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Abstract

The naming of eleven banks as "too big to fail (TBTF)" in 1984 led bond raters to raise their ratings on new bond issues of TBTF banks about a notch relative to those of other, unnamed banks. The relationship between bond spreads and ratings for the TBTF banks tended to flatten after that event, suggesting that investors were even more optimistic than raters about the probability of support for those banks. The spread-rating relationship in the 1990s remained flatter for TBTF banks (or their descendants) even after the passage of the Federal Deposit Insurance Corporation Improvement Act of 1991 (FDICIA), suggesting that investors still see those banks as TBTF. Until investors are disabused of such beliefs, investor discipline of big banks will be less than complete.

Key words: market discipline, too big to fail

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I. Introduction

In May of 1984, the federal government contributed roughly $1 billion to save Continental Illinois Bank from default. Then the 7th largest bank in the United States, Continental was also a *money center* bank holding large deposits of hundreds of smaller banks throughout the Midwest. The failure of such a large, money center bank might have tipped many smaller banks into default so the controlling authority, the Comptroller of the Currency, engineered a rescue that saved bank depositors *and* stock and bond investors in the holding company. The rescue was controversial so Congress called the Comptroller to testify. When the Comptroller admitted (under intense questioning) that other large banks might warrant support, Congressman McKinney uttered the now famous phrase:

> "Mr. Chairman, We have a new kind of bank. It is
> called too big to fail. TBTF and it is a wonderful bank."
> (Hearings before the Subcommittee on Financial Institutions, 1994)

Whatever the benefits of the Continental bailout (in terms of averted crises), the cost of the TBTF mentality it engendered is obvious: weaker market discipline. Insuring bond holders of very large banks turns them into yet another class of risk-indifferent claimants (like insured depositors) with little incentive to monitor and penalize (via higher spreads) risk taking by banks perceived as TBTF. Evidence from that era suggests that the bailout and the Comptroller's testimony had exactly that effect. O'Hara and Shaw (1990) find that stock prices of the eleven banks named as TBTF by Carrington (1984) after the Comptroller's testimony rose 1.3 percent immediately after they were named. Avery et al. (1988) found that bank bond spreads were barely related to ratings, and unrelated to accounting or bank balance sheet risk measures. Market discipline of banks, they concluded, is weak.

Lawmakers and regulators recognize the distortions created by a TBTF mentality among investors and have taken measures to change the market's mind. FDICIA (Federal Deposit Insurance Corporation Improvement Act of 1991) obligates regulators to take prompt corrective action against severely distressed banks and strictly limits regulators' discretion to support distressed banks that are considered "essential" (Wall, 1993). P and A (purchase and assumption) default resolutions, developed after the Continental bailout, enable regulators to save insured bank depositors without necessarily sparing bond holders or other *uninsured* investors (Kwast et al., 1994). P and A resolution does put bank bond investors at risk, even for big banks; when the Bank of New England failed in 1991, bond holders of the holding company were not made whole (Federal Deposit Insurance Corporation, 1998).

Research since these reforms finds that bank bond spreads have become more sensitive to bank risk. In a study of bank bond spreads observed over 1983-1991, Flannery and Sorescu (1996) find a significant, positive relationship between spreads and accounting measures of bank risk in the later (post-TBTF) years of their sample.

Theirs and subsequent studies confirm the existence of market discipline after FDICIA, but our paper investigates its strength around the Comptroller's announcement and more recently.[1] We investigate whether investors monitor and price the risk of the very biggest banks—the banks actually named as TBTF in 1984—as closely as for other banks.[2] Our question is a basic one that has gone unasked for U.S. banks.[3] Avery et al. (1988) and especially

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[1]Avery et al (1998) suggested that TBTF might explain the missing link between bank bond spreads and risk. Morgan and Stiroh (2001), Sironi (2003), and Kwast et al (2004) also find evidence of market discipline.

[2]Penas and Unal (2004) classify a bank as TBTF if its assets exceed two percent of all bank assets. They find that bank bond prices react most favorably to merger announcements when the merger might elevate two medium sized banks to TBTF status.

[3]Gropp et al. (2004) find that credit spreads predict ratings downgrades to C or lower on Fitch's scale of individual (excluding the possibility of public support) bank strength ratings *only* for banks Fitch considered unlikely to receive public support in the event of default. For TBTF banks, investors evidently could not anticipate Fitch's next move,

Flannery and Sorescu (1998) observe that the TBTF mentality undermines market discipline, but neither tests whether the relationship between bank bond spreads and risk is weaker for the particular banks, namely big ones, that investors are most likely to consider TBTF. Our reasoning is simple: if the TBTF mentality leads investors to discount bank default risk, the naming of TBTF banks in 1984 should have altered the relationship between bank bond spreads and risk relative to other banks. If investors *still* expect support for those banks, any such differences that emerged after 1984 should persist even after FDICIA.

As many researchers have, we use bond ratings as a proxy for default risk, but our use of ratings raises one complication. Moody's and S&P ratings on bank bonds reflect the possibility of government support for a given bank (as judged by the agencies),[4] so how can the relationship between bond spreads and ratings tell us whether *investors* consider a bank TBTF if the bank's rating reflects whether *raters* consider it so?[5] Using a simple model, we show that if investors expect support for a particular bank, then the relationship between spreads and ratings for that bank will differ from that of banks for which investors do not expect support. The precise nature of that difference—whether the spread-rating relationship is steeper or flatter—will depend on whether investors are more or less optimistic about the probability of support for a given bank, but that is secondary given our question. The main insight from the model is how to use differences in the spread-rating relationship to identify whether the TBTF announcement in 1984

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or Fitch raters ignored risk-relevant information in past market spreads. Either way, it suggests TBTF for European banks alters the relationship between bond spreads and risk, and by extension, market discipline. Our question is largely the same as Gropp et al (2004), but we study U.S. banks, and we look at contemporaneous, not time-series, relationship.

[4]For example, S&P's "bank survivability assessment" rating reflects a bank's position in the financial system and the possibility of direct government support.

[5]Were we interested in the *raters'* views on TBTF, we could just study their government support ratings. It is investors who impose market discipline *(via* prices) so it is their beliefs that we are after.

led investors to discount risk for the banks named as TBTF, and, whether they still do, even after FDICIA.

We examine the spreads-rating relationship using a sample of new bank bonds issued over two windows: 1982-1986 and 1993-1998. The early window is centered around 1984:Q3, when Carrington (1984) named the TBTF banks alluded to by the Comptroller. The later period starts about a year after FDICIA (1991). Using difference-in-difference regressions, we first show that the ratings for the banks named as TBTF in 1984 improved by about a notch relative to other banks. The relationship between spreads and ratings for the TBTF banks also flattened after those banks were named, implying (via our model) that the TBTF announcement made investors even more optimistic than raters about the possibility of support. We find very similar differences in the spread-rating relationship for the banks that were named as TBTF (or their descendants) over the post- FDICIA period.

The change in the relationship between spread and ratings after 1984 suggests that the TBTF mentality undermined market discipline of very large banks. The persistence of that difference suggests that FDICIA has not entirely shaken investors' beliefs in TBTF. Until that occurs, bond market discipline of the very largest banks will be less than complete.[6]

II. Changes in Ratings and Spreads after the TBTF Announcement

Before testing whether the TBTF event changed the relationship between bond spreads and ratings, we first investigate whether that event affected either variable separately. The naming of those banks moved stock prices (O'Hara and Shaw, 1990), so we want to see how that event registered in the bond market.

[6]See Stern and Feldman (2004) for a thorough discussion of the TBTF problem and possible solutions.

Our event study uses spreads, ratings, and other terms on 162 *new* bonds issued by banks (or holding companies) between 1982:Q2-1984:Q2 and 1984:Q4-1986:Q4. We exclude 1984:Q3—the quarter when TBTF banks were named—giving us equal sized windows of nine quarters before that event and nine quarters after.[7]

Our data, summarized in Table 1, require little description. *Spread* equals the yield on a given issue minus the yield on a Treasury bond of comparable maturity. *Rating* equals the average of Moody's and Standard and Poor's (S&P) rating on each bond, with one representing the highest/safest rating and 16 the lowest/riskiest. Both agencies intend the ratings as relatively stable (over the business cycle) measures of the risk default, and of expected loss given default (Moody's (2002) and S&P (2004)).

These are spreads and ratings on *new* bond issues, so the spreads reflect actual transaction prices (not matrix extrapolations) and the ratings reflect raters' real-time (not outdated) risk estimates. Issue size (*Proceeds)* makes a good proxy for issuer size and a reasonable proxy for liquidity (as long as some transaction costs are fixed). *Subordination* equals one for subordinated issues or zero for senior issues. That variable may be measured with error (zero subordination before 1985 seems dubious), but none of the interesting results hinge on it.

Figure 1 plots *Spread* against *Rating*. Lower rated bonds tended to pay higher spreads, but the relationship is not strictly linear, or even monotonic; some curvature in the relationship is evident, and there is a distinct kink at 10, the cutoff between investment grade and high-yield

[7]The data, from Security Data Corp's Domestic New Bond database, were provided to us by Joao Santos. Santos (2004) describes the data more thoroughly. We excluded asset-backed bonds, convertible bonds, bonds issued in 1984:Q3, and bonds without the necessary data to compute a spread. We cannot control for the option features of issue; these data were mostly missing so we elected to omit them altogether. Options are obviously an important bond feature, but their omission here should not bias results. 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.

bonds.[8] Spreads on TBTF issues appear slightly lower than on other issues with the same rating, but that might reflect differences in other terms.

To test for changes in ratings and spreads after the TBTF announcement, we estimate difference-in-difference regressions using a dummy variable to distinguish bonds issued before the announcement, and another dummy to distinguish banks named in that announcement:

$$(1) \quad X_{it} = \alpha + \beta POST_t + \gamma TBTF_i + \delta POST_t \cdot TBTF_i + \theta Z_{it} + \varepsilon_{it}$$

The dependent variable, X, equals the rating or spread on bond i issued in quarter t. POST equals one after 1984:Q3 and zero before. TBTF equals one for issues by banks named as TBTF in 1984:Q3 and zero for other issues. Zit controls for subordination, issue size, and maturity.[9]

The coefficient on *POST* measures the average change in the dependent variable on *all* issues after the announcement because of, for example, coincident changes in economic conditions. The coefficient on *TBTF* measures the average difference in the dependent variable for TBTF issues before the announcement. The interaction between those dummies, *POST*TBTF,* indicates whether the change in ratings after the announcement differed for the banks actually named as TBTF. The hypothesis that the announcement made raters less pessimistic about default risk on TBTF issues implies $\delta<0$. We use the same regression to see whether spreads changed after the announcement, but without controlling for risk (as we do later), we cannot venture a hypothesis for that regression.

Table 2 reports the regressions. Given other bond terms, ratings on TBTF issues did not differ significantly from ratings on other issues before 1984:Q3, but were about a notch lower

[8]The investment grade cutoff is at 10. Empirical work that focuses on the investment grade sample provides similar results, although typically less precisely estimated.

afterward (column 4). More precisely, the ratings on other issues worsened by 2.2 notches after 1984:Q3, but the ratings on TBTF issues worsened by just 1.1 notches. By contrast, the spreads on TBTF issues did not differ significantly, either before or after 1984:Q3 (column 2). Spreads on TBTF issues *tended* to fall relative to other issues after 1984:Q3, but that 31.9 basis point relative decline, though large, is not quite statistically significant (p-value=0.12).

Table 2 indicates that that the TBTF announcement did register in the bond market, at least among raters. The impact on spreads was less significant, but without controlling for risk, the spread regressions in Table 2 are hard to interpret. The next set of regressions have the bond rating on the right side and the bond spread on the left. Those regressions will reveal whether risk, as proxied by ratings, mattered less for spreads after the TBTF announcement. Before we estimate those spread-rating regressions, we discuss a simple model that shows how we can identify investors' expectations of support from the spread-rating relationship even if the rating reflects raters' expectations of support.

III. Identifying Investors' TBTF Beliefs from the Bond Spread-Rating Relationship

The model in this section shows how we can infer whether investors expect support for a particular bank by comparing spreads, conditional on ratings, across banks. Our model is simple, but not unrealistic. We assume that analysts—raters and investors—do not know for sure which banks are TBTF and which are not, so they have to estimate the probability of support for each bank that *might* be TBTF. As a result, their estimates may differ. As it turns out, it is precisely when investors and raters' estimates of support *do* differ that we can infer whether investors, in particular, expect support for a given bank.

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[9]We do not include issuer fixed effects because we are interested in *differences* between (TBTF and other) issues, not *within* issues over time

Analyst uncertainty about regulator behavior—will they or won't they support a given bank—is reasonable. According to Freixas (2000), regulators should keep the market guessing *via* "creative ambiguity" if they want to maintain some measure of market discipline without credibly committing to a *laizess-faire* policy, and regulators seem to follow that prescription. The Comptroller of the Currency, for example, only alluded to banks that his agency considered TBTF in his testimony to Congress in 1984, but avoided naming names. The ambiguity worked to some extent, evidently, because Carrington's (1984) list of TBTF banks differed slightly from the list in *Business Week* (O'Hara and Shaw, 1990). Analysts' uncertainty about regulatory behavior was probably heightened by FDICIA, as the constraints imposed on regulators in that act are still untested. Creative ambiguity still seems to be the unofficial policy among high-ranking bank regulators who (perhaps having learned from the Comptroller's experience) regularly avow that no bank is too big to fail.

Allowing for analyst uncertainty, and by extension, disagreement among analysts, also squares with what raters say on the matter:

> "…banking authorities pay … lip service to the concept of market discipline …
> so the analyst must make his own judgment of the likely behavior
> of the authorities." (Moody's, 1993)

We also allow for analysts' uncertainty about the fundamental (unsupported) probability of default for banks.[10] Raters and investors in our model must estimate default probabilities for any bank where support is not certain. They form independent estimates, but in the end, investors back out the numerical default probability implied by a given rating by reversing the mapping (rating category → % default) made available to investors by the rating agencies. In

other words, investors use ratings as a noisy signal of default risk. Our modeling on this point closely resembles Moody's (2002, p. 5) remarks on ratings for banks:

> "…the opacity of bank accounting (makes) true solvency unknowable even to bond raters…" and ratings should be viewed as "forecasts with uncertainty" (Moody's, 2002)

Given those two assumptions, we follow straightforward asset pricing intuition and model the interest spread on bonds as a function of investors' estimates of the probability of default (or losses given default). If investors believe the government will assist the bank, they discount the underlying risk of loss accordingly. To illustrate, consider a bond issued by such a small bank that neither investors nor raters assign any probability that the bank is TBTF. Let Z denote the underlying probability that the bank will default on the bond, and let $Z^R = Z + e^R$ denote bond raters' estimate of Z, where e^R denotes error in the estimate. Suppose raters convert their default risk estimates into ratings using a linear formula:

$$(2) \quad R = a\left(Z + e^R\right)$$

where $a \geq 0$. In reality, ratings reflect the probability of default (PD) and loss given default (LGD). Incorporating that distinction (by defining Z ≡ PDxLGD) does not alter the point we are making, so we ignore it. Allowing a more realistic, discrete rating formula ($Z \leq k \Rightarrow R = 1$, etc.) does not change our point either, so we maintain the continuous version (2).

Now consider investors and spreads. Suppose the marginal investor's default risk estimate is $Z^I = Z + e^I$ where e^I represents error in the investor's risk estimate. Risk can affect spreads in a complicated way, but it seems safe to suppose that spreads will be non-decreasing in Z^I:

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[10]Morgan (2002) concludes that banks are more opaque than other firms, but Flannery et al. (2004) conclude the

$$(3) \quad S = b\left(Z + e^I\right) + v$$

where $b \geq 0$.[11] The term v represents taxes, trading costs ("liquidity"), and other factors that might affect spreads.[12]

Eliminating Z from (2) and (3) yields:

$$(4) \quad S = \frac{b}{a}R + b(e^I - e^R) + v$$

Equation (4) is the spread-rating relationship we intend to estimate and compare across different banks. In essence, (4) implies that investors use ratings as one possible proxy for risk, as seems to be true in reality. The relationship between spreads and ratings will be stochastic to the extent that raters' and investors' estimates differ i.e., $e^I \neq e^R$.

Now consider a bond issued by a bank that *might* receive government support if it verges on default, i.e., it might be TBTF. The possibility of support will lead investors and raters alike to discount the underlying probability of default (Z) accordingly. Let B^R denote raters' estimate of the probability of support and let B^I denote investors'. The discounted analogues to equations (2) and (3) for a bank that might be TBTF are:

$$(5) \quad \begin{aligned} R &= a\left(1 - B^R\right)\left(Z + e^R\right) \\ S &= b\left(1 - B^I\right)\left(Z + e^I\right) + v \end{aligned}$$

Eliminating Z yields the counterpart to (4) for a TBTF candidate:

$$(6) \quad S = \frac{b}{a}\frac{1 - B^I}{1 - B^R}R + b(1 - B^I)(e^I - e^R) + v$$

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opposite.

[11]Spreads on subordinated may be decreasing in risk (or implied volatility) for bonds on the verge of default, but Gorton and Santomero (1990) and Flannery and Sorescu (1996) find that allowing for that non-monotonicity does not alter their results on the strength or weakness of market discipline. Our quadratic regression specification allows for non-monotonicity in the empirical spread-risk relationship.

[12]See Deliandeis et al. (2001), Elton et al. (2001), and Huang and Huang (2003) for other determinants of spreads.

A comparison of Equations (4) and (6) shows that the relationship between spreads and ratings will differ for TBTF candidates to the extent that investors and raters disagree about the probability of support. If investors are more optimistic than raters ($B^I > B^R$), the spread-rating relationship will be flatter for TBTF banks. The relatively optimistic investors in that case will tend to downplay a low rating by the (more pessimistic) raters, so the spread for a given rating will be smaller than for a non-TBTF bank. In the limit, where investors are certain about a bailout ($B^I = 1$), spreads on TBTF banks would be independent of ratings. By contrast, if investors are less optimistic than raters ($B^I < B^R$), they will view a risky rating by the more optimistic raters as an especially bad sign, implying a higher premium for a given rating for the TBTF candidate.

Our null hypothesis is that investors were *not* swayed by the TBTF announcement, i.e., B^I=0. Given that null, there are two potentially problematic cases. If $B^R > B^I = 0$, we would mistakenly reject $B^I = 0$ only because raters (but not investors) expect a bailout. If $B^R = B^I > 0$, we would mistakenly accept $B^I = 0$ because investors and raters happen to consider support equally likely. Both cases are knife-edge in the sense that B^I must equal a precise value (0 or B^R) so the likelihood of false inferences, though possible, seems remote.[13]

Equations (4) and (6) are the spread-rating relationships we estimate and compare across potential TBTF candidates and others.[14] We estimate relatively parsimonious equations, so we have to consider whether the omission of other factors that affect bonds spreads, e.g., the *v* in (4) and (6), might bias our comparison. If those factors are also correlated with bonds ratings, their omission *will* bias our estimates of *b/a*. So long as the correlation between *v* and ratings does not

[13]In addition, evidence from the stock market in O'Hara and Shaw (1990) suggests that it is unlikely that $B^I=0$.
[14]We can allow investors to base their risk estimate (and hence spreads) directly on the ratings, or vice-versa, but not both.

systematically differ between bonds issued by TBTF banks and bonds issued by other banks, however, our comparison across those two sets of issues will remain unbiased. In effect, we are differencing out any bias. A second possible bias occurs if the errors in risk estimates by investors and raters, e^I and e^R, are correlated with ratings. If the difference in errors (e^I - e^R) is uncorrelated with ratings, those errors will not bias our estimates of b/a.[15] Even if that difference is correlated with ratings (thus biasing our b/a estimates), our comparison across TBTF issues and other issues will again be unbiased as long as the correlation does not systematically differ between those two sets of issues.[16]

IV. Changes in the Spread-Rating Relationship after the TBTF Announcement

Using the data over the 1984:Q2-1986:Q4 period described in Section II, we estimate regressions of the form:

(7)

$$\begin{aligned} Spread_{i,t} = a + a_t + \alpha TBTF_i + \beta POST_i + \delta TBTF_i \cdot POST_t + \\ F(Rating_{i,t}) + F(Rating_{i,t})TBTF_i + F(Rating_{i,t})POST_t + F(Rating_{i,t})TBTF_i \cdot POST_t + \\ \gamma X_{it} + \lambda X_{it} \cdot POST_i + e_{i,t}, \end{aligned}$$

where the function F is linear or quadratic in *Rating*.

TBTF equals 1 for issues by banks named in 1984:Q3 and zero for other issues. *POST* equals one after 1984:Q3 and zero before. X_{it} controls for other bond terms: subordination, issue size, and maturity. The quarter dummy, a_t, allows for fixed differences in spreads over time. We do not include a bank fixed effect because we are interested in the differences between TBTF

[15]Bond ratings by Moody's and S&P *are* more likely split over riskier bonds (Morgan, 2002), so differences between raters and *investors* may increase with risk as well.

[16]Selection bias is possible with the new issue data we are studying if the propensity to issue depends on spreads (Covitz et al. (2004)), but our comparison across TBTF and other issuers will be unbiased as long as the selection bias does not differ systematically across those sets of issuers.

and other issues, rather than differences within issuers over time. We allow for correlation in errors for a given issuer, but assume (as is standard) independence of errors across issuers. Allowing for correlation within issuers tends to increase standard errors and reduce statistical significance.

Table 3 reports the both the linear and quadratic regression results. Note that we report the estimates of Equation (7) *as if* we estimated separate regressions before and after the announcement (to ease exposition), but in fact, we pooled the data and used the dummy *POST* to capture differences before and after the announcement. Thus, the difference column for each regression (linear and quadratic) equals the coefficient on the *POST* dummy or its interaction with other variables.

The results indicate that the relationship between spreads and ratings did differ for TBTF issuers, but only after they were named as such. In both the linear and quadratic regressions, the *TBTF*Rating* coefficients are only significant after Carrington (1984) named them. In the quadratic specification, for example, the p-value on the joint significance of the TBTF dummy and interactions is 0.63 before the Comptroller's announcement and 0.09 afterward.[17]

Economically, the linear relationship between spreads and rating became flatter for TBTF issues and steeper for other issues. The changes are substantial. With the linear regression, a one notch decline in ratings was associated with a 14.5 basis points rise in spreads regardless of issuer (the *TBTF*Rating* interaction is not significantly different from zero) in the pre-announcement period. Post-announcement, a one notch decline in ratings increased spreads by 39.7 basis points for non-TBTF issues, but just 15.4 basis points for TBTF issues. Bond

[17]We do not focus on the intercept differences because the regressions include quarter dummy variables, so the intercept is sensitive to which quarter is excluded.

investors apparently became relatively tough on non-TBTF issues and relatively soft on TBTF issues.

The quadratic relationship also flattened for TBTF issues. Pre-announcement, the coefficient on $Rating^2$ and all the TBTF coefficients were individually and jointly insignificant, implying a nearly straight-line relationship between spreads and ratings for both sets of issues. After the announcement, the coefficients on *Rating* and $Rating^2$ were negative and positive, respectively, implying a lazy *J* relationship between spreads and ratings.[18] The coefficients on the *TBTF*Rating* interactions very nearly cancel the coefficients on *Rating,* implying a much flatter curve for the TBTF issues.[19] The difference in the *Rating* coefficients (pre minus post-announcement) is significant for other issues, but not for TBTF issues, which implies that the spread-rating relationship for TBTF issues flattened relative to other issues.

Interpreted through our model, the flatter spread-rating relationship for TBTF issues implies that investors took the higher risk ratings of TBTF issues less seriously after the Comptroller's announcement. Recall from Table 2 that raters raised ratings on TBTF issues about one notch (relative to other issues) after the TBTF announcement, suggesting raters viewed support as more likely afterwards. The flattening of the spread-rating line after TBTF issuers means investors were even more optimistic than raters after the announcement.

This interpretation is also consistent with the different incentives of investors and raters. Efficient investors can avoid idiosyncratic risk by holding a diversified portfolio of bonds. Raters, by contrast, are clearly motivated to avoid missing a default, whether it results from

[18]This reflects, in part, the presence of more low-grade, high-yield bonds.

[19]For TBTF issues, the linear portion became more positive ($TBTF*Rating$=40.06, p=0.03), while the quadratic portion became more negative ($TBTF*Rating^2$=-3.85, p = 0.02). This implies a flatter curve for the TBTF issues.

idiosyncratic or market events. Thus, investors may care less than raters about mistakes, so they can afford to be more optimistic about government support.

A final implication is that investors became relatively tougher on the other bank issues *not* named as TBTF. One interpretation is that the Comptroller's announcement resolved some ambiguity about exactly which institutions were candidates for government support. If so, we would expect higher spreads for the banks revealed as not too big to fail. This interpretation contrasts with Black et al. (1997), who argue that the TBTF event weakened market discipline for BHCs generally, even those smaller than the 11 actually named as TBTF,[20] but is consistent with Penas and Unal (2004), who document the value of being perceived as TBTF.

V. Differences in the Spread-Rating Relationship in the Post-FDICIA Era

Have FDICIA and other reforms eliminated the differences in the spread-rating relationship that emerged after the Comptroller's announcement? To answer that, we estimate spread-rating regressions using data from 1993 to 1998, which spans part of what Covitz et al. (2004) call the "post-FDICIA regime."[21] FDICIA mandated least-cost resolution of failed banks, making it harder for regulators to justify resolutions that involved insurance for non-insured claimants. A loophole in FDICIA provides for additional assistance for "essential," i.e., TBTF, banks, but the conditions for providing such assistance are more stringent than before FDICIA.[22] If FDICIA weakened investors' expectations of support for TBTF banks, as was intended, we would expect smaller differences in the spread-rating relationship for TBTF banks over our post-

[20]They report increased institutional holdings of BHCs relative to comparable, non-financial firms after the TBTF announcement, and reduced stock market reaction to BHC dividend cuts and omissions.
[21]The "post-FDICIA" period in Covitz et al. (2004) spans 1993-2002.
[22]Providing such support requires approval by two-thirds of the FDIC's directors, the Board of Governors of the Federal Reserve, and concurrence of the Secretary of the Treasury (Wall, 1993).

FDICIA window. In fact, we find difference very similar to those that emerged right after the Comptroller's announcement.

a) Data and Results

Table 4 compares terms on TBTF and other issues for the 1993-1998 period where TBTF issues are identified as those from the original 1984 list and their surviving descendants.[23] Subordination was more common on TBTF, especially after 1996, but the other terms were fairly similar.[24] By contrast, the terms on TBTF issues changed quite substantially between the TBTF and post-FDICIA era (compare Tables 1 and 4). The average TBTF issue was rated 3.5 over 1984-86 (the post-announcement period) versus 6.0 over 1993-98. Despite that two and a half notch downgrade, TBTF spreads barely changed between eras.

Figure 2 plots average spreads against ratings for TBTF and other issues. Both curves mostly slope upward with a kink at the investment grade cutoff of 10. The correlation between spreads and ratings was lower for TBTF issues than for other issues (0.51 versus 0.69), suggesting a weaker link between spreads and ratings for the former.

Table 5 reports regressions of spreads on ratings as in Equation (6) using these more recent data.[25] Note that there is no obvious counterpart to the Comptroller's announcement to do a before and after comparison, so we estimate the regressions over the entire 1993-1998 period. As in the earlier post-announcement period, the linear relationship between spreads and ratings (column 1) is significantly flatter for TBTF issues. The difference appears substantial: one lower notch on TBTF issues increased spreads by 8 basis points, compared to 19.2 for other issues.

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[23] Morgan and Stiroh (2001) describe these data in more detail.

[24] TBTF spreads were about four basis points higher, their ratings were about 0.3 notches lower (i.e., safer), and they were about a year longer (in maturity) than other issues.

[25] Recall that we are defining TBTF issues based on the original list of 1984 and their descendants. To the extent that we are missing some other banks that have grown into TBTF status, we are biasing the results against finding significant differences between the TBTF and other issues.

The quadratic relationship is also different for TBTF issues. The curve for other issues has the same right-leaning J-shape estimated for the early period (Table 3) and the estimated curve for TBTF issues is flatter.

The differences in the spread-rating relationship for TBTF and other issues in the post-FDICIA era resemble the differences that emerged after TBTF banks were named (compare Tables 3, column 5 vs. Table 5, column 2). This suggests that those large banks, and their descendents, may still enjoy the privileged position as TBTF that emerged after the Comptroller's announcement in 1984.

b) Robustness Tests

This section discusses several alternative cuts of the data that serve as robustness tests for our analysis of the data for 1993 to 1998. One obvious candidate is to identify potential TBTF issues by size rather than by the original 1984 list. Whether "big" is defined as assets over $100 billion, over $85 billion (roughly the sample mean), over $50 billion (roughly the sample median), or using the definition of Penas and Unal (2004), we always reject that the spread-rating relationship for "big" banks was the same as for other banks.

The differences are still significant, although weaker, if we exclude non-investment grade issues for the post-FDICIA period. Excluding those issues considerably weakens the differences around the TBTF announcement (in Table 3), but we suspect that is because our sample over that period is small, and, because the extra variation with those issues included is important to identifying the differences during that period.

Finally, the differences evident in Table 5 were also significant if we estimated piece-wise linear regressions, where the step in spreads can change from rating to rating. In that case, we rejected the null that the TBTF banks had the same spread-rating relationship as for other issues.

VI. Conclusions

The naming of TBTF banks in 1984 elevated bond ratings for those banks about a notch compared to other, unnamed, banks. The naming of those banks also tended to flatten the relationship between the spreads on their bonds and the bonds' ratings. Interpreted through our model of how spreads will relate to ratings when both investors and raters believe in TBTF—but in different degree—suggests that the naming of TBTF banks made investors even more optimistic than raters about future support of TBTF-named banks. These findings for bank bonds are consistent with, and extend, O'Hara and Shaw's (1990) finding of an increase in stock prices for the TBTF banks after those banks were named by Carrington (1984).

We find similar differences in the bond spread-rating relationship for the descendants of the TBTF banks over a post-FDICIA window using more recent data, suggesting that investors still consider the possibility of support for TBTF banks when judging and pricing the risk of those banks' bonds. Until bond holders no longer consider the possibility of support for those banks, bond market discipline of TBTF candidates will be less than complete.

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Table 1: Bond Summary Statistics around the Comptroller's TBTF Announcement

Reported are means and standard deviations each year and for all years on bank and bank holding company bonds issued between 1982:Q2-1984:Q2 and 1984:Q4-1986:Q4. TBTF issuers named in Carrington (1984). Spread equals bond yield minus yield on Treasury bond of comparable maturity. Average rating is average of Moody's and S&P rating.

	1982	1983	1984	1985	1986	1982-1986
		TBTF				
Mean Spread (bp)	85.10	60.84	56.25	69.96	85.28	74.47
Std. Dev. of Spread (bp)	44.77	18.62	12.83	30.72	39.12	34.72
Subordinated (%)	0.00	0.00	0.00	0.25	0.16	0.10
Proceeds ($millions)	104.6	149.8	137.4	170.5	187.8	156.1
Maturity (years)	4.8	6.6	3.9	8.3	7.8	6.6
Average Rating	2.5	2.4	3.4	3.2	3.8	3.2
Number of Issues	11	9	8	12	19	59
		Other				
Mean Spread	132.95	83.73	102.57	166.23	118.52	124.31
Std. Dev. of Spread	54.54	32.22	103.41	182.76	88.93	106.13
Subordinated (%)	0.00	0.00	0.29	0.29	0.18	0.14
Proceeds ($millions)	66.7	55.4	70.8	71.0	102.5	77.7
Maturity (years)	8.9	8.8	11.1	9.4	9.7	9.4
Average Rating	3.7	4.6	6.3	7.5	5.4	5.3
Number of Issues	23	18	7	21	34	103

Table 2: Difference in Spreads and Ratings for TBTF Issues and Change After 1984:3

OLS regression coefficients (robust standard errors) estimated using 162 new bonds issued by banks and bank holding company between 1982:Q1–1986:Q4, excluding 1984:Q3 when TBTF banks were named. *TBTF = 1* for issues of banks named TBTF by Carrington (1984); =0 for others. *POST* = 1 for issues after 1984:Q3; =0 before.

	Dependent Variable:			
	Spread		**Rating**	
Constant	106.680***	136.253**	4.200***	10.408***
	(7.721)	(53.311)	(0.291)	(1.402)
POST	31.301	23.100	2.024***	2.157***
	(19.140)	(16.910)	(0.518)	(0.423)
TBTF	-35.430***	-2.171	-1.617***	0.002
	(10.418)	(14.193)	(0.345)	(0.461)
Post*TBTF	-25.881	-31.916	-1.050*	-1.068*
	(21.224)	(20.625)	(0.614)	(0.567)
Subordinated Dummy		68.222*		2.354***
		(38.060)		(0.643)
Ln(Proceeds)		-18.762		-1.757***
		(11.857)		(0.306)
Maturity		4.763**		0.083*
		(1.994)		(0.050)
Joint sig. of TBTF (p-values)	0.00	0.12	0.00	0.08
Joint sig. of Post (p-values)	0.22	0.30	0.00	0.00
Adjusted-R^2	0.07	0.22	0.24	0.44

***, **, * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 3: Differences in Spread-Rating Relationship for Bonds of TBTF Banks and Change after They Were Named in 1984:Q3

OLS coefficients estimates from regression of spread on ratings estimated with 162 new bank (or bank holding company) bonds issued between 1982:Q1–1986:Q4, excluding 1984:Q3 when TBTF banks were named. TBTF = 1 for issues of banks named TBTF by Carrington (1984); =0 for others. Component adjusted-R^2 is for the 69 observations in the pre-1984:Q3 period and for the 93 observations in the post-1984:Q3 period estimated separately. Robust standard errors that allow for dependence within issuers reported in parentheses.

	Linear Regression			**Quadratic Regression**		
	Pre-83:Q3	**Post-83:Q3**	**Difference**	**Pre-83:Q3**	**Post-83:Q3**	**Difference**
Average Rating	14.536***	39.721***	25.185***	9.063	-38.311***	-47.374***
	(1.872)	(4.590)	(4.931)	(8.804)	(4.940)	(10.671)
Average Rating^2				0.576	4.814***	4.238***
				(0.933)	(0.316)	(1.024)
TBTF	-21.721	108.587***	130.308***	-104.236	-84.103*	20.133
	(24.844)	(35.334)	(36.375)	(163.279)	(46.660)	(170.949)
TBTF*Average Rating	6.798	-24.336***	-31.135***	63.155	40.064**	-23.091
	(6.003)	(5.874)	(7.201)	(110.010)	(17.787)	(112.214)
TBTF*Average Rating^2				-8.414	-3.846**	4.568
				(16.451)	(1.567)	(16.569)
Subordination Dummy	-68.424***	-15.205	53.219**	-67.191***	-21.195*	45.997**
	(12.311)	(22.183)	(24.463)	(13.437)	(11.079)	(17.978)
Ln(Proceeds)	26.145***	29.993**	3.849	25.732***	10.019	-15.713
	(5.542)	(13.789)	(14.845)	(4.975)	(8.612)	(9.905)
Maturity	4.731***	0.485	-4.246	4.916***	4.223***	-0.693
	(1.464)	(2.301)	(2.985)	(1.422)	(0.950)	(1.636)
Jt. Sig. TBTF (p value)	0.38	0.00	0.00	0.63	0.09	0.84
Full Adjusted-R^2		0.75			0.90	
Component Adjusted-R^2	0.67	0.76		0.66	0.94	

***, **, * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 4: Characteristics of New Bonds Issued by TBTF and Other Banks: 1993 - 1998

Sample statistics calculated (at issuance) for 584 conventional, fixed-rate bonds. *TBTF Issues* include bonds issued by the 11 bank holding companies identified by Carrington (1984) and descendants. *Other Issues* include all other bank, bank holding company, and S&L bonds. Spread is the difference (in basis points) between the bond yield at issuance and a Treasury security of comparable maturity.

	1993	1994	1995	1996	1997	1998	1993-98
				TBTF Issues			
Mean Spread (basis points)	79.8	77.8	84.0	57.8	71.6	78.0	73.2
Std. Dev. Of Spread (bp)	32.8	17.7	36.5	28.2	36.4	6.0	31.9
Subordinated (%)	75.0	77.8	45.5	41.5	80.0	100.0	57.8
Proceeds ($million)	224.6	185.6	115.3	160.2	290.0	233.3	173.1
Maturity (years)	9.7	10.7	9.0	8.9	14.4	10.0	9.6
Average Rating	7.0	6.6	5.4	5.5	5.6	5.8	6.0
Number of Issues	28	18	33	41	5	3	128
				Other Issues			
Mean Spread (bp)	75.7	52.7	74.8	64.9	81.2	80.3	69.1
Std. Dev. Of Spread (bp)	62.8	36.7	84.1	60.4	55.0	15.9	63.7
Subordinated (%)	51.4	31.0	26.8	31.6	44.4	42.9	35.7
Proceeds ($million)	154.4	130.3	136.7	152.0	243.3	275.5	153.6
Maturity (years)	7.4	6.5	7.9	9.9	12.1	13.2	8.4
Average Rating	6.7	5.3	6.5	6.4	6.6	6.6	6.3
Number of Issues	107	87	127	98	9	28	456

Source: Author's calculations using data from Securities Data Corporation.

Table 5: Bond Spread-Rating Relationship in the Post- FDICIA Period (1993-1998)

OLS coefficients from regression of spread on ratings estimated with 584 new bank (or holding company) bonds issued between 1993 and 1998. TBTF = 1 for issues by banks named TBTF by Carrington (1984) and descendents; =0 for others. Robust standard errors that allow for dependence within issuers reported in parentheses.

	Linear	**Quadratic**
Average Rating	19.170***	-38.402***
	(3.489)	(9.358)
Average Rating^2		3.819***
		(0.713)
TBTF	78.059***	-101.003***
	(20.840)	(29.816)
TBTF*Average Rating	-11.131***	40.735***
	(3.213)	(10.220)
TBTF*Average Rating^2		-3.361***
		(0.834)
Subordination Dummy	-0.048	10.492**
	(5.856)	(4.060)
Ln(Proceeds)	-6.248***	-3.992***
	(2.168)	(1.387)
Maturity	1.320***	1.715***
	(0.430)	(0.444)
Jt. Sig. TBTF	0.00	0.00
Adjusted-R^2	0.48	0.70

***, **, * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Figure 1: Spreads vs. Ratings for 1982:Q2-1986:Q4

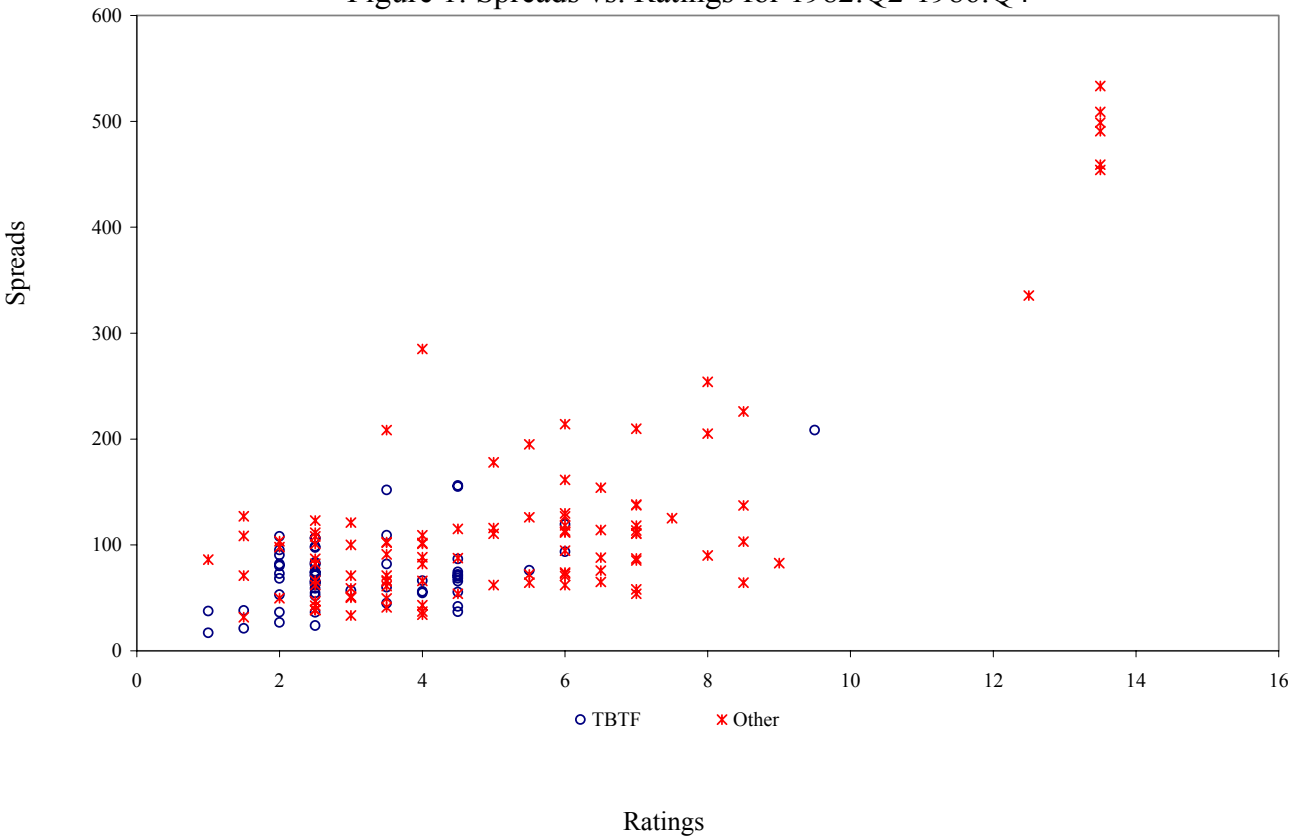

Figure 2: Spreads vs. Ratings for 1993-1998