

Bond Market Discipline of Banks: Is the Market Tough Enough?

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Abstract

As the banking business grows more complex, government supervisors of banks seem increasingly willing to share the role of policing bank risk with private investors, especially bondholders. This paper investigates the disciplinary role of markets using bond spreads, ratings, and bank portfolio data on over 4,100 new bonds issued between 1993 and 1998, including almost 600 bond issues by banks and bank holding companies. We find that the bond spread/rating relationship is the same for the bank issues as for non-bank issues, especially among the investment grade issues. This suggests the bond market prices public measures of bank risk efficiently. Investors also look beyond the ratings, as spreads on the bank issues depend on the underlying portfolio of loans and other assets. Banks contemplating a shift into riskier activities like trading, for example, can expect to pay higher spreads as a result. That is market discipline. The market, however, appears relatively soft on bigger banks and less transparent banks, pointing to possible slippage in the disciplinary mechanism for banks either considered too big to fail or too hard to understand by the bond market.

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I. Introduction

Banks are among the most heavily regulated of U.S. industries, with both sides of the balance sheet subject to some degree of oversight by government regulators. Supervisors from various government agencies regularly call upon banks, *en situ*, to examine their assets, loans particularly, for signs of trouble. On the liability side, federal deposit insurance helps attract money to banks, and for banks in need of liquidity, the discount window provides an alternative source of funds. As for the really big banks in the 1980s, “too big to fail” status gave them some certainty of an outright rescue by the government in the event of distress or insolvency. Compared to other industries, the chain of command over banks seems reversed: supervisors first, markets second.

Academics have long suspected this perceived chain of command for banks. Adam Smith (1776), for one, reasoned that little government intervention was needed to maintain a stable banking system beyond a simple requirement that bank notes and bonds be payable upon demand by holders – in specie. Given that leash, private investors could control banks on their own.¹ Central bankers now seem increasingly willing, even eager, to share their disciplinary role with market investors, especially as the complexity, size, and breadth of their subjects grow. Calls for *mandatory* subordinated debt issuance by banks—basically nonstarters in the past—are now receiving more serious consideration from central bankers.² The difference in spreads on these uninsured bonds may help supervisors in monitoring bank risk and in allocating their examination resources more efficiently. More important, the rise in spreads associated with greater risk-taking could provide *ex ante* discipline of banks. Market discipline could, in principle, force banks back toward the first-best level of risk; the level banks would choose absent government intervention or other market frictions.

Effective discipline requires first that bondholders consider themselves *at risk* in the event of default, and second, that they can effectively observe the default risk. Neither condition is obviously true for banks.³ Notwithstanding FDICIA and other reforms, bank bondholders may still expect the government to rescue very large banks and holding companies considered “too big to fail.” Bondholders will also be unable to price bank risk if they cannot accurately observe it, a

¹Instability during the “free banking era” of the 19th century is sometimes viewed as proof to the contrary. With hindsight, however, revisionists now argue that panics and wildcat banking problems were exaggerated, or that the protective remedies – deposit insurance, the discount window, etc. – are even worse because of the moral hazards they invite (Gorton (1999)). See also Kaufman (1990, 1999).

²Increased market discipline is one of three “pillars” of the latest round of bank regulatory reforms. See Meyer (1999) for a discussion. Benink and Calomiris (1999) discuss mandatory issues of subordinated debt and Flannery (1998) surveys the empirical literature on market discipline.

³Explicit deposit insurance might also soften market discipline of banks, according to Billet et al. (1998). They find that banks shift toward insured deposits when the market punishes them for increased risk-taking, allowing them to avoid the market-imposed costs of risk. We discuss this idea in the following section.

plausible concern if the risk banks take with the lending and trading portfolios is harder to judge than the risk of other types of firms. Either friction—unobserved risks or *de facto* insurance—can blunt the market discipline of banks.

Empirical research to this point has focused primarily on whether the market provides *any* discipline of banks. Avery et al. (1988) found no relationship whatsoever between bank holding company (BHC) bond spreads (over Treasuries) and observable measures of BHC risk like bond ratings, regulators' risk assessments, non-performing loans, etc. Their findings, which were based on data from the early 1980s, suggest a complete breakdown of the disciplinary mechanism for banks. Using a sample from the late 1980s and early 1990s, Flannery and Sorescu (1996) reported some link between bond spreads and risk at BHCs. The missing link in the earlier years, they conclude, may have reflected the prevailing “too big to fail” (TBTF) mentality, under which bondholders may have considered themselves *de facto* insured. More recently, Jagtiani et al. (1999) also found a connection between spreads on bank or BHC bonds and risk measures.

While the recent evidence suggests that banks face some discipline from markets, the question remains whether the market provides enough discipline. As Flannery and Sorescu (1996) put it:

“Our results provide no indication that market discipline could (or could not) *entirely* replace government supervision of bank risk taking. This remains an important issue for future research (p. 1374, original emphasis).

Our paper approaches the sufficiency question—whether the market is tough enough on banks—from three angles. First, we test if the relationship between bond spreads and risk is the same for banks and non-banks. Assuming the market is efficient in pricing the risk of other firms, a cross-sector test tells if the market disciplines banks equally harshly. Second, we investigate if the spreads on bank bonds reflect the relative risks of a bank's *entire* portfolio of loans and other assets. The spread/portfolio relationship for banks tells us if the market prices the *ex ante* risk in a bank's portfolio, whereas most other researchers focused on the relationship between spreads and *ex post* risk measures, such as non-performing loans. Finally, we test if the strength of the spread/portfolio relationship depends on the size of the bank or BHC issuing the bond, or the transparency of the issuer. These split sample tests give us some indication of whether *de facto* insurance (which should depend on size) or opacity weakens the disciplinary mechanism for banks. We run these tests using data on over 4,100 *new* bonds issued between 1993 and 1998, including nearly 600 issues by banks or BHCs.

Our findings are two-edged: the bond market provides some discipline of banks, but not necessarily enough. On the positive side, we find that the relationship between bond spreads and

ratings is virtually identical across banks and non-banks. We also find a strong relationship between bank and BHC bond spreads and asset portfolios, suggesting investors look beyond public measures of risk in gauging bank risk exposure. The effects of particular portfolio shifts on bank spreads are not always precisely identified, but some are consistently large and positive. Shifts into trading or credit card lending, for example, force banks to pay higher spreads to investors. That is market discipline. The relationship between spreads and portfolios is weaker, however, for the bigger banks and for the more opaque banks (as indicated by disagreement between bond raters). The latter findings suggest that the frictions discussed above—implicit deposit insurance and information problems—may blunt the market mechanism for banks.

II. Deposit Insurance and the Market Discipline Test

Deposit insurance is central to the market discipline issue. Whatever its salutary effects, full insurance makes depositors indifferent to risk and their indifference motivates the bank's owner—shareholders—to take more risk than they otherwise would. The FDIC has essentially sold shareholders in the bank a put option on the assets and, as others have observed, option holders love risk. Controlling the moral hazard invited by deposit insurance requires discipline from outside the bank. Bank regulators currently provide much of this constraint through asset limitations and capital requirements. Private investors, namely bondholders, may also be a source of discipline since they do not share the upside gains with shareholders. If the marginal cost of funds to banks is determined in the bond market, and if the market prices banks risk efficiently, in principle, discipline imposed by bondholders might force banks back to the level of risk they would take *laissez faire*, in the absence of government intervention.

Bond market discipline, however, presupposes that bondholders actually consider themselves at risk in the event of failure. In the early 1980s, even uninsured bank debt holders were partially or fully protected under the “too big to fail (TBTF) policy,” which limits incentives to monitor or control risk.⁴ Implicit, or *de facto*, deposit insurance turns bondholders into another class of depositors who do not need to monitor bank risk-taking. Since the FDIC Improvement Act (FDICIA) of 1991 was supposed to eliminate *de facto* insurance, this reform should put bondholders on guard again. Jagtiani et al. (1998), for example, conclude that the market prices the risk of BHC debt more than the more senior bank debt, which suggests that the perceived safety net remains an important issue for investors. The question remains, however, whether this policy shift is public knowledge and credible.

⁴O'Hara and Shaw (1990) document a rise in the share prices of the 11 banks identified by the Comptroller of the Currency (in testimony to Congress) as too big to fail.

The points above are standard in this literature. Billet et al. (1998) recently make a novel argument: they suggest that deposit insurance may weaken discipline through a cost of funds effect. If bondholders try to raise spreads in response to increased risk, banks can soften the blow by substituting insured funds, they argue. We agree with their evidence that such substitution occurs in fact, but this does not seem to matter at the margin where banks decide how much lending to do and how much risk to take in the process.

We can make our case using the same model of a bank's lending and liability decisions they used (Figure 1).⁵ Banks all face the same marginal revenue curve for loans: R_L . The curve slopes down because banks are assumed to have some market power in the loan market. Loans are funded with a mixture of *insured* deposits and *uninsured* bonds. The marginal cost of another dollar of bond finance is flat because banks are price takers in the bond market. Since bonds are uninsured, riskier issuers pay a higher spread: $R_{UH} > R_{UL}$, where R_{UH} is the schedule for high-risk banks and R_{UL} is the schedule for low-risk banks. The deposit market is more local, which gives a bank some market power; hence the marginal cost of insured deposits, R_I , is increasing. The marginal cost of deposits is independent of risk because deposits are insured. Deposits are cheaper initially, because they are insured, but at some point, bond finance becomes the cheaper source of funds.

The equilibrium quantity of lending and the liability mix depends on the risk of the bank. The low-risk bank lends L^* , where the marginal cost and revenue from lending are equal. The loans are funded with I^* in insured deposits, where the marginal cost of deposits and bonds are equal. The other $L^* - I^*$ in loans are funded with bonds. The riskier bank makes fewer loans, $L^* - DL$, because it faces a higher marginal cost of bonds and, as Billet et al. stress, funds more of its loans with insured deposits.

The higher marginal cost of funds facing the riskier bank, and the resulting *decline* in lending, presumably the major risk in banking, strikes us as market discipline at work. The change in the liability mix seems irrelevant since it does not change lending at the margin.⁶ Suppose there were no deposit insurance; the difference in lending across the high-risk and low-risk bank in Figure 1 is exactly the same even without the upward-sloping schedule for uninsured deposits.⁷

⁵We omit the shift in the marginal cost of insured funds that they showed, as that shift is irrelevant here.

⁶Their major piece of evidence supports the discipline hypothesis indirectly. They show that banks do indeed substitute insured funds for uninsured funds after their bond rating is lowered by Moody's. Upgrades, conversely, lead banks back to the market for uninsured funds.

⁷Schweitzer et al. (1992) find bank holding company bond downgrades cause a larger abnormal returns in equity prices than downgrades of industrial firms. Upgrades have statistically identical impact across BHCs and industrials.

Lending and risk-taking are determined at the margin, regardless of infra-marginal substitution of funds.

The crucial question, in terms of Figure 1, is whether the rise in spreads associated with a bond downgrade for banks provides sufficient discipline. Do investors punish banks for a downgrade as severely as non-banks? Absent any frictions, they should. If ratings are less informative for banks, however, (because of disagreement), or if investors are counting on implicit insurance (more so than raters that is), we would expect a weaker relationship between ratings and spreads for banks.

III. Bond Spreads and Ratings: A Cross-Sector Comparison

We have spreads and ratings on over 4,100 straight, fixed-rate bonds issued by U.S. firms between 1993 and 1998, including nearly 600 bonds issued by commercial banks or their holding companies.⁸ The spread is defined as the difference between the yield to maturity on the bond at issuance and the yield on a Treasury bond of comparable maturity.⁹ Ratings are from both Moody's and S&P. The agencies' letter rating symbols were converted to numbers as shown in Table 1; higher numerical ratings correspond to lower letter grades and higher risk, at least as perceived by the agencies. Note the cutoff between investment and speculative grades at 10. We use either the average of the ratings or the more risky rating to proxy for the risk of the issuer.

Note that we observe the spreads and ratings on each bond only once, at the date of issuance. Using "when issued" data means we can be sure the spreads are based on actual transactions, not estimates derived from pricing matrices or quotes from dealer. The latter can be noisy and even misleading if dealers quote strategically. We can also be sure that our ratings are "fresh," meaning they reflect the raters' real-time assessment of the bonds' repayment prospects. Ratings inevitably go "stale" after a time, and although bonds are re-rated periodically, the agencies' ongoing coverage of an issue may not be as thorough as their initial analysis at issuance. Since we are not marking the progress of each bond over time, the time series domain of our data is more limited. We have some temporal variation, however, as many firms sold bonds to market more than once over the sample period. Multiple issues by the same firm gives us an unbalanced panel that lets us identify within firm effects.

⁸Securities Data Corporation (SDC), a private agency, collected the data. The initial data covered virtually every new public issue in the U.S. over 1993-98, 9,311 issues in all. After excluding the 2,479 floating rate issues and the 1,332 asset-backed issues, we were left with a core of 5,500 traditional, fixed-rate bonds. Another 1,396 issues were lost due to incomplete data, leaving us with 4,104 issues, nearly 75% of the universe of traditional, fixed-rate bonds issued for 1993-98.

⁹Linear interpolation was used for a bond with a maturity that did not precisely match the available Treasury bond maturity.

Sample statistics for bank issues and other issues are reported in Table 2. Of the 4,104 bonds in the sample, banks or their holding companies (and a few savings and loans) issued 574, roughly 14% of the total. The bank issues sold at lower spreads than the other issues – 70 basis points (bp) versus 126 bp – and were better rated – 6.2 on average (not quite an A/A2) versus 7.7. Subordination was much more common with the bank issues, most likely because regulators afford preferential treatment to subordinated debt in calculating required capital at banks.¹⁰ The bank issues were smaller in face value than other issues, and considerably shorter – 8.6 years in average maturity on bank issue versus 13.1 years for other issues. All of these differences were persistent over time as well.

Figure 2 plots the average spread on issues in each rating category—for bank and non-bank issues—against the rating. The spread/rating relationship is strongly positive for both sets of issues. The curve is not linear: it steepens sharply at 10, the cutoff between investment and speculative issues. The two curves look similar at the impressionist level, but there are some differences in the details. Most obvious is the *negative* relationship between bank spreads and ratings of above 14, although there were just a few bank issues in that range. The curves were much more similar in the investment grade range, where most bank issues were distributed.

To test formally if the spread/rating relationship was the same for bank and other issuers, we estimated regression equations of the following form:

$$(1) \text{ Spread}_{i,t} = \mathbf{a} + \mathbf{a}_B \text{ Bank}_{i,t} + \sum_{j=2}^{16} (\mathbf{b}_j + \mathbf{b}_{j,B} \text{ Bank}_{i,t}) D_{i,t}^j + (\mathbf{d} + \mathbf{d}_B \text{ Bank}_{i,t}) \mathbf{X}_{i,t} + \mathbf{a}_i + \mathbf{a}_t + \mathbf{e}_{i,t}$$

The dependent variable is the spread on bond i at issue date t . $\text{Bank}_{i,t}$ is a dummy variable indicating if the bond was issued by a bank or BHC ($\text{Bank}_{i,t} = 1$) or by a non-bank firm ($\text{Bank}_{i,t} = 0$). $D_{i,t}^j$ is a set of 15 dummy variables indicating the numeric rating assigned to each bond. $D_{i,t}^j = 1$ if bond i was rated j ; $D_{i,t}^j = 0$ otherwise.¹¹ The coefficient on each rating dummy measures spread difference between that rating and the top rating (AAA/Aaa), the excluded category. $\mathbf{X}_{i,t}$ is a vector of other bond characteristics: face value, maturity, and a subordination

¹⁰Regulators include subordinated debt (and intermediate-term preferred stock) in Tier II capital, up to 50% of Tier I Capital and on a declining schedule as maturity approaches (Spong (1994)).

¹¹The reported results use the highest numerical value (most risky) of the ratings assigned by S&P and Moody's. Alternative specification that use the average, the lower, always S&P, or always Moody's rating give qualitatively similar results and are not reported. Note that one of the 16 possible dummy variables must be dropped to avoid collinearity in the data and we dropped the $j=1$ dummy. Each \mathbf{b}_j , therefore, measures the difference in spreads between a bond rated j and a bond rated 1 (AAA in S&P or Aaa in Moody's).

dummy variable. Note that $Bank_{i,t}$ enters interactively with *all* the independent variables and separately as well. The fixed effect, \mathbf{a}_i , sweeps out any constant differences across issuers, such as liquidity effects associated with particular issuers. The time effects for the year and quarter of issue, \mathbf{a}_t , pick up any fixed difference over time, e.g., regulatory, market, or macroeconomic conditions at the time of issuance.¹²

Table 3 reports both the fixed effect estimates of Equation (1) and OLS estimates (without fixed effects). Since Equation (1) is essentially equivalent to estimating separate equations for bank and non-bank issues, we report separate coefficient estimates for each type of issue as well as the difference between the coefficients. F-tests were used to determine if these coefficients were *jointly* different from zero. The p -values for these tests are reported at the bottom of the table, along with the adjusted- R^2 .

Both the OLS and fixed effect estimates fit reasonably well, but the “within” estimates from fixed effects are more sensible in some respects. Under OLS, the rating schedule for both sets of issuers is essentially flat between the first and fourth ratings. Allowing the fixed effects produces a steeper schedule over that interval, implying that the flat spot was associated with the names of particular issuers. OLS also produces a negative coefficient on subordination for non-banks, implying *lower* spreads subordinated non-bank issues. Adding the fixed effects reverses that counter-intuitive result.

The relationship between spreads and ratings is virtually identical across banks and non-banks, particularly with the fixed effects.¹³ With the OLS estimates, the differences in the rating coefficients are all small and insignificant except for $Rating=12$; the two bank issues in that category carried significantly lower spreads than the non-banks issues with the same rating. Primarily because of that one difference, the *joint* difference in the coefficients is also significant ($p=0.023$). With the fixed effect estimates, however, none of the individual rating coefficients are significantly different for banks and non-banks, nor can we reject that the differences are jointly zero ($p=0.671$).

¹²Conspicuously absent from Equation (1) are controls for the option features of issue; these data were mostly missing in the SDC reports so we elected to omit them altogether. Options are obviously an important bond feature, but their omission here should not bias results. Options can create a non-linear, even non-monotonic, relationship between spreads and risk, a point emphasized by Gorton and Santomero (1990). Including the partial data that were available did not alter our results so we elected to omit them altogether. Calls options are standard across issues so omitting that term should not be a problem. Puts appear to be less common; if their incidence varies across bank and other issues, bias is possible.

¹³The slope turns up around 3.5, in the *AA/A* range on Moody’s scale and *Aa2/Aa3* range on S&P’s. Gorton and Santomero (1990) stress this possibility, but the Black and Cox (1976) bond pricing formula they invoke seems to imply the opposite of long-shot bets that might put their claim back in the money.

There is one notable difference in the pricing of bank and non-bank issues: size (face value) matters more for banks. Size might be correlated with liquidity, but liquidity effects cannot explain why face value matters more for bank issues. Moreover, the fixed effects should eliminate any liquidity differences associated with particular issuers, yet the size differential is only significant with fixed effects. Issue and issuer size are almost surely correlated (positively) as well, so the differential size effect hints at a lingering “too big to fail” mentality among bank bond investors. We return to this issue later.

These cross-sector results suggest that the market is essentially evenhanded across banks and non-banks issues. With the exception of size, bank and non-bank bond characteristics are priced equivalently. The fact that the cost of a downgrade is the same for banks as for non-banks is particularly important, as ratings are a standard proxy for risk.

Ratings are also publicly observable, so it is not altogether surprising that investors price them. The same goes for the risk measures used in other studies of the discipline hypothesis. ROA, non-performing loans, leverage, and such are all publicly observable, so they provide a relatively weak test of the hypothesis. The next section investigates whether investors look beyond these easily observed measures of risk and attempts to analyze the risks potentially concealed in a bank’s portfolio of loans and other assets. This portfolio hypothesis seems central to the market discipline hypothesis; supervisors can rely on markets to limit bank risk-taking only if investors are able to observe and price those risks.

IV. Beyond Ratings: Bank Bond Spreads and Portfolios

To test the portfolio hypothesis, we drop non-bank issues and add detailed balance sheet and performance data for the remaining bank and bank holding company (BHC) issues. The latter come from the “Call Reports” that bank holding companies must file with bank regulators (FR form Y-9C).¹⁴ All the call report items are publicly available, but after only with a delay. Hence, the bond data (spreads, etc.) were matched with call report data in the quarter before issuance.

(a) Portfolio Structure and Hypotheses

The performance and portfolio variables are summarized in Table 4. Complete regulatory data were available for 497 of the 574 bank and BHC issues in the SDC data set.¹⁵ The missing

¹⁴There is some noise in the data here as we are using data on BHC balance sheets when in some cases the bond was issued by a bank.

¹⁵The 77 missing issues were either not associated with a bank holding company, or not governed by U.S. bank regulators. Excluding these issues from the regressions in Table 3 did not change the results.

observations are not much cause for concern, however, as this subset and the full set of bank and BHC issues were nearly identical (compare Table 2 and 4).

We include several risk and performance measures that should affect the spread independently of the issuer's portfolio. First is whether the bond was issued by the holding company ($BHC = 1$) or the bank ($BHC = 0$). The former is more common as the holding company has more discretion than the bank in allocating funds across other banks and subsidiaries in the company. But the holding company is also once removed from the banks and other cash generating subsidiaries, which implies more risk to investors. Hence, we expect higher spreads on BHC issues, all else equal.

The sample includes a good cross section of sizes. The average issuer had \$85.5 billion in assets, which is a medium-sized bank, but there were also some small issuers (assets under \$1 billion), and some large issuers (assets over \$100 billion). We expect lower spreads, the larger the assets as investors may consider bigger issuers safer by virtue of diversification, or because of implicit insurance extended to big banks.¹⁶

Interest rate risk is measured by *Gap/Assets*, the absolute value of the share of assets that reprice within a year less the share of liabilities that reprice within a year. The larger the gap, the higher the spread, assuming of course, that the gap has not been hedged. Higher *ROA* should be associated with a lower spread, although investors should also consider the risks of those returns. We also include two measures of diversification: *Asset Concentration* is the sum of squared share of assets in each category, with all loans lumped in a single category. *Loan Concentration* is sum of squared shares of loans in each of the loan categories. Concentration in a single asset or loan implies higher exposure, hence higher spreads (to the extent investors cannot shed the risk themselves).

Spreads may also depend on liability and capital structure. Equity obviously matters because it protects the bondholders from losses on the asset side and it may reduce agency problems between shareholders and bondholders; shareholders with a large stake in the bank are less inclined to take excessive asset risk. The liability mix may also matter because of priority differences. Bonds are subordinate to insured depositors, so the higher the share of insured claims, the smaller the share leftover for bondholders. Insured liabilities in Table 4 comprise all of the non-interest bearing deposits (mostly savings and checking accounts), and some of the interest bearing deposits (checking accounts paying interest, money market accounts, and CDs under \$100,000). The second category includes CDs over \$100,000 as well, which are uninsured, but large CDs are

¹⁶Bigger BHCs are better diversified across loans, but not necessarily safer (Demsetz and Strahan (1997)).

still prior to subordinated debt in the event of bankruptcy. Thus, we look for a negative sign on deposits, both interest and non-interest bearing, but we do not put much weight behind this prediction since these effects seem second order.¹⁷

Of primary interest is the link between spreads and issuer's portfolio of assets and loans. Table 4 reports these items as they appear in the Call Reports, rather than some *ad hoc* aggregation. If these categories are useful to the bank analysts at the regulatory agencies who use them, private analysts and investors should find them informative as well. Despite the many asset categories, roughly 90% of the issuers' assets are invested *Cash, Securities, Loans, and Trading Assets*.

Holding cash eliminates interest rate and credit risk, so if we treat cash as our benchmark, how risky are the other three in relative terms? *Securities* expose the bank to interest rate risk and possibly credit risk, depending on the issuer, so spreads should rise as banks substitute securities for cash. *Loans* entail credit risk and possibly interest rate risk, depending on the maturity, so spreads should also rise as banks move out of cash into loans. *Trading* bears special attention, as it is less familiar than the other assets. The trading account is where banks book the securities and other assets they expect to trade, whether for their own account or to make a market for other traders. Gains and losses on derivative positions, forwards, futures, options, etc. also appear in the banks' trading account.¹⁸ Though only about 6 percent of these issuers' assets are counted as trading assets, note the high standard deviation; one issuer booked over half its assets in the trading account. In general, trading figures very prominently on the books of the dozen or so money center banks in the U.S.

The trouble with trading is not that it is inherently risky, but trading positions are hard for outsiders – raters, investors, and even regulators – to monitor. Positions in liquid assets can be changed instantaneously, and changes in leveraged positions are hard to monitor because cash flow is relatively unaffected (Hentschel and Smith (1996)). Traders face a nonlinear compensation schedule (their downside liability is limited), which may incline them to take more risk than their principals – bank partners, shareholders, bondholders, and regulators – desire. Myers and Rajan (1998) see trading as the “dark side” of liquidity at banks. Liquidity is usually a good thing for most firms (and their creditors), but liquidity at bank can be a bad thing because it enables trading. Trading does indeed seem to confound outsiders, like the rating agencies (Morgan (1999)). Dollar

¹⁷This effect operates only if there are assets leftover after paying depositors, and even then the effect is second order; assuming n uninsured claimants with equal interests, \$1 less *insured* liabilities implies \$1/ n more assets per uninsured claimant. Phil Strahan was helpful with this paragraph.

¹⁸The notional value of derivative positions are counted *off*-balance sheets. Securities intended to be held until maturity are counted in the securities line.

for dollar, trading assets generate more disagreement between Moody's and S&P than any other asset.¹⁹ We expect bond investors will demand a substantial premium for the heavy trading banks.

The remaining assets in Table 4 comprise only a tiny share of the total so we do not hypothesize about their effects on spreads. Other real estate owned (OREO) deserves mention however. OREO is property collected by banks on defaulted loans and mortgages. This variable is essentially a lagged version of past-due loans and other *ex post* risk measures used in other tests of the discipline hypothesis. We are more interested in whether spreads price the *ex ante* risk in the banks' asset and loan portfolio. Given these exposures, it is not clear why lagging variables like OREO should matter.

Bank loans are divided into 15 categories in the Call Report. Virtually any of these is riskier than cash, the benchmark, so we expect all to enter positively. In addition, we test if the loan coefficients are jointly zero. If so, the loan portfolio is irrelevant in determining the spread, a negative result for the discipline hypothesis. We also test if the coefficients all equivalent; failure to reject that hypothesis implies investors are unwilling or unable to measure the relative risk of the various loan types, another negative for the discipline hypothesis. We do not have strong priors about the risks of each type of lending, and in fact, the relative risks can change over time. Credit card lending, for example, was once one of the safest and most profitable lines for banks, but with increased entry, risk in that segment increased dramatically in early 1995.²⁰

(b) Regression Results

To test these portfolio effects, we estimated similar versions of Equation (1), augmented with the full list of variables in Table 4 for the bank bonds. The results are in Tables 5 and 5B. The bond characteristics, which are included in every equation, affect these BHC bond spreads much as in the earlier regressions. Note that we now include rating and rating-squared as continuous variables, where rating is the average of the S&P and Moody's rating. Neither rating coefficient is individually significant but they are jointly significant at below 1 percent. We included the ratings here deliberately to test if investors look beyond the rating, but we also report the same equations

¹⁹Bank equity, moreover, is especially important in reducing this disagreement over trading banks. Capital at trading banks may be a commitment mechanism: it motivates principals to monitor their traders more vigilantly, "to stop them before they trade again."

²⁰C&I lending is usually considered the riskiest line, particularly as the better corporate borrowers have substituted market funding for bank credit. With real estate (RE) lending, some types are riskier than others. 1-4 family, residential RE loans are relatively safe compared to "commercial" (non-farm, non-residential RE). Consumer lending *was* a relatively safe haven for banks until recently, when new entry and adverse selection across borrowers drove consumer loan charge-offs sharply higher over the latter half of our sample period (Morgan and Toll (1997) and Morgan (1999)).

without the rating (Table 5B). The BHC performance and portfolio measures were added stepwise to gauge their marginal explanatory power.

Given the rating and bond characteristics, the risk and performance measures do not add much (Column 2). *Asset Concentration* is the only significant variable and these variables are barely jointly significant at the 10 percent level. Their inclusion increases the adjusted-R² by only 0.01.²¹

Adding the balance sheet variables improves the fit much more (Column 3). The gain in the adjusted-R² of 0.04, and most of the gain comes from the asset side. Those coefficients are jointly different from zero, but the same hypothesis cannot be rejected for the liability and capital coefficients. The individual asset coefficients are mostly positive as expected, implying that all are considered riskier than cash, the benchmark asset. *Trading* comes in significantly positive, as does *Securities* and *Other Assets*.²² Controlling for the asset mix also increases the significance of the performance and risk variables. The latter are jointly significant here at below once percent here, and *ROA* is now negative and significant. This is sensible: investors should reward banks with higher *ROA* only if the bank produced higher returns on the same set of assets and with the same risk. Column 3 does contain some odd results, however. *Equity* enters positively, contrary to expectations, and *OREO* and *Loan Concentration* both enter negatively. We are also surprised that *Securities* enters significantly, while *Loans* does not, as we would think that the credit risk in the latter would swamp the mostly interest rate risk in securities.

Breaking out the loan portfolio (Column 4) improves the results a bit more and reverses most of these oddities. We can reject equivalence of the loan coefficients, implying investors distinguish between the different types of lending. We can also reject that the loan coefficients are jointly equal to zero, suggesting that investors price overall loan risk once these differences are allowed. Decomposing the loan portfolio adds another 0.02 to the adjusted-R². Most of the loan coefficients are positive, as expected, and none are significantly below zero. *Credit Card* loans are the most significant individually, indicating that investors realize the growing risk in that lending segment. *Other Loans* is also significant.²³ *C&I* loans is nearly significant at the 10 percent level.

²¹The weak link between spreads and ROA recalls earlier results. Flannery and Sorescu (1996) found spreads and ROA were weakly related in the early years of their sample period (1983-91), but the relationship was insignificant over the full period or in the latter years, when discipline supposedly stiffened. Avery et al. (1998) found no relationship between bonds spreads and ROA. Jagtiani et al. (1998) found a strong negative relationship for BHCs, but no relationship for banks in the 1990s.

²²This item includes income accrued but uncollected, net due from foreign branches, securities purchased but undelivered, and other assets.

²³Other loans includes obligations of states and political subdivision, loans to nonprofit organizations, loans to individuals for investment purposes (not backed by real estate), and certain loans to other financial institutions.

Breaking out the loan mix also reverses the odd results in Column 3. *OREO* and *Loan Concentration* are no longer significantly negative, and *Equity* is no longer significantly positive.

The results are very similar when the rating is excluded (Table 5B). The adjusted- R^2 s are lower across the board, but they increase monotonically as we add the performance and balance sheet variables. The results of the joint hypothesis tests are all the same as before, and the individual coefficients estimates are similar. The BHC dummy is positive and significant here, however. Evidently both investors and raters understand the extra risk in lending to the BHC, versus the bank, so the BHC is insignificant when rating is also included. This is consistent with Jagtiani et al. (1998), who find stronger discipline for BHC debt than for bank debt.

Finally, several additional assets are individually significant when the rating is excluded: *Federal Funds Sold*, which are essentially loans to other banks, and *Premises*. The loan coefficients are collectively significant in explaining spreads, but the only individually significant coefficient is *Other Loans*. *Credit Card* lending is insignificant here.

V. Frictions: Is the Market Soft on Big Banks or Opaque Banks?

Earlier we suggested two reasons why the market might fail to discipline banks adequately. First was implicit bond insurance. Notwithstanding FDICIA and other regulatory changes, investors may cling to the notion that some banks are still “too big to fail (TBTF),” in which case bondholders enjoy *de facto* insurance along with the deposit holders. To test this possibility, we split the sample of banks and BHC issues by the size (assets) of the issuer and repeated the regression in Column 4, Table 5 for each set of issues. The size cuts were the obvious ones: the median, the mean, over \$100 billion (the usual definition of large). We also singled out the 11 banks defined by the Comptroller as TBTF (Carrington (1984)).

Rather than report the 300 plus coefficients, Table 6 reports summary and test statistics only. The results in the top panel suggest that smaller banks are subject to more market discipline than their larger counterparts. The larger the bank, the less its portfolio matters for explaining the spreads on its bonds. The p-value for the F-test (last column) drops with each successive size cut. For banks with more than the average amount of assets (\$85 billion), we fail to reject that loans and assets are jointly insignificant in explaining spreads. The results are similar for “large” banks with more than \$100 billion in assets. Banks that were identified in the 1980s as TBTF seem to have retained that status, as the p-value is lowest for their bond issues.²⁴ These results were qualitatively similar if we drop the ratings as explanatory variables as in Table 5B.

²⁴The adjusted- R^2 , on the other hand, rises with each successive cut. This could merely reflect the shrinking sample. A higher adjusted- R^2 could also reflect that the larger banks are simply lumped together as “safe,”

A second possible reason for weak market discipline of banks was opacity; investors cannot price the risk in a bank's portfolio if they cannot observe it. The empirical evidence on opacity mixed. Flannery et al. (1997) find that trading volume and volatility are actually lower for bank holding companies than for matched, non-bank counterparts. Banks are not particularly opaque, they conclude, "they are boring." Morgan (1999), on the other hand, finds that bond raters – Moody's and S&P – disagree more over banks than virtually any other type of firm, especially if large trading assets, and especially after the demise of TBTF. He concludes that banks are comparatively more opaque, and that the veil is inherent to the business, not merely an artifact of the federal safety net.

We use disagreement between the bond rating as a proxy of opacity here as well. The sample of bank and BHC issues were divided into "transparent" issues where Moody's and S&P agreed, and "opaque" issues where the agencies split. For both sets of issues, we re-estimated the regression in Column 4, Table 5. Included in that list are assets, so we are controlling for the size effects just noted. The lower panel of Table 8 shows the results. For the transparent issues, we can strongly reject that the loan and asset coefficients are jointly equal to zero. That hypothesis is not rejected for the issues with split ratings, however, suggesting that asset opacity may hamper the market's ability to discipline bank risk. Again, the results are similar if the ratings variables are dropped as in Table 5B.

VI. Conclusions

The bond market does discipline banks, but not without some frictions. On the positive side, we find that publicly observed measures of risk – bond ratings – are priced alike for bank and non-bank issuers, particularly for investment-grade issues. This suggests that the bond market is not particularly soft on banks. In addition, investors look beyond the ratings to the *ex ante* exposures in the underlying portfolio of BHC assets and loans. Trading assets, in particular, are associated with much higher spreads. The agency problems associated with trading, for example, create additional uncertainty for raters and investors, which forces the banks to pay higher spreads. That is market discipline.

On the down side, we find the link between spreads and portfolios is weaker for bigger banks, especially for the really big banks—the ones the Comptroller of the Currency once named as "too big to fail." The fact that bank size matters in this way suggests, FDICIA and other reforms notwithstanding, bank bondholders may still expect the government to prop up these giant banks in the event of distress. Asset opacity may also be a problem in disciplining bank risk. Using

and what little variance there is in spreads is well explained by the ratings, which we are controlling for here.

disagreement, or splits, between bond raters as a measure of opacity, we find that the correlation between bank spreads and asset portfolios is weaker for the more opaque banks with split ratings. Since splits are more common among banks than among other firms (Morgan (1999)), the new finding here suggests that, when it comes to banks, the market may be a less effective disciplinarian.

Viewed from both sides, our results suggest that bond investors provide some discipline of banks, but not necessarily enough.

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Figure 1: A Bank's Loan and Funding Decisions

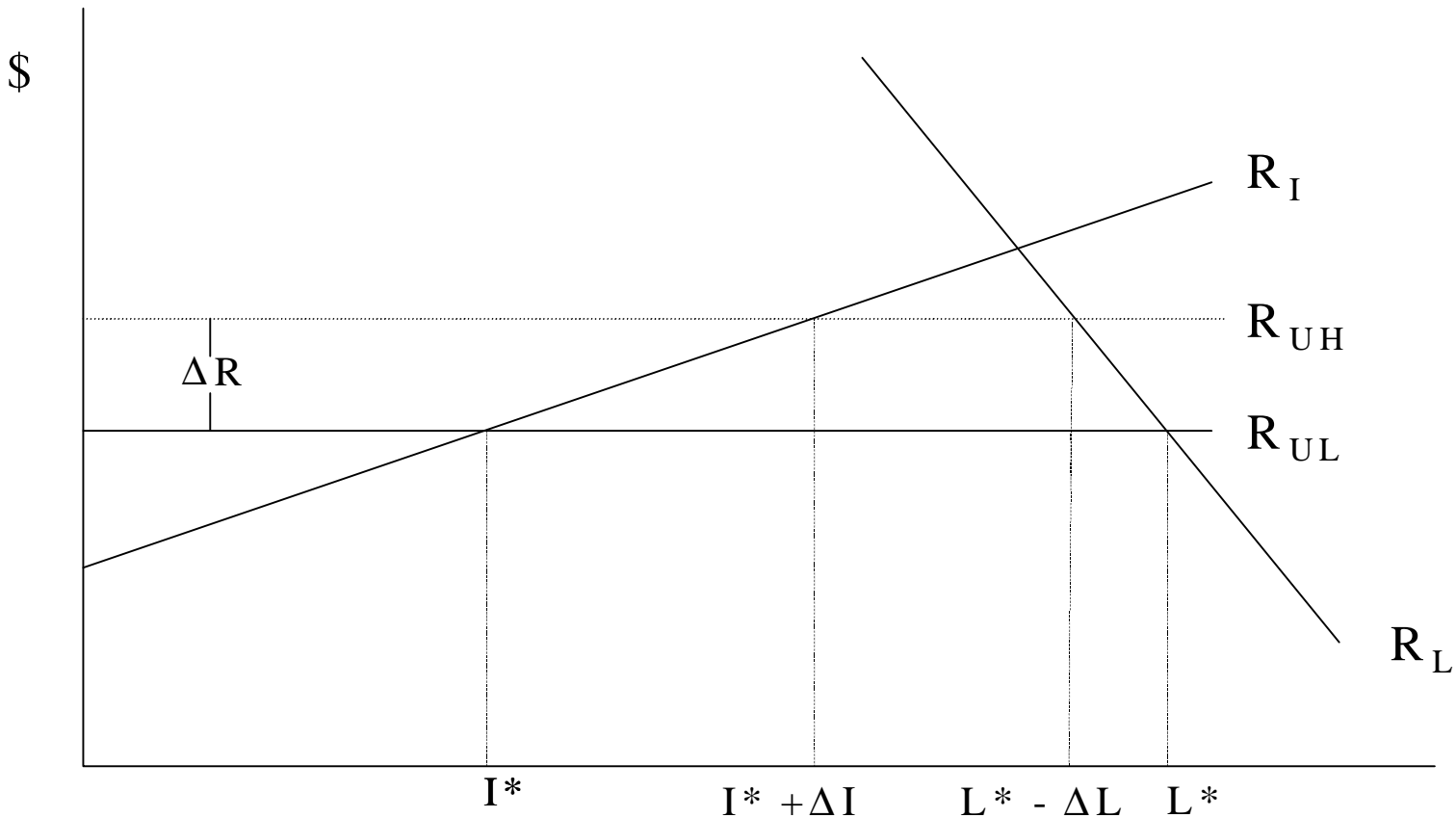


Fig. 1. R_L is the marginal revenue on loans. R_I is the marginal cost of insured deposits. R_{UL} is the marginal cost of uninsured liabilities for low risk-banks. R_{UH} is the marginal cost of funds for high-risk banks. The equilibrium loan portfolio depends on the marginal cost of uninsured funds. Given an exogenous change in risk, the resulting change in the loan portfolio depends only on the size of risk premium ΔR . The shift between uninsured and insured funds does not affect the change in lending, and thus, the degree of market discipline. Source: Billet, Garfinkel, and O'Neal (1998).

Figure 2: Average Bond Spread for Banks and Non-Banks

Plot of mean bond spreads relative to average rating for banks and non-banks. Spread is measured as the basis point (bp) difference between the bond yield and a Treasury bond of comparable maturity. Average rating is the mean of the numeric ratings given by S&P and Moody's as defined in Table 1. Includes 4,104 conventional bonds issued between 1993 and 1998: 574 issued by banks or bank holding companies and 3,530 issued by non-banks. Gaps in the plot indicate that no data was available for bonds issued at that average rating.

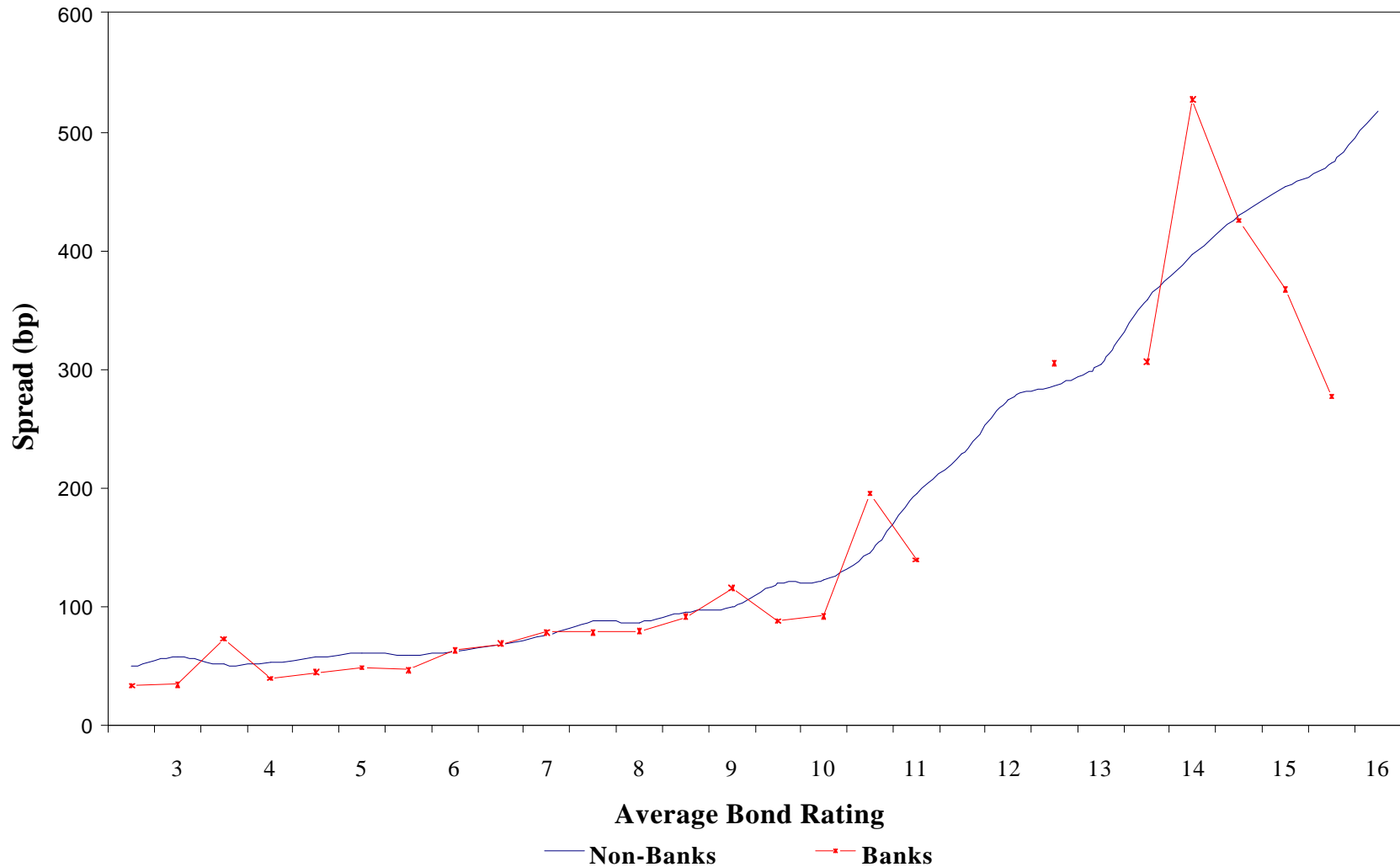


Table 1: S&P and Moody's Senior Bond Rating Scales

<i>S&P</i>	<i>Moody's</i>	<i>Number</i>	<i>Grade</i>	<i>Interpretation</i>
AAA	Aaa	1	Investment	Highest quality
AA+	Aa1	2	""	High quality
AA	Aa2	3	""	
AA-	Aa3	4	""	
A+	A1	5	""	Strong payment capacity
A	A2	6	""	
A-	A3	7	""	
BBB+	Baa1	8	""	Adequate payment capacity
BBB	Baa2	9	""	
BBB-	Baa3	10	""	
BB+	Ba1	11	Speculative	Likely to fulfill obligations; ongoing uncertainty
BB	Ba2	12	""	
BB-	Ba3	13	""	
B+	B1	14	""	High risk obligations
B	B2	15	""	
B-	B3	16	""	

Source: Cantor and Packer (1994).

Table 2 : Summary Characteristics of New Bonds Issued by Banks and Other Firms, 1993-1998

Sample includes 4,104 conventional, fixed-rate bonds. Statistics calculated at issuance. *Bank Issues* include banks, bank holding companies, and S&L bonds. All other issues are counted in *Other Issues*. Spread is the difference (in basis points) between the bond yield (at issuance) and Treasury security of comparable maturity.

	1993	1994	1995	1996	1997	1998	1993-1998
	<i>Bank Issues</i>						
<i>Mean Spread (bp)</i>	76.6	55.8	76.9	63.1	68.4	80.6	69.7
<i>Std. Dev. of Spread (bp)</i>	58.2	37.0	76.9	53.6	33.8	15.5	58.7
<i>Face Value (\$million)</i>	168.2	138.4	131.8	155.8	263.1	276.4	157.4
<i>Maturity (years)</i>	7.9	7.1	8.2	9.7	13.1	13.3	8.6
<i># Subordinated</i>	74	40	49	47	7	15	232
<i>Average Rating</i>	6.7	5.5	6.3	6.1	5.8	6.4	6.2
<i>Number Issues</i>	133	105	159	135	13	29	574
	<i>Other Issues</i>						
<i>Mean Spread (bp)</i>	145.0	136.5	111.8	111.1	98.7	121.6	126.2
<i>Std. Dev. of Spread (bp)</i>	150.0	147.9	124.8	117.3	94.7	80.7	131.6
<i>Face Value (\$million)</i>	161.1	149.4	153.2	170.0	254.2	238.9	172.8
<i>Maturity (years)</i>	14.6	10.9	11.9	11.7	13.8	15.4	13.1
<i># Subordinated</i>	13	4	3	4	1	0	25
<i>Average Rating</i>	7.7	7.7	7.1	7.8	8.1	8.0	7.7
<i>Number Issues</i>	1,111	526	713	603	189	388	3,530

Source: Authors' calculations using data from Securities Data Corporation.

Table 3: Regression Comparing the Spread/Rating Relation for Bank and Nonbank Bonds

Reported are regression coefficients and standard errors (in parenthesis). The dependent variable is the spread between yields (at issuance) on the bond and a Treasury bond of comparable maturity. Each regression includes both non-banks and banks and every coefficient is allowed to vary between the two groups. Each Rating dummy variable equals 1 if it matches the lowest numeric value from S&P and Moody's, 0 if not. Subordinated equals 1 if issue such, 0 if not. Equations were estimated by OLS and with inclusion of a fixed effect over 1993-98 with 3,530 observations for non-banks and 574 bank observations. All regressions include year and quarter dummy variables that are also allowed to vary between non-banks and banks (not reported). Note some Rating coefficients are not identified in the Fixed Effects regression due to an insufficient number of observations.

	OLS			Fixed Effect		
	Non-Banks	Banks	Difference	Non-Banks	Banks	Difference
<i>Rating = 2</i>	-13.162 (10.199)	20.489 (40.514)	33.652 (41.778)	9.255 (12.268)	12.267 (21.084)	3.013 (24.393)
<i>Rating = 3</i>	-0.047 (6.299)	15.786 (34.005)	15.833 (34.583)	30.091*** (10.707)	44.119** (19.953)	14.027 (20.142)
<i>Rating = 4</i>	5.657 (4.744)	20.029 (33.699)	14.372 (34.032)	33.515*** (8.323)	42.046** (19.065)	8.530 (17.965)
<i>Rating = 5</i>	14.313*** (4.33)	22.995 (33.311)	8.682 (33.591)	36.807*** (8.145)	38.858** (15.738)	2.050 (14.149)
<i>Rating = 6</i>	15.858*** (3.997)	25.778 (33.306)	9.921 (33.545)	35.212*** (7.949)	44.471*** (14.617)	9.260 (12.696)
<i>Rating = 7</i>	27.233*** (4.198)	36.425 (33.357)	9.192 (33.620)	44.491*** (8.004)	56.813*** (14.058)	12.322 (11.888)
<i>Rating = 8</i>	45.465*** (4.300)	44.577 (33.614)	-0.888 (33.888)	57.220*** (8.178)	64.249*** (13.876)	7.030 (11.667)
<i>Rating = 9</i>	49.191*** (4.208)	53.986 (33.974)	4.795 (34.233)	63.118*** (8.202)	59.757*** (13.393)	-3.361 (10.844)
<i>Rating = 10</i>	74.252*** (4.298)	61.799* (33.856)	-12.453 (34.127)	77.806*** (8.787)		
<i>Rating = 11</i>	121.807*** (6.176)	145.418*** (46.503)	23.611 (46.911)	109.407*** (10.069)		
<i>Rating = 12</i>	194.621*** (6.483)	82.157* (46.906)	-112.464*** (47.352)	175.607*** (10.927)		
<i>Rating = 13</i>	247.776*** (6.281)	254.806*** (46.833)	7.030 (47.252)	210.226*** (10.860)		
<i>Rating = 14</i>	332.247*** (5.796)	380.154*** (39.378)	47.908 (39.802)	290.586*** (12.164)		
<i>Rating = 15</i>	400.634*** (5.111)	373.736*** (46.649)	-26.898 (46.929)	288.882*** (12.401)		
<i>Rating = 16</i>	449.195*** (5.221)	451.626*** (46.437)	2.431 (46.730)	355.381*** (13.188)		
<i>Subordinated</i>	-30.412*** (9.276)	15.165*** (5.145)	45.578*** (10.608)	15.271* (8.934)	12.866*** (3.969)	-2.405 (9.807)
<i>Ln(Face Value)</i>	-1.875** (0.925)	-5.241* (2.684)	-3.366 (2.839)	-0.082 (0.762)	-5.298*** (1.850)	-5.216*** (2.001)
<i>Maturity</i>	0.981*** (0.081)	1.388*** (0.342)	0.408 (0.352)	1.230*** (0.057)	1.335*** (0.229)	0.105 (0.236)
<i>Constant</i>	46.446*** (6.208)	42.112 (36.850)	-4.334 (37.370)	27.504*** (8.817)	52.764** (21.912)	25.260 (22.701)
Number of observations		4,104			4,104	
R ²		0.870			0.425	
Adjusted R ²		0.867			0.093	
p-value of F-test: bank rating differences = 0		0.023			0.671	
p-value of F-test: all bank differences = 0		0.000			0.248	

***, **, and * indicate statistical significance at the 99%, 95%, and 90% level, respectively.

Table 4: Bond, Performance, and Portfolio Characteristics of Bank Issuers

The statistics were calculated using 497 bank holding company observations over 1993-98. The performance and portfolio statistics were calculated using data in the quarter before the bond issuance. The BHC dummy indicates if the bond was issued by the holding company or the bank. Gap/Assets is defined as the absolute value of the difference between earning assets that reprice in 1 year and interest-bearing liabilities that reprice in 1 year relative to total assets. Asset concentration is defined as the sum of the squared shares of the 11 asset types. Loan concentration is defined as the sum of the squared shares of the 15 loan types.

	Mean	Standard Deviation	Minimum	Maximum
<i><u>Bond Characteristics</u></i>				
Spread (bp)	62.7	30.4	-55.0	155.0
Average Rating	5.9	1.8	1.0	10.0
Face Value (\$m)	159.4	123.2	10.0	1000.0
Maturity (yrs)	8.7	6.8	1.0	40.0
Subordinated (%)	42.3			
<i><u>BHC Performance and Risk</u></i>				
BHC (%)	65.4			
Assets (\$B)	85.3	81.2	0.2	365.7
Gap/Assets (%)	28.5	10.9	0.0	62.9
Return on Assets (%)	1.19	0.46	1.80	4.43
Asset Concentration	0.43	0.08	0.20	0.62
Loan Concentration	0.25	0.13	0.16	1.00
<i><u>Liability and Capital</u></i>				
Equity/Assets (%)	7.6	1.2	4.3	14.4
Non-Interest Bearing Deposits/Assets (%)	13.3	5.0	1.0	32.5
Interest Bearing Deposits/Assets (%)	51.1	10.8	18.5	76.4
Borrowing Less than 1 Year/Assets (%)	4.7	4.1	0.0	24.1
Borrowing Greater than 1 Year/Assets (%)	4.1	4.0	0.0	19.9
Other Liabilities/Assets (%)	19.2	11.6	0.6	60.2
<i><u>Assets</u></i>				
Cash/Assets (%)	6.4	3.4	1.0	34.9
Security/Assets (%)	17.2	7.7	3.5	46.6
FF Sold/Assets (%)	3.8	5.7	0.0	30.6
Loan/Assets (%)	59.4	13.8	12.1	77.7
Trading Assets/Assets (%)	5.8	10.3	0.0	51.6
Premises & Fixed Assets/Assets (%)	1.6	0.8	0.7	7.4
OREO/Assets (%)	0.3	0.6	0.0	8.8
Subsidiary Investments/Assets (%)	0.1	0.2	0.0	1.7
Customer Liability on Acceptances/Assets (%)	0.5	0.5	0.0	3.1
Intangible Assets/Assets (%)	1.0	1.0	0.0	9.4
Other Assets/Assets (%)	3.7	2.1	1.0	16.4
<i><u>Loan Portfolio</u></i>				
Construction RE Loans/Assets (%)	1.6	1.3	0.0	12.8
Farmland RE Loans/Assets (%)	0.2	0.3	0.0	4.9
1-4 Family RE Loans/Assets (%)	14.1	8.1	0.0	43.7
Multifamily RE Loans/Assets (%)	0.7	0.5	0.0	3.5
Nonfarm RE Loans/Assets (%)	6.0	3.7	0.0	28.7
Foreign RE Loans/Assets (%)	0.7	1.8	0.0	7.8
C & I Loans/Assets (%)	16.8	7.2	0.5	41.6
Foreign Depository Acceptances/Assets (%)	1.1	1.4	0.0	8.6
Agricultural Loans/Assets (%)	0.4	0.6	0.0	4.6
Credit Card Loans/Assets (%)	5.9	9.5	0.0	64.5
Other Consumer Loans/Assets (%)	8.1	5.0	0.1	22.9
Foreign Government Loans/Assets (%)	0.4	0.7	0.0	4.4
Other Loans/Assets (%)	3.4	2.2	0.0	10.9
Financing Receivables/Assets (%)	1.6	1.4	0.0	8.7
Reserves and Unearned Interest/Assets(%)	-1.5	0.7	-4.1	-0.2

Source: Bond characteristics from Securities Data Corporation. Other data are from Bank Holding Company Call Reports (FR Y-9C).

Table 5: Regression Equations Relating BHC Bond Spreads to Performance and Portfolio Measures

Reported are regression coefficients and standard errors (in parenthesis). The dependent variable is the spread between yields on the BHC or bank bond and a government bond of comparable maturity. All regressions include fixed effects for each issuer and year and quarter dummy variables (not reported). Equations were estimated by OLS over 1993-98. BHC data are from the quarter before issuance. The asset and loan coefficients show the change in spread associated with a shift from cash into that asset or loan category. The liability and capital coefficients show the change in spread associated with shift into those items out of "other liabilities," (the omitted source of funds). F-tests of joint significance and other hypotheses are reported at the end of the table. See Table 4 and text for variable definitions.

	(1)	(2)	(3)	(4)
<i>Bond Characteristics</i>				
Face Value	-0.032*** (0.009)	-0.034*** (0.009)	-0.032*** (0.010)	-0.033*** (0.010)
Maturity	1.410*** (0.179)	1.383*** (0.179)	1.341*** (0.178)	1.318*** (0.18)
Subordinated	10.653*** (2.906)	11.205*** (2.934)	7.820*** (2.942)	8.780*** (3.004)
Rating	3.086 (4.796)	1.594 (5.236)	2.560 (5.516)	0.592 (5.685)
Rating ²	0.452 (0.382)	0.486 (0.402)	0.641 (0.422)	0.757* (0.438)
<i>BHC Performance and Risk</i>				
BHC Issuer		4.669 (3.215)	3.304 (3.206)	3.718 (3.264)
Ln (Assets)		-4.244 (9.396)	13.967 (11.448)	9.074 (12.217)
Gap/Assets		-24.761 (16.83)	-27.749 (18.900)	-14.671 (20.108)
Return on Assets		-667.436 (448.671)	-1215.337** (493.391)	-1385.398** (540.796)
Asset Concentration		77.258** (36.428)	243.623*** (89.66)	259.400*** (94.918)
Loan Concentration		-28.906 (62.509)	-120.430* (71.445)	-157.042 (97.157)
<i>Liability and Capital</i>				
Equity/Assets			477.550** (258.128)	241.449 (281.347)
Non-Interest Bearing Deposits/Assets			135.640 (99.656)	42.346 (109.861)
Interest Bearing Deposits/Assets			-40.581 (61.414)	-14.896 (67.414)
Borrowing Less than 1 Year/Assets			46.240 (61.429)	72.862 (63.316)
Borrowing Greater than 1 Year/Assets			-26.494 (68.355)	-21.505 (75.917)
<i>Assets</i>				
Security/Assets			328.681*** (99.549)	392.472*** (109.357)
FF Sold/Assets			213.579* (120.782)	205.44 (132.515)
Loans/Assets			155.627 (133.665)	
Trading Assets/Assets			399.604*** (120.692)	442.194*** (135.632)
Premises & Fixed Assets/Assets			488.302 (777.836)	943.311 (843.523)
OREO/Assets			-1150.675* (640.528)	-801.194 (774.453)
Subsidiary Investments/Assets			658.069 (1334.361)	767.712 (1515.732)
Customer Liability on Acceptances/Assets			-328.199 (730.456)	-569.890 (777.361)
Intangible Assets/Assets			-31.368 (251.332)	319.361 (302.003)
Other Assets/Assets			722.477*** (179.575)	809.560*** (190.516)

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Table 5: continued

	(1)	(2)	(3)	(4)
<i>Loan Portfolio</i>				
Construction RE Loans/Assets				94.102 (323.231)
Farmland RE Loans/Assets				1356.188 (2989.216)
1-4 Family RE Loans/Assets				134.186 (135.407)
Multifamily RE Loans/Assets				1196.106 (839.795)
Nonfarm, NonRes RE Loans/Assets				45.027 (234.172)
Foreign RE Loans/Assets				-138.498 (679.957)
C & I Loans/Assets				265.939 (171.762)
Foreign Depository Acceptances/Assets				117.346 (271.768)
Agricultural Loans/Assets				-484.043 (1266.756)
Credit Card Loans/Assets				373.495** (168.782)
Other Consumer Loans/Assets				46.831 (187.759)
Foreign Government Loans/Assets				-185.878 (413.345)
Other Loans/Assets				441.085* (239.841)
Financing Receivables/Assets				-278.85 (245.801)
Reserves and Unearned Interest/Assets				613.355 (708.852)
Constant	23.441 (15.189)	60.112 (107.793)	-419.906 (185.35)	-385.77* (204.075)
Adjusted Within-R ²	0.35	0.36	0.40	0.42
No. of obs	497	497	497	497
No. of groups	81	81	81	81
<u>Hypothesis Tests (p-values for F-tests):</u>				
Tests of Joint Significance				
Rating and Rating ²	0.000	0.000	0.000	0.000
BHC Performance and Risk Variables		0.098	0.007	0.010
Liability and Capital Variables			0.132	0.666
Asset Variables			0.001	0.001
Loan Portfolio Variables				0.076
Equality of Loan Portfolio Coefficients				0.077

***, **, and * indicate statistical significance at the 99%, 95%, and 90% level, respectively.

Table 5B: BHC Bond Spreads Regressions - Excluding Ratings

Reported are OLS regression coefficients and standard errors (in parenthesis). Regressions are identical to those described in detail in Table 5, except the bond rating is excluded.

	(1)	(2)	(3)	(4)
<u>Bond Characteristics</u>				
Face Value	-0.036*** (0.009)	-0.037*** (0.009)	-0.034*** (0.010)	-0.035*** (0.010)
Maturity	1.605*** (0.181)	1.525*** (0.178)	1.577*** (0.179)	1.505*** (0.182)
Subordinated	18.600*** (2.643)	17.050*** (2.709)	14.905*** (2.750)	15.396*** (2.774)
<u>BHC Performance and Risk</u>				
BHC		8.928*** (2.935)	9.254*** (2.924)	9.365*** (2.947)
Ln (Assets)		1.879 (9.468)	11.533 (11.905)	5.373 (12.654)
Gap/Assets		-18.852 (17.321)	-25.511 (19.685)	-14.280 (20.820)
Return on Assets		-1041.429** (453.820)	-1281.787** (513.434)	-1413.332** (558.655)
Asset Concentration		107.069*** (36.875)	289.016*** (92.920)	330.097*** (97.493)
Loan Concentration		-71.543 (63.540)	-82.047 (74.182)	-149.832 (100.377)
<u>Liabilities and Capital</u>				
Equity/Assets			329.765 (267.123)	112.193 (289.968)
Non-Interest Bearing Deposits/Assets			102.989 (103.776)	-17.588 (113.255)
Interest Bearing Deposits/Assets			-19.201 (63.369)	10.938 (69.462)
Borrowing Less than 1 Year/Assets			53.007 (63.997)	90.197 (65.602)
Borrowing Greater than 1 Year/Assets			24.213 (69.275)	26.866 (76.880)
<u>Assets</u>				
Security/Assets			244.316** (101.222)	367.880*** (111.684)
FF Sold/Assets			284.507** (125.208)	334.919** (134.967)
Loans/Assets			92.116 (137.932)	
Trading Assets/Assets			363.126*** (124.441)	470.668*** (138.403)
Premises & Fixed Assets/Assets			1548.178** (787.809)	2083.940** (846.670)
OREO/Assets			-284.639 (650.257)	62.199 (785.367)
Subsidiary Investments/Assets			426.006 (1389.528)	201.674 (1567.851)
Customer Liability on Acceptances/Assets			-597.966 (754.833)	-882.834 (799.150)
Intangible Assets/Assets			9.257 (257.441)	517.795* (304.102)
Other Assets/Assets			704.575*** (187.114)	823.155*** (197.424)

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Table 5B: continued

	(1)	(2)	(3)	(4)
<i>Loan Portfolio</i>				
Construction RE Loans/Assets				19.814 (335.257)
Farmland RE Loans/Assets				1655.352 (3094.918)
1-4 Family RE Loans/Assets				93.191 (139.633)
Multifamily RE Loans/Assets				1414.010 (870.492)
Nonfarm, NonRes RE Loans/Assets				8.051 (240.658)
Foreign RE Loans/Assets				-181.220 (699.397)
C & I Loans/Assets				271.477 (177.324)
Foreign Depository Acceptances/Assets				159.693 (278.417)
Agricultural Loans/Assets				-609.77 (1313.018)
Credit Card Loans/Assets				253.797 (173.354)
Other Consumer Loans/Assets				-117.388 (190.364)
Foreign Government Loans/Assets				-284.104 (428.528)
Other Loans/Assets				533.059** (245.181)
Financing Receivables/Assets				-396.054 (252.681)
Reserves and Unearned Interest/Assets				86.279 (727.786)
Constant	63.056*** (4.426)	25.170 (110.467)	-348.477* (191.173)	-351.671* (208.643)
Adjusted Within-R ²	0.30	0.32	0.35	0.37
No. of obs	497	497	497	497
No. of Groups	81	81	81	81
<u>Hypothesis Tests (p-value for F-tests)</u>				
Tests of Joint Significance				
BHC Performance and Risk Variables		0.002	0.000	0.000
Liability and Capital Variables			0.571	0.801
Asset Variables			0.005	0.001
Loan Portfolio Variables				0.038
Equality of Loan Portfolio Coefficients				0.030

***, **, and * indicate statistical significance at the 99%, 95%, and 90% level, respectively.

Table 6: Is the Market Soft on Big Banks and Opaque Banks?

Summary results from split sample regressions. All regressions correspond to Table 5, Column 4 with the bond spread as the dependent variable and include bond characteristics, ratings, risk, performance, liability structure, asset composition, and loan portfolio composition as independent variables. For each subsample, the number of observations, mean assets (in billions), mean spread (in basis points), adjusted within-R², and the p-value for the joint significance of all balance sheet and loan portfolio variables are reported.

Split	No. of Obs.	Mean Assets	Mean Spread	Adjusted Within-R²	p-value
Comparison of Small and Large Banks					
The sample is split by size. The split compares large banks to small banks, with a cut-off defined as either \$50B in assets (roughly the median), \$85B in assets (roughly the mean), \$100B, or a list of institutions previously considered too-big-to-fail. The too-big-to-fail group includes BankAmerica, Bankers Trust, Chase Manhattan, Chemical, Citicorp, Continental Illinois, First Chicago, JP Morgan, Manufacturers Hanover, Security Pacific, and Wells Fargo.					
Assets less than \$50B (median)	249	25.8	59.5	0.52	0.008
Assets greater than \$50B (median)	248	145.0	65.9	0.41	0.031
Assets less than \$85B (mean)	328	35.2	58.0	0.39	0.001
Assets greater than \$85B (mean)	169	182.5	71.7	0.52	0.178
Assets less than \$100B	339	37.1	58.9	0.38	0.001
Assets greater than \$100B	158	188.7	70.8	0.56	0.304
Not Too-Big-to-Fail	370	53.7	59.0	0.34	0.038
Too-Big-to-Fail	127	177.1	73.4	0.69	0.929
Comparison of Transparent and Opaque Banks					
The sample is split by a measure of opacity, determined by whether S&P and Moody's disagree about the rating.					
No Split Rating	238	93.8	61.6	0.30	0.000
Split Rating	259	77.7	63.6	0.45	0.562
All Banks					
All	497	85.3	62.7	0.42	0.000