30,906
Summit Bank	24,171	Summit Bancorp	30,016
		BB&T Corporation	29,178
The Northern Trust Company	23,894	Northern Trust Corporation	25,315
The Huntington National Bank	26,590	Huntington Bancshares Incorporated	26,731
		Crestar Financial Corporation	24,974
		Regions Financial Corporation	23,340
		Marshall & Ilsley Corp.	19,477
		Union Planters Corp.	18,105
		First Tennessee National Corp.	14,389
		Old Kent Financial Corporation	13,774
		Compass Bancshares, Inc.	13,511
Star Bank, National Association	10,672		
		Central Fidelity Banks, Inc.	10,556
		Zions Bancorporation	9,482
		Bancwest Corp.	8,093

Appendix 3
Panel Regressions Analysis
All Debt (Subordinated & Senior) *SPREAD* on Issuer's Risk Characteristics
Period: 1992-1997

The dependent variable is ***SPREAD***, which is regressed against the various risk factors (described in Table 1). The ***SPREAD*** and the risk factors are measured as of December 31 of each year. The variables ***BKINSURE***, ***BKLEVMKT***, ***BKNPLOAN***, and ***BKROA*** are the multiplicative terms of ***DUMBANK*** multiplied by the risk variables, as written in equation (1). The variables ***XNPLOAN***, ***XINSURED***, and ***XROA*** are the multiplicative terms of ***LEVMKT*** and the risk variables, as written in equation (1). P-Values are reported in parentheses. Significance at the 1, 5, and 10 percent level is indicated by ***, **, and * respectively.

Independent Variables	***1***	***2***	***3***	***4***	***5***	***6***
Intercept	***178.1172*** (0.0009)***	***139.8778*** (0.0029)***	***158.0140*** (0.0032)***	***180.5336*** (0.0013)***	***141.6572*** (0.0033)***	***166.3622*** (0.0041)***
LOGTA	***-6.8699*** 0.0001)***	***-4.2567*** (0.0028)***	***-6.1444*** (0.0001)***	***-6.5789*** (0.0001)***	***-4.2216*** (0.0043)***	***-6.1560*** (0.0001)***
INSURED	***0.2194*** (0.0004)***		***-0.1389*** (0.2700)***	***0.2123*** (0.0034)***		***-0.1502*** (0.3034)***
LEVMKT	***0.0101** (0.0530)***		***0.0265** (0.0102)***	***0.0081*** (0.2249)***		***0.0219** (0.0760)***
NPLOAN	***5.4034*** (0.0003)***		***10.1346*** (0.0018)***	***5.2716*** (0.0009)***		***11.1700*** (0.0016)***
ROA	***-11.9436*** (0.0024)***		***9.0233*** (0.1871)***	***-16.9954*** (0.0010)***		***2.9932*** (0.7076)***
BKINSURE				***-0.0107*** (0.9423)***	***-0.0132*** (0.9253)***	***0.0467*** (0.7521)***
BKLEVMKT				***-0.0003*** (0.9754)***	***0.0094*** (0.2925)***	***0.0039*** (0.7110)***
BKNPLOAN				***-1.4010*** (0.7893)***	***-0.2905*** (0.9534)***	***-4.2422*** (0.4119)***
BKROA				***13.4239*** (0.1052)***	***7.4694*** (0.2869)***	***10.2601*** (0.2025)***
XNPLOAN		***0.0026** (0.0373)***	***-0.0063** (0.0224)***		***0.0026** (0.0362)***	***-0.0069** (0.0197)***
XINSURED		***0.0004*** (0.0001)***	***0.0005*** (0.0005)***		***0.0004*** (0.0001)***	***0.0005*** (0.0014)***
XROA		***-0.0189** (0.0005)***	***-0.0362*** (0.0004)***		***-0.0227*** (0.0002)***	***-0.0330*** (0.0015)***
DUMSUB	***6.3944** (0.0196)***	***6.6898** (0.0129)***	***7.2059*** (0.0065)***	***6.285** (0.0164)***	***6.6920** (0.0132)***	***7.2443*** (0.0064)***
DUMBANK	***7.8994** (0.0209)***	***8.7326** (0.0115)***	***9.2629*** (0.0062)***	***-5.9085*** (0.7044)***	***-3.9830*** (0.7609)***	***-4.4725*** (0.7789)***
N	*319*	*319*	*319*	*319*	*319*	*319*

Adjusted R-Square	*0.5950*	*0.6431*	*0.6491*	*0.6077*	*0.6422*	*0.6513*

Appendix 4
Panel Regressions Analysis
All Debt (Subordinated & Senior) *SPREAD* on Issuer's Credit Ratings
Period: 1992-1997

The dependent variable is ***SPREAD***, which is regressed against the various risk factors (described in Table 1). The ***SPREAD*** and the risk factors are measured as of December 31 of each year since the bond was issued through December 31, 1997. P-Values are reported in parentheses. Significance at the 1 and 5 percent level is indicated by *** and ** respectively.

Independent Variables	*1*	*2*	*3*
Intercept	***185.7114*** (0.0008)***	***60.4256* (0.0622)***	***185.4131*** (0.0007)***
LOGTA	***-6.5245*** 0.0001)***	***-1.6254 (0.1780)***	***-7.1629*** (0.0001)***
SPMOODY		***6.7394*** (0.0001)***	
REGRATE			***7.5583*** (0.0016)***
DUMSUB	***6.4609** (0.0221)***	***1.9549 (0.4711)***	***6.0851** (0.0291)***
DUMBANK	***4.6290 (0.1826)***	***5.9626* (0.0536)***	***4.1213 (0.2289)***
N	***319***	***319***	***319***
Adjusted R-Square	***0.6020***	***0.6574***	***0.6095***

Appendix 5
Panel Regressions Analysis
All Debt (Subordinated & Senior) *SPREAD* on Issuer's Risk Characteristics
For Banks and Their Parent BHCs (1992-1997)

The dependent variable is ***SPREAD***, which is regressed against the various risk factors (described in Table 1). The ***SPREAD*** and the risk factors are measured as of December 31 of each year. The variables ***BKINSURE***, ***BKLEVMKT***, ***BKNPLOAN***, and ***BKROA*** are the multiplicative terms of ***DUMBANK*** multiplied by the risk variables, as written in equation (1). The variables ***XNPLOAN***, ***XINSURED***, and ***XROA*** are the multiplicative terms of ***LEVMKT*** and the risk variables, as written in equation (1). P-Values are reported in parentheses. Significance at the 1, 5, and 10 percent level is indicated by ***, **, and * respectively.

Independent Variables	***1***	***2***	***3***	***4***	***5***	***6***
Intercept	***189.1680*** (0.0035)***	***156.7361*** (0.0043)***	***170.7920*** (0.0073)***	***175.7029*** (0.0088)***	***158.9231*** (0.0052)***	***169.1626** (0.0145)**
LOGTA	***-8.6638*** (0.0001)***	***-5.8666*** (0.0012)***	***-7.8228*** (0.0001)***	***-8.2558*** (0.0001)***	***-5.8130*** (0.0026)***	***-7.8233*** (0.0002)***
INSURED	***0.2932*** (0.0008)***		***-0.4246** (0.0240)**	***0.3688*** (0.0013)***		***-0.4084** (0.0721)*
LEVMKT	***0.0186*** (0.0032)***		***0.0463*** (0.0005)***	***0.0264*** (0.0054)***		***0.0509*** (0.0034)***
NPLOAN	***7.4250*** (0.0009)***		***15.9598*** (0.0091)***	***6.9402*** (0.0059)***		***21.4335*** (0.0055)***
ROA	***-7.7931** (0.0569)**		***24.6952*** (0.0044)***	***-9.7553** (0.0972)*		***20.4692** (0.0360)**
BKINSURE				***-0.1726 (0.2778)***	***-0.1109 (0.4230)***	***-0.0935 (0.5341)***
BKLEVMKT				***-0.0156 (0.1783)***	***0.0074 (0.4048)***	***-0.0062 (0.6064)***
BKNPLOAN				***-1.3743 (0.7896)***	***1.4260 (0.7604)***	***-3.2682 (0.5518)***
BKROA				***7.8076 (0.3555)***	***8.2351 (0.2417)***	***9.1939 (0.2496)***
XNPLOAN		***0.0044 (0.1050)***	***-0.0191** (0.0147)**		***0.0039 (0.1660)***	***-0.0253*** (0.0063)***
XINSURED		***0.0005*** (0.0001)***	***0.0012*** (0.0001)***		***0.0006*** (0.0001)***	***0.0012*** (0.0001)***
XROA		***-0.0152** (0.0163)**	***-0.0666*** (0.0001)***		***-0.0224*** (0.0053)***	***-0.0660*** (0.0001)***
DUMSUB	***11.4140*** (0.0008)***	***11.3123*** (0.0006)***	***11.7989*** (0.0002)***	***10.5898*** (0.0021)***	***11.2897*** (0.0006)***	***11.5908*** (0.0003)***

DUMBANK	***12.1529*** (0.0018)*	***14.0789*** (0.0002)*	***14.3731*** (0.0001)*	*22.4585 (0.1936)*	*5.7801 (0.6611)*	*14.9008 (0.3833)*
N	*180*	*180*	*180*	*180*	*180*	*180*
Adjusted R^2	*0.6566*	*0.6945*	*0.7058*	*0.6748*	*0.6925*	*0.7051*

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